Intended for **Transport for NSW**

Document type Report

Date April 2023

TARAGO, NSW DECEMBER 2022 SURFACE WATER MONITORING REPORT



TARAGO, NSW DECEMBER 2022 SURFACE WATER MONITORING REPORT

Project name Project no. Recipient Description Tarago Surface Water Monitoring 318001376-T3 TfNSW

This report describes the methodology and results for quarterly surface water monitoring undertaken as part of the Tarago Lead Management Project <u>at</u> Tarago, NSW.



Ramboll Level 2, Suite 18 Eastpoint 50 Glebe Road PO Box 435 The Junction NSW 2291 Australia

T +61 2 4962 5444 https://ramboll.com

Revision Number	Revision	Date	Prepared by	Checked by	Approved by
0	Draft	27/01/2023	J Kirsch	S Maxwell CEnvP (SC) 41184	F Robinson
1	Final	17/04/2023	J Kirsch / N Gilbert	S Maxwell CEnvP (SC) 41184	F Robinson

Ramboll Australia Pty Ltd. ACN 095 437 442 ABN 49 095 437 442

CONTENTS

Abbreviat	ions	3
1.	INTRODUCTION	4
1.1	Background	4
1.2	Objectives	4
2.	SCOPE OF WORK	5
2.1	Monitoring Scope	5
3.	SAMPLING and ANALYSIS QUALITY PLAN	7
4.	QUALITY ASSURANCE / QUALITY CONTROL PROGRAM	8
4.1	QA/QC Data Evaluation	8
5.	ASSESSMENT CRITERIA	11
5.1	Rationale for Application of Guidelines	11
6.	RESULTS	14
6.1.1	Monitoring Events	14
6.1.2	Physico-Chemical Results	16
6.1.3	Analytical Results	17
6.1.4	Analytical Results Trends	20
7.	SUMMARY	38
8.	CONCLUSIONS	40
9.	LIMITATIONS	41
9.1	User Reliance	41
10.	REFERENCES	42

LIST OF TABLES

Table 2-1: Surface Water Sampling Locations	5
Table 4-1: QA/QC –Assessment of DQIs	8
Table 5-1: Hardness Corrections for Tier 1 Freshwater Ecology	
Guidelines	12
Table 5-2: Guidelines Applied to Sampling Points	12
Table 5-3: Guideline Criteria (mg/L)	13
Table 6-1: Indicative Summary of Rainfall Preceding	
Sampling Events	15
Table 6-2: Summary of Surface Water Physico-Chemical Parameters	16
Table 6-3: Summary of Onsite and Near Site Surface Water	
Analytical Results (SW1_UP, SW1, SW2, SW3, SW4, SW5, SW6,	
SW7)	18
Table 6-4: Summary of Mulwaree River Surface Water Analytical	
Results (SW8, SW9, SW10)	19
Table 7-1: CoPC Results Summary (Lead, Copper, Zinc)	38
LIST OF FIGURES	
Figure 2-1: Surface Water Monitoring Locations	6
Figure 6-1: Ungradient and Onsite Total Lead Concentration Trend	21
Figure 6-2: Ungradient and Onsite Dissolved Lead Concentration	21
	22
Figure 6-3: Mulwaree River (Offsite) Total Lead Concentration Trend	22
Figure 6-4: Mulwaree River Offsite Dissolved Lead Concentration	24
Trond	25
Figure 6 5: Ungradient and Onsite Tetal Conner Concentration Trend	25
Figure 6-6: Ungradient and Onsite Dissolved Conper Concentration	27
	20
i enu	28

Figure 6-7: Mulwaree River (Offsite) Total Copper Concentration	
Trend	30
Figure 6-8: Mulwaree River (Offsite) Dissolved Copper Concentration	
Trend	31
Figure 6-9: Upgradient and Onsite Total Zinc Concentration Trend	33
Figure 6-10: Upgradient and (Onsite) Dissolved Zinc Concentration	
Trend	34
Figure 6-11: Mulwaree River (Offsite) Total Zinc Concentration Trend	36
Figure 6-12: Mulwaree River (Offsite) Dissolved Zinc Concentration	
Trend	37

APPENDICES

Appendix 1 SAQP

Appendix 2 Calibration Certificate

Appendix 3 Results Tables

Appendix 4 Laboratory Reports

Appendix 5

Site Photographs

ABBREVIATIONS

Measures	Description
ADWG	Australian Drinking Water Guidelines
ALS	Australian Laboratory Services
ANZECC	Australian and New Zealand Environment and Conservation Council
ANZG	Australian and New Zealand Guidelines (for Fresh and Marine Water Quality)
ARMCANZ	Agriculture and Resource Management Council of Australia and New Zealand
COC	Chain of Custody
CoPC	Contaminants of Potential Concern
DEC	Department of Environment and Conservation
DO	Dissolved Oxygen
DQI	Data Quality Indicator
EC	Electrical Conductivity
EPA	Environment Protection Authority (NSW)
EnRiskS	Environmental Risk Sciences Pty Ltd
LCS	Laboratory Control Sample
Mercury	Inorganic mercury unless noted otherwise
mg/L	Milligrams per Litre
NATA	National Association of Testing Authorities
NEPC	National Environment Protection Council
NEPM	National Environment Protection Measure
NHMRC	National Health and Medical Research Council
NSW	New South Wales
ORP	Oxidation/Reduction Potential
QA/QC	Quality Assurance/Quality Control
RPD	Relative Percent Difference
Ramboll	Ramboll Australia Pty Ltd
SAQP	Sampling and Analysis Quality Plan
TDS	Total Dissolved Solids
TfNSW	Transport for New South Wales
VMP	Voluntary Management Proposal
-	On tables is "not calculated", "no criteria" or "not applicable"

1. INTRODUCTION

Ramboll Australia Pty Ltd (Ramboll) was engaged by Transport for New South Wales (TfNSW) to complete periodic surface water monitoring downstream of contamination identified with the Goulburn – Bombala rail corridor at Tarago, New South Wales (NSW).

Contamination has been identified along approximately 900 lineal meters of the rail corridor (Ramboll, 2019). This area is herein referred to as "the Site" and is presented with surface water monitoring locations on **Figure 2-1**.

1.1 Background

The Woodlawn Mines Ore Concentrate Load-Out Complex operated within the Goulburn – Bombala rail corridor at Tarago from the 1970s to the 1990s. Concentrates were produced at the Woodlawn Mine approximately 6.5 km west and included a zinc concentrate consisting mainly of sphalerite (zinc oxide), lead concentrate of galena (lead sulphide) and copper concentrate of chalcopyrite (copper iron sulphide).

On 25 March 2020, the NSW Environment Protection Authority (NSW EPA) declared the Site as significantly contaminated under Section 11 of the *Contaminated Land Management Act 1997* (Declaration Number 20201103). TfNSW is currently managing the contamination under a Voluntary Management Proposal (VMP) which includes further assessment of site contamination and remediation to address the potential risks to human health and the environment.

An extensive body of work has been completed to characterise contaminant impacts associated with historical operation of the Site. This work has included assessment of soil, groundwater and surface water across the Site and assessment of soil, groundwater, surface water and airborne dust within the surrounding area. A previous assessment completed by Ramboll (2020) identified contaminants of potential concern (CoPC) relevant to receiving surface waters were limited to metals which exceed relevant human health and ecological assessment criteria.

In 2020, Environmental Risk Sciences Pty Ltd (EnRiskS) were commissioned to undertake a review of the existing data and provide further advice in relation to the risk to human health and the environment due to lead and other metals in areas adjacent to the Site (EnRiskS, 2021). As part of the assessment EnRiskS (2021) developed site specific criteria for metals in soil, sediment, and surface water for the drainage features accessed during surface water monitoring. These site-specific criteria have been adopted for assessment of the surface water results presented in this report.

Periodic monitoring of onsite and offsite surface water commenced in 2019 and ceased in April 2021 following consistent observation that risks to the receiving environment from Site contamination were low. On 6 September 2022 the NSW EPA issued a Prevention Notice to TfNSW relating to deficiencies in the implementation the Tarago Lead Management Plan (Ramboll, 2019). In response, surface water monitoring was reinstated to further assess temporal and geographic trends in contaminant distribution from the Site.

1.2 Objectives

The objectives of the surface water monitoring program are to:

- Collect reliable water quality data, to provide a data continuum which forms the basis for assessment of impacts from the Site on surrounding surface water receptors.
- Present data to date on a quarterly basis.

2. SCOPE OF WORK

2.1 Monitoring Scope

The scope of work for each surface water monitoring event includes:

- Collection of surface water samples at 11 predefined locations, as presented in **Table 2-1** and **Figure 2-1** (plus collection of quality assurance samples).
- Measurement of surface water physico-chemical properties including pH, temperature, electrical conductivity (EC), dissolved oxygen (DO), redox potential (ORP) and total dissolved solids (TDS).
- Submission of samples to a National Association of Testing Authorities (NATA) accredited laboratory for analysis of total and dissolved metals (aluminium, arsenic, barium, beryllium, cadmium, chromium, cobalt, iron, lead, manganese, mercury, nickel and zinc).
- Assessment of laboratory results against adopted assessment criteria, as presented in Section 5.
- Assessment of data quality and reliability.

Table 2-1: Surface Water Sampling Locations

Sample ID	Location
On and Near Site	
SW1	Adjacent to a culvert on the western side of the rail line at CH 262.600 on tributary of Mulwaree River.
SW1 - UP	Intended as an up-stream sample, located on a western tributary of the Mulwaree River, approximately 100 m west of the rail corridor at CH. 262.600.
SW2	Adjacent to a culvert on the eastern side of the rail line at CH 262.600 on tributary of Mulwaree River.
SW3	Adjacent to a culvert on the western side of the rail line at CH 262.300.
SW4	Adjacent to a culvert on the eastern side of the rail line at CH 262.300.
SW5	Adjacent to a culvert on the western side of the rail line at CH 262.000.
SW6	Adjacent to a culvert on the eastern side of the rail line at CH 262.000.
SW7	A dam located downgradient from the Site northern rail culvert forming part Lot A DP 440822.
Offsite – Mulwaree River	
SW8	Mulwaree River adjacent Lumley Road.
SW9	Mulwaree River off Braidwood Road.
SW10	Mulwaree River off Braidwood Road.



Legend

\blacklozenge	Surface water sampling
	Rail corridor
	Rail corridor fence
	Area of lead exceedance
	Indicative surface water

rea of lead exceedance (within rail corridor) ndicative surface water flow path (ie: not ephemeral)

location

Indicative ephemeral surface water flow path



3. SAMPLING AND ANALYSIS QUALITY PLAN

Prior to the commencement of routine surface water monitoring, Ramboll prepared a Sampling and Analysis Quality Plan titled '*Sampling Analysis and Quality Plan (SAQP) – Surface Water Monitoring, Tarago Lead Management*' (Ramboll, 2020).

The SAQP is attached as **Appendix 1**.

4. QUALITY ASSURANCE / QUALITY CONTROL PROGRAM

4.1 QA/QC Data Evaluation

An assessment was made of data completeness, comparability, representativeness, precision and accuracy based on field and laboratory considerations, as outlined in NEPM 1999 Amendment (2013) guidelines. The DQI assessment for the December 2022 surface water monitoring event is provided in **Table 4-1**.

Table 4-1: QA/QC -Assessment of DQIs

Assessment of DQIs (as per NSW EPA, 2020)	Ramboll's Assessment	Completeness	Comparability	Representativene	Precision	Accuracy
Field QA/QC						
Sampling team	Sampling was completed by Ramboll experienced environmental scientists/engineers between 12 and 13 December 2022.	x	x			
Reference to sampling plan/method, including any deviations from SAQP	Sampling was undertaken in general accordance with the SAQP. SW5 could not be sampled as the location was dry.	x				
Any information that could be required to evaluate measurement uncertainty for subsequent testing (analysis)	Samples were collected from 11 pre-determined locations (unless dry) for consistency between the sampling rounds. Samples were collected from 100 mm below surface, where practical.				x	x
Decontamination procedures carried out between sampling events	Samples were collected directly into laboratory supplied sampling containers using dedicated disposable sampling equipment. Disposable nitrile gloves were worn during sample collection and were changed between sample locations. Field parameters were recorded after analytical samples had been collected. Non disposable sampling equipment (i.e., water quality meter probe) were rinsed between sampling locations with a solution of Decon®90 and potable water.			x	x	x
Logs for each sample collected, including date, time, location (with GPS coordinates if possible), sampler, duplicate samples, chemical analyses to be performed, site observations and weather/environmental (i.e., surroundings) conditions. Include any diagrams, maps, photos.	Each sample was labelled with a unique sample ID, as presented in Table 2-1 . Surface water parameters including pH, temperature, EC, DO and ORP were measured and recorded for each of the sampling locations using a calibrated multiparameter water quality meter. Measurements of field parameters were recorded once parameters had stabilised.		x	x		
Chain of custody fully identifying – for each sample – the sampler, nature of the sample, collection date, analyses to be performed, sample preservation method, departure time from the site and dispatch courier(s) (where applicable)	Samples were transported to the laboratory under chain of custody conditions. The chain of custody forms were signed by the laboratory on receipt of the samples. All surface water samples were placed into laboratory-supplied bottles that were prepared with the required preservatives. Surface water samples were stored in an ice filled cooler in the field and during transportation to the laboratory.	x	x			
Field quality assurance/quality control results (e.g., field blank, rinsate blank, trip blank, laboratory prepared trip spike)	Intra- and inter-laboratory duplicate results, are presented in Table 13 , Appendix 3 . No trip spike/blanks were collected due to the targeted contaminants of the investigation not being volatile. Relative Percent Differences (RPDs) exceeded the RPD criteria (≤30%) for: • Total and dissolved iron • Total and dissolved manganese				x	x

ŝ

Assessment of DQIs (as per NSW EPA, 2020)	Ramboll's Assessment	Completeness	Comparability	Representativeness	Precision	Accuracy
	• Total and dissolved zinc The exceedances in the RPD criteria are considered to be associated with low level concentrations less than 10-times the laboratory limit of reporting. The higher concentration was generally reported in the primary sample. These minor discrepancies are not considered to affect the reliability of the data.					
Sample splitting techniques – subsampling, containers/preservation (ensure unique ID for subsequent samples provided)	The external duplicate samples were obtained by first gathering a larger volume of water and then decanting to create three identical sub samples. Field duplicate samples were labelled with a unique identification that does not reveal the association between the primary and duplicate samples e.g., D01.			x		x
Statement of duplicate frequency	Intra- and inter- laboratory duplicate samples were analysed at a rate of 10%.			x	x	
Field instrument calibrations (when used)	The water quality meter was hired from a rental company who calibrated the equipment prior to hire. The calibration certificate is included in Appendix 2 .				x	x
Sampling devices and equipment	The calibrated water quality meter was used to collect field data, including pH, temperature, EC, DO, ORP and TDS. These parameters were recorded once stabilised.	x	x			
Laboratory QA/QC						
A copy of signed chain-of-custody forms acknowledging receipt date, time and temperature and identity of samples included in shipments	Copy of the signed chain of Custody (COC) forms are provided in Appendix 4.	x	x			
Record of holding times and a comparison with method specifications	Review of the COC forms and laboratory certificates indicated that holding times were met.	x	x			
Analytical methods used, including any deviations	Summary analytical methods were included in the laboratory test certificates presented in Appendix 4 .	x	x			
Laboratory accreditation for analytical methods used, also noting any methods used which are not covered by accreditation	Eurofins MGT was used as the primary laboratory and ALS was used as the secondary laboratory. The laboratory certificates are NATA stamped.	x			x	
Laboratory performance for the analytical method using inter- laboratory duplicates	Analytical methods were comparable between laboratories.		x			x
Surrogates and spikes used throughout the full method process, or only in parts. Results are corrected for the recovery	All laboratory control samples and surrogates were acceptable.	x	x			
A list of what spikes and surrogates were run with their recoveries and acceptance criteria (tabulate)	Laboratory spike and surrogate recoveries are detailed in the laboratory certificates provided in Appendix 4.		x			x
Practical quantification limits (PQL)	The PQL for dissolved mercury (<0.0001 mg/L) exceeds the adopted ecological screening criteria for 95% species protection (0.00006 mg/L). Mercury was not detected above the PQL in any of	x	x			

Assessment of DQIs (as per NSW EPA, 2020)	Ramboll's Assessment	Completeness	Comparability	Representativeness	Precision	Accuracy
	the samples collected indicating that any exceedances of the criteria are anticipated to be minor (within 0.00004 mg/L). All remaining PQLs were below the adopted assessment criteria.					
Reference laboratory control sample (LCS) and check results	The results for LCS were acceptable and no detections were made in blank samples.	x				
Laboratory frequencies (tabulate)	Laboratory quality control samples including duplicates, surrogate spikes and blanks were undertaken by the laboratories at appropriate frequencies.	x				x
Laboratory results (tabulate)	The results for laboratory duplicates were acceptable and no detections were made in blank samples.	x				x

Overall, it is considered that the completed investigation works and the data obtained adequately complied with the requirements of NEPM 1999 Amendment (2013) guidelines. Some uncertainty surrounds the mercury results due to PQLs above for all data to date however this uncertainty does not affect the conclusions of the report because mercury is not a contaminant of concern. However, it is considered that the data is of suitable quality to meet the project objectives.

5. ASSESSMENT CRITERIA

The criteria adopted for the assessment of surface water contamination are sourced from the following references:

- National Environment Protection Council (NEPC), National Environment Protection (Assessment of Site Contamination) Measure (NEPM) 1999, as amended 2013 (NEPC, 2013).
- National Health and Medical Research Council (NHMRC) (2001) National Resource Management Ministerial Council (NRMMC) Australian Drinking Water Guidelines 6, Version 3.6 updated March 2021 (ADWG, 2011).
- National Health and Medical Research Council (NHMRC), *National Resource Management Ministerial Council (NRMMC) Guidelines for Managing Risks in Recreational Water* (NHMRC, 2008).
- Department of Environment and Conservation (DEC) *Guidelines for the Assessment and Management of Groundwater Contamination* (DEC, 2007).
- Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG, 2018) (available at <u>www.waterquality.gov.au/anz-guidelines</u>).
- Australian and New Zealand Environment and Conservation Council (ANZECC) & Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ) Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC, 2000).
- Advice on risks to human health and the environment: Boyd Street and publicly accessible areas, Tarago NSW, Site specific criteria Protection of human health and terrestrial and/or aquatic ecosystems (EnRiskS, 2021).

5.1 Rationale for Application of Guidelines

The relevance of guidelines was determined based on iterative screening from the broadest and most sensitive water usage scenario which occurs in the Mulwaree River back through agricultural land and public roads to the least sensitive scenario which occurs at the Site.

All results from Mulwaree River samples (SW8 to SW10) have been screened against Tier 1 / screening guidelines relevant to human health (incidental ingestion), freshwater ecology, irrigation and stock watering as each of these receptors occur within the receiving waters (the Mulwaree River). Should results exceed screening guidelines and indicate site contamination as the source, it would be appropriate to apply the guidelines that were exceeded to sampling locations upstream as this would inform further assessment of the Site as the potential source. Previous monitoring results do not indicate site contamination is adversely affecting the Mulwaree River. Site-specific guidelines were developed for Arsenic, Cadmium, Lead, Manganese and Nickel (EnRiskS, 2021) that integrate the ephemeral nature of surface water features between the Mulwaree River and the Site. Additionally, several technical refinements were identified and are relevant to guideline application. These were:

- ADWG (2011) Section 6.3.1 states that guideline values refer to the total amount of the substance present, regardless of its form (e.g., in solution or attached to suspended matter) and so analytical results from unfiltered samples should be assessed against human health criteria. The primary human health risk from contaminants in surface water from the Site is via recreational use. NHMRC (2008) suggests that 10-times the ADWG values may provide a conservative estimate of acceptable recreational exposure guidelines values. This approach was applied to derive recreational exposure criteria.
- ANZG (2018) guidelines for metals in freshwater are adopted from the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC, 2000) which states the major toxic effect of metals comes from the dissolved fraction, so it is valid to filter

samples (e.g., to 0.45 $\mu m)$ and compare the filtered concentration against the trigger values.

• Water hardness is identified as a physical parameter with quantifiable effects. Correction factors are defined in the guidelines to address the effect of water hardness on the bioavailability of cadmium, chromium, lead, nickel and zinc.

To define appropriate hardness correction factors, water was conservatively presumed to be moderately hard based on the Goulburn Mulwaree Regional State of the Environment Report 2004-2009 (Goulburn Mulwaree Council, 2009). Hardness correction factors were adopted from Table 3.4.4 of the *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZECC, 2000) to refine Tier 1 criteria as described in **Table 5-1** below.

	Original guideline value (mg/L)	Hardness Correction Factor	Corrected guideline value (mg/L)
Cadmium	0.0002	2.7	0.00054
Chromium	0.001	2.5	0.0025
Lead	0.0034	4	0.0136
Nickel	0.011	2.5	0.0275
Zinc	0.008	2.5	0.02

Table 5-1: Hardness Corrections for Tier 1 Freshwater Ecology Guidelines

Application of guidelines at each sampling point is summarised in **Table 5-2**.

Sampling Point	Location	Human Health - Site Specific ¹	Ecology - Site Specific ¹	Human Health - Recreational Sceening ²	Ecology – Screening ³	Irrigation – Screening ³	Stock Water – Screening ³
SW1-UP	Upstream of Southern Culvert (offsite)	4	4	4	¥	-	-
SW1	Upstream of Southern Culvert	1	1	1	1	-	-
SW2	Downstream of Southern Culvert	1	√	1	1	-	-
SW3	Upstream of Middle Culvert	1	1	1	1	-	-
SW4	Downstream of Middle Culvert	1	1	1	1	-	-
SW5	Upstream of Northern Culvert	√	1	1	1	-	-
SW6	Downstream of Northern Culvert	1	1	1	1	-	-
SW7	Dam on farm downstream of Northern Culvert (offsite)	-	-	4	4	4	4
SW8	Mulwaree River upstream of Middle and Northern Culvert Discharge	-	-	4	4	4	4
SW9	Mulwaree River upstream of Southern Culvert Discharge	-	-	4	4	4	~
SW10	Mulwaree River downstream of Middle and Northern Culvert Discharge	-	-	1	1	1	1

Table 5-2: Guidelines Applied to Sampling Points

¹ EnRiskS (2021)

² ANZG (2018)

³ ANZECC (2000)

Assessment criteria adopted under each guideline are presented in **Table 5-3**.

Contaminant	Human Health - Site Specific Criteria	Human Health - Recreation Screening	Ecology - Site Specific Criteria	95% Fresh water (ANZG 2018)	Irrigation - Screening	Stock Water - Screening
Total Metals						
Aluminium	-	2ª	NA	NA	NA	NA
Arsenic	7	0.1	NA	NA	NA	NA
Barium	-	2	NA	NA	NA	NA
Beryllium	-	0.6	NA	NA	NA	NA
Cadmium	1.4	0.002	NA	NA	NA	NA
Chromium	-	0.5	NA	NA	NA	NA
Cobalt	-	-	NA	NA	NA	NA
Copper	-	20	NA	NA	NA	NA
Iron	-	3	NA	NA	NA	NA
Lead	7	0.1	NA	NA	NA	NA
Manganese	350	5	NA	NA	NA	NA
Mercury	-	0.01	NA	NA	NA	NA
Nickel	14	0.2	NA	NA	NA	NA
Zinc	-	30 ^h	NA	NA	NA	NA
Dissolved Meta	ls					
Aluminium	NA	NA	5	0.055 ^b	20	5
Arsenic	NA	NA	0.5	0.024 ^c	2	0.5-5
Barium	NA	NA	-	-	-	-
Beryllium	NA	NA	-	-	0.5	-
Cadmium	NA	NA	10	0.00054 ⁹	0.05	0.01
Chromium	NA	NA	-	0.0025 ^{d g}	1	1
Cobalt	NA	NA	-	0.0014	0.1	1
Copper	NA	NA	0.5	0.0014	5	0.4-5
Iron	NA	NA	-	-	10	not sufficiently toxic
Lead	NA	NA	0.1	0.0136 ^g	5	0.1
Manganese	NA	NA	-	1.9	10	not sufficiently toxic
Mercury	NA	NA	-	0.00006 ^{e, f}	0.002	0.002
Nickel	NA	NA	1	0.0275 ⁹	2	1
Zinc	NA	NA	20	0.02 ^g	5	20

Table 5-3: Guideline Criteria (mg/L)

NA – not applicable

blank cell denoted with - indicates no criterion available.

^a Aluminium calculated using the ADWG (2011) aesthetic guideline based on post-flocculation problems. Insufficient data to set a guideline value based on health considerations

^b Aluminium guideline for pH > 6.5 was based on the average pH being above pH 6.5 at each surface water location.

^c Guideline value for arsenic (III).

^d Guideline value for chromium (VI).

^e Guideline value for inorganic mercury.

^f 99% species protection level DGV has been adopted to account for the bioaccumulating nature of this contaminant.

^{*g*} Hardness correction factor applied to the threshold value as detailed in ANZG 2018

^h Zinc calculated using the ADWG (2011) aesthetic guideline. Insufficient data to set a guideline value based on health considerations

6. **RESULTS**

6.1.1 Monitoring Events

A total of 11 monitoring events have been completed between August 2019 and December 2022. Surface water monitoring events were completed after a period of rainfall (where possible) as this is the only occasion where surface water is present in the drainage channels.

Table 6-1 includes information on rainfall conditions preceding each monitoring event. The table includes comparison of the rainfall over the 48-hour period preceding the sampling event to the design rainfall events for the Mulwaree catchment (Wollondilly and Mulwaree Rivers Flood Study WMA Water 2016) in order to provide an indication of the significance of the rainfall event. Average monthly rainfall data compared to actual monthly rainfall data is also included to indicate the general climate conditions in the month of sampling.

Event	Max Rainfall over 48hr Critical Duration (mm)	Rainfall in 48 hrs preceding monitoring events (mm)										
		13-Aug- 19	24-Sep- 19	29-Jan- 20	1-Apr-20	11-Aug- 20	13-Oct- 20	28-Jan-21	14-Apr-21	13-Jul-21	12-Sep-22	12-Dec-22
>10% AEP	< 126	0	0	0	0	-	0	0	0	0	7.2	0
10% AEP	126	-	-	-	-	-	-	-	-	-	-	-
5% AEP	147	-	-	-	-	-	-	-	-	-	-	-
2% AEP	175	-	-	-	-	163	-	-	-	-	-	-
1% AEP	197	-	-	-	-	-	-	-	-	-	-	-
Monthly Rainfall Observed (mm)		19	41.2	22	79.2*	157.8	94.4	64	2.4	26	66.6	45.6
Average Monthly Rainfall (mm)		42.9	44	49	40.4*	42.9	44	63.9	25.9	32.6	44.1	56.4
Comment		Dry month, dry conditions precedent	Average rainfall month, dry conditions precedent	Dry month, dry conditions precedent	Wet month, dry conditions precedent	Wet month, high rainfall event precedent	Wet month, dry conditions precedent	Average rainfall month, dry conditions precedent	Dry month, dry conditions precedent	Average rainfall moth, dry conditions precedent	Wet month, low rainfall event precedent	Average rainfall, dry conditions precedent

Table 6-1: Indicative Summary of Rainfall Preceding Sampling Events

Notes: All rainfall data was sourced from the Australian Bureau of Meteorology. Daily rainfall was sourced from the closest weather station with rainfall records preceding each monitoring event (Lake Bathurst, Windellama

and Goulburn Airport). Monthly averages and records were sourced from the closest weather station with a complete record (Goulburn Airport).

*Monthly observations and averages are for rainfall in the calendar month in which each monitoring event occurred except for the 1 April 2020 event for which March data is presented. Based on this the monthly data is

not a direct representation of rainfall preceding monitoring though is considered as an indicator of general conditions around each monitoring event.

AEP – Annual Exceedance Probability

6.1.2 Physico-Chemical Results

Surface water physico-chemical parameters were measured in the field during the majority of sampling rounds and are summarised in **Table 6-2**. The full physico-chemical parameter dataset for all data to date is provided as **Table 1** of **Appendix 3**.

Sample			Temp.	SPC	pН	DO	ORP	TDS		
ID	Records		°C	µS/cm	pH units	mg/L	mV	mg/L	Comments	
On and Ne	ar Site									
		Minimum	7.8	206.1	6.35	0.04	23.6	133.9		
SW1	8	Maximum	17.4	733	7.77	11	175.8	434	Dry January 2020.	
		Average	11.7	581.3	7.4	5.6	122.8	335.7		
	8	Minimum	8	205.6	7.05	0.1	-41.4	133.3	Dry January 2020.	
SW1-UP		Maximum	19.94	704	7.8	10.86	186.9	431	Parameters not recorded	
		Average	12.8	575.5	7.5	5.7	121.1	337.0	September 2019.	
		Minimum	7.3	213.3	6.54	0.12	48.3	137.8	Dry January 2020.	
SW2	9	Maximum	17.54	677	8.27	10.59	185.9	416	Parameters not recorded	
		Average	11.7	550.9	7.8	5.7	139.5	320.9	September 2019.	
		Minimum	8.54	142.5	6	4.7	64.8	92.3	Dry January 2020 and	
SW3	7	Maximum	21.75	245	7.96	9.43	196.1	159	January 2021.	
		Average	11.9	209.6	6.9	6.5	156.6	130.1	September 2019.	
SW4	10	Minimum	7.4	128.2	5.75	1.12	70	99.45	Dry January 2020	
		Maximum	20.33	388.3	8.8	10.42	263.1	251.8	Parameters not recorded	
		Average	12.1	227.4	7.3	6.0	173.8	167.1	September 2019.	
SW5		Minimum	8.71	117.9	6.45	4.06	-3	76.7	Dry January, April 2020,	
	4	Maximum	11.95	251.2	8.35	9.33	191	121	and January 2021,	
		Average	10.9	187.0	7.2	7.5	106.5	98.9	December 2022 and	
	4	Minimum	8.3	168.3	6.53	4.5	111	109.2	Dry January April	
SW6		Maximum	17.6	201.2	9.07	9.73	205.8	117	October 2020, and	
		Average	11.7	180.8	7.6	7.4	170.0	113.1	January, April 2021.	
		Minimum	7.38	94.7	6.34	1.8	56	61.8	Evidence of property	
SW7	9	Maximum	23.1	2342	8.92	8.76	168	396.6	owner pushing material	
		Average	15.5	445.5	7.3	5.6	110.7	155.4	fill to the surface.	
Offsite										
		Minimum	8.4	170.5	7.0	3.1	84.0	107.9		
SW8	9	Maximum	23.6	1007.0	8.5	9.3	136.1	656.5		
		Average	15.7	699.6	7.5	6.3	117.5	415.8		
		Minimum	7.7	125.3	7.2	0.3	83.0	115.7		
SW9	9	Maximum	25.0	1030.0	8.4	16.8	227.7	812.5		
		Average	15.6	610.3	7.7	8.5	138.4	452.6		
		Minimum	7.9	682.0	7.2	3.6	3.8	454.4		
SW10	6	Maximum	20.3	978.0	7.6	8.2	148.7	564.0		
		Average	14.1	779.7	7.4	5.7	94.7	491.5		

 Table 6-2: Summary of Surface Water Physico-Chemical Parameters

.

6.1.3 Analytical Results

A summary of the surface water analytical results for monitoring events from August 2019 to December 2022 is presented in **Table 6-3** and **Table 6-4** for on and near site and the Mulwaree River sampling locations, respectively. The corresponding results tables are presented in **Tables 2** through **12** of **Appendix 3**.

						No. abo	ve site-	No above Tier 1 criteria				
						specific	criteria	ANZECC (2000) Fresh Water Guidelines		Health-based Screening Criteria	Eco Screening Criteria (ANZG	
Analyte	No. of Samples	No. of Detects	Minimum	Maximum	Average	Human Health	Ecology	Irrigation ¹	Stock Water ¹	(Recreational Waters)	95% Protection) Fresh Water	
Total Metals												
Aluminium	57	40	0.06	11	0.934	-	-	-	-	3	-	
Arsenic	58	32	0.001	0.016	0.003	0	-	-	-	0	-	
Barium	57	57	0.03	0.36	0.075	-	-	-	-	0	-	
Beryllium	58	0	-	-	-	-	-	-	-	0	-	
Cadmium	58	35	0.0003	0.04	0.005	0	-	-	-	2	-	
Chromium	57	32	0.001	0.011	0.002	-	-	-	-	0	-	
Cobalt	58	23	0.001	0.014	0.004	-	-	-	-	-	-	
Copper	58	50	0.001	0.31	0.044	-	-	-	-	0	-	
Iron	57	56	0.06	8.9	1.483	-	-	-	-	9	-	
Lead	63	50	0.001	0.17	0.024	0	-	-	-	2	-	
Manganese	58	58	0.009	1.1	0.173	0	-	-	-	0	-	
Mercury	58	4	0.0001	0.0001	0.000	-	-	-	-	0	-	
Nickel	58	43	0.001	0.451	0.021	0	-	-	-	1	-	
Zinc	58	54	0.005	7	0.562	-	-	-	-	0	-	
Dissolved M	etals											
Aluminium	55	33	0.05	3.6	0.688	-	-	0	0	-	32	
Arsenic	56	30	0.001	0.011	0.002	-	0	0	0	-	0	
Barium	55	55	0.03	0.12	0.061	-	-	-	-	-	-	
Beryllium	56	0	-	-	-	-	-	0	-	-	0	
Cadmium	56	31	0.0002	0.018	0.003	-	2	0	0	-	29	
Chromium	55	16	0.001	0.003	0.002	-	-	0	0	-	6	
Cobalt	56	15	0.001	0.005	0.002	-	-	0	0	-	8	
Copper	56	42	0.001	0.2	0.038	-	0	0	0	-	41	
Iron	55	41	0.06	2.6	0.845	-	-	-	-	-	31	
Lead	56	36	0.001	0.033	0.010	-	0	0	0	-	28	
Manganese	56	55	0.005	1	0.093	-	-	0	-	-	0	
Mercury	56	0	-	-	-	-	-	0	0	-	0	
Nickel	56	35	0.001	0.421	0.019	-	0	0	0	-	8	
Zinc	56	48	0.005	2.6	0.363	-	0	0	0	-	38	

Table 6-3: Summary of Onsite and Near Site Surface Water Analytical Results (SW1_UP, SW1, SW2, SW3, SW4, SW5, SW6, SW7)

¹ Applicable to SW7 only

ANZECC (2000) Fresh Water Guidelines Ecological Screening Health-based Criteria (ANZG 95% **Screening Criteria** Protection) Fresh No. of No. of (Recreational Waters) Analyte Minimum Maximum Average Irrigation Stock Water Water Samples Detects **Total Metals** Aluminium 23 8 0.05 0.72 0.279 0 -24 Arsenic 7 0.001 0.001 0.001 0 23 22 0.02 0.076 0 Barium 0.12 Beryllium 24 0 ---0 Cadmium 24 2 0.0003 0.0004 0.000 0 23 Chromium 0.001 0.002 0.002 0 4 0.001 0.003 0.002 Cobalt 24 3 24 15 0.001 0.01 0.003 0 Copper Iron 23 22 0.15 3.2 0.614 1 7 0.001 0.002 0 Lead 24 0.002 Manganese 24 24 0.03 1.9 0.255 0 0 Mercury 24 0 ---Nickel 24 22 0.001 0.002 0.002 0 24 21 0.008 0.031 0 Zinc 0.16 --**Dissolved Metals** Aluminium 21 2 0.35 0.41 0.380 2 0 0 -Arsenic 22 3 0.002 0.003 0.003 0 0 0 Barium 21 20 0.02 0.12 0.073 --Beryllium 22 0 0 ---0 -Cadmium 22 2 0.0002 0.0004 0.000 1 0 0 0 Chromium 21 1 0.001 0.001 0.001 0 0 22 0 0 Cobalt 1 0.001 0.001 0.001 0 22 0.003 13 0.001 0.008 0 Copper 14 0 21 18 0.07 0.231 3 Iron 0.8 Lead 22 0 0 0 0 ---22 0 Manganese 22 0.012 0.85 0.149 0 _ 22 0 0 0 0 Mercury ---22 0 0 Nickel 17 0.001 0.002 0.001 0

7

0

Table 6-4: Summary of Mulwaree River Surface Water Analytical Results (SW8, SW9, SW10)

NA = not applicable

22

Zinc

17

0.006

0.14

0.028

0

6.1.4 Analytical Results Trends

The following time series charts present total and dissolved concentrations of lead, copper and zinc for the 11 monitoring events completed between August 2019 and December 2022. Dailly rainfall is presented for the same period.

6.1.4.1 Lead

Concentration Trends On and Near Site

Figure 6-1 presents total lead concentrations reported in surface water samples (SW1-UP, SW1 through to SW7) collected upstream and downstream of three onsite rail culverts. All surface water samples collected on and near the site to date have reported total lead concentrations below the site-specific criterion for human health (7 mg/L). Maximum total lead concentrations recorded to date are more than 40-times lower than the criterion. Therefore, the criterion has not been plotted on the y-axis of the graph in order to allow visual assessment of the low concentration trends. Increases in total lead concentrations were reported at SW2, SW4, SW6 and SW7 (maximum increase of 0.03 mg/L at SW6) when compared to the previous monitoring event (September 2022).

Figure 6-2 presents dissolved lead concentrations reported for the samples mentioned above. Data is presented relative to the EnRiskS (2021) site-specific ecological criterion for lead (0.1 mg/L). All samples to date have reported dissolved lead concentrations below the criterion. Similar to total lead, an increase in concentration was reported at SW6 when compared to the previous monitoring event (September 2022).



Figure 6-1: Upgradient and Onsite Total Lead Concentration Trend



Figure 6-2: Upgradient and Onsite Dissolved Lead Concentration Trend

Concentration Trends Mulwaree River (Offsite)

Figure 6-3 presents total lead concentrations reported in surface water samples (SW8, SW9, SW10) collected from the Mulwaree River located offsite. Data is presented relative to the adopted human health criterion for recreational water (0.1 mg/L). All surface water samples collected from the Mulwaree River to date have reported total lead concentrations at least 50-times lower than the criterion.

For the assessment of ecological risk, dissolved lead concentrations in samples collected from the Mulwaree River have been plotted relative to the adopted criterion for 95% protection of species protection in freshwater aquatic ecosystems (0.0034 mg/L) and irrigation (0.1 mg/L) and presented in **Figure 6-4**. The freshwater guideline for stock watering (5 mg/L) has not been plotted on the y-axis of the graph in order to allow visual assessment of the low concentration trends. All samples collected from the Mulwaree River to date have reported dissolved lead concentrations below the laboratory PQL (<0.001 mg/L) and below adopted ecological criteria.



```
Figure 6-3: Mulwaree River (Offsite) Total Lead Concentration Trend
```



Figure 6-4: Mulwaree River Offsite Dissolved Lead Concentration Trend

6.1.4.2 Copper

Concentration Trends On and Near Site

Figure 6-5 presents total copper concentrations in surface water samples (SW1-UP, SW1 through to SW7) collected upstream and downstream of three onsite rail culverts. Maximum total copper concentrations recorded to date are more than 60-times lower than the adopted human health criterion for recreational waters (20 mg/L). Therefore, the criterion has not been plotted on the y-axis of the graph in order to allow visual assessment of the low concentration trends. All surface water samples collected on and near the Site to date have reported total copper concentrations below the human health recreational criterion. Increases in total copper concentrations were reported at SW1-UP, SW2, SW3, SW4 and SW6 when compared to the previous monitoring event (September 2022) however, the increase was minor (maximum increase of 0.015 mg/L at SW4).

Figure 6-6 presents dissolved copper concentrations reported for the samples mentioned above. The site-specific ecological criterion of 0.5 mg/L has not been plotted on the y-axis of the graph in order to allow visual assessment of the low concentration trends. All samples collected on and near the site to date have reported dissolved copper concentrations below the site-specific ecological criterion.



```
Figure 6-5: Upgradient and Onsite Total Copper Concentration Trend
```



Figure 6-6: Upgradient and Onsite Dissolved Copper Concentration Trend

Concentration Trends Offsite

Figure 6-7 and **Figure 6-8** present total and dissolved copper concentrations reported in surface water samples (SW8, SW9, SW10) collected from the Mulwaree River located offsite. Both graphs have been presented on a smaller scale (maximum y-axis value of 0.02 mg/L) when compared to upgradient and onsite locations (presented in **Figure 6-5** and **Figure 6-6**) to allow visual assessment of the low concentration trends.

As presented in **Figure 6-7**, all samples collected from the Mulwaree River to date have reported total copper concentrations below the human health recreational criterion of 20 mg/L. Similar concentrations have historically been reported at SW8, SW9 and SW10. During the most recent monitoring event (December 2022), SW8 and SW10 (downstream of the Site) reported marginally higher total copper concentrations (0.002 mg/L higher) than SW9 (upstream of the Site). Concentrations across the three offsite locations are generally identical, which indicates that total copper concentrations in the Mulwaree River are likely to be influenced by sources other than the Site and represent background conditions in the receiving waters.

Concentrations of dissolved copper in samples collected from the Mulwaree River relative to the adopted ecological assessment criterion (0.0014 mg/L) for 95% protection of freshwater species (ANZG, 2018) is presented in **Figure 6-8**. The freshwater guideline for irrigation (5 mg/L) and stock watering (0.4 mg/L) have not been plotted on the y-axis of the graph in order to allow visual assessment of the low concentration trends. Dissolved copper concentrations in all samples correlate closely and have reported variable concentrations above and below the criterion for 95% protection of freshwater species since monitoring began in January 2020. Dissolved copper concentrations in the Mulwaree River appear representative of background and not representative of impacts from the Site. Samples do not exceed the less sensitive guidelines for irrigation and stock water.



Figure 6-7: Mulwaree River (Offsite) Total Copper Concentration Trend





6.1.4.3 Zinc

Concentration Trends On and Near the Site

Figure 6-9 presents total zinc concentrations reported in surface water samples (SW1-UP, SW1 through to SW7) collected upstream and downstream of three onsite rail culverts. The human health criterion for recreational water (30 mg/L) has not been plotted on the y-axis of the graph in order to allow visual assessment of the low concentration trends. All surface water samples collected on and near the site to date have reported total zinc concentrations below the adopted human health criterion. Slight increases in total zinc concentrations were reported at SW2, SW3, SW4 and SW6 when compared to the previous monitoring event (maximum increase of 0.77 mg/L at SW6).

Figure 6-10 presents dissolved zinc concentrations reported for the samples described above. The site-specific ecological criterion of (20 mg/L) has not been plotted on the y-axis of the graph in order to allow visual assessment of the low concentration trends. All samples collected on and near the site to date have reported dissolved zinc concentrations below the adopted criteria.



Figure 6-9: Upgradient and Onsite Total Zinc Concentration Trend



Figure 6-10: Upgradient and (Onsite) Dissolved Zinc Concentration Trend
Concentration Trends Offsite

Figure 6-11 and **Figure 6-12** present total and dissolved zinc concentrations reported in surface water samples (SW8, SW9, SW10) collected from the Mulwaree River located offsite. Both graphs have been presented on a smaller scale (maximum y-axis value of 0.2 mg/L) when compared to upgradient and onsite locations (presented in **Figure 6-9** and **Figure 6-10**) to allow visual assessment of the low concentration trends.

All samples collected from the Mulwaree River to date have reported concentrations below the adopted human health criterion (30 mg/L). The maximum total zinc concentration reported to date (0.16 mg/L during August 2020) is approximately 188-times lower than the adopted criterion. Therefore, the criterion has not been plotted on the y-axis of the graph (**Figure 6-11**) in order to allow visual assessment of the low concentration trends.

Figure 6-12 presents dissolved zinc concentrations in samples collected form the Mulwaree River relative to the adopted ecological criterion (0.02 mg/L). The less sensitive guidelines for irrigation (5 mg/L) and stock water (20 mg/L) have not been plotted on the y-axis of the graph in order to allow visual assessment of the low concentration trends. Concentrations of dissolved zinc did not exceed the criteria in December 2022 and have decreased at all offsite locations when compared to the previous monitoring event (September 2022). Similar to copper, comparable zinc concentrations in the Mulwaree River both upstream and downstream of the Site indicate background conditions and are not representative of impacts from the Site.

SW7 is sampled from a dam receiving water from the Northern Culvert and is located at 2135 Braidwood Road. Based on repeated discussion with the owner of 2135 Braidwood Road Ramboll understands the dam is to be decommissioned and backfilled in the near future. Within this context elevated contaminant concentrations in surface water identified at this location are not considered to present a risk to human health or ecology



Figure 6-11: Mulwaree River (Offsite) Total Zinc Concentration Trend





7. SUMMARY

A summary of CoPC results with regard for human health and ecological risk is presented in **Table 7-1**.

Table 7-1: CoPC Results Summary (Lead, Copper, Zinc)

Metal	Total/ Dissolved	Sample Location	Criteria	Summary	Assessment	
Lead	Total	On and Near Site (SW1- UP, SW1, SW2, SW3, SW4, SW5, SW6, SW7)	Site-specific human health criterion of 7 mg/L (EnRiskS, 2021).	Concentrations of total lead were below the adopted human health criteria in all samples	Based on the monitoring data assessed, which accounts for seasonal variation, the risk to human health from lead in surface water is considered to be low and acceptable.	
		Mulwaree River/Offsite (SW8, SW9, SW10)	Recreational water criterion (0.1 mg/L).	collected to date.		
		On and Near Site (SW1- UP, SW1, SW2, SW3, SW4, SW5, SW6, SW7)	Site-specific ecological criterion of 0.1 mg/L (EnRiskS, 2021).			
	Dissolved	Mulwaree River/Offsite (SW8, SW9, SW10)	95% species protection for freshwater ecosystems (0.0034 mg/L) (ANZG, 2018). ANZECC (2000) Freshwater guidelines for irrigation (5 mg/L) and stock water (0.1 mg/L).	Concentrations of dissolved lead were below the adopted ecological assessment criteria in all samples collected to date.	Risk to ecological receptors from lead in surface water was found to be low and acceptable.	
	Total	On and Near Site (SW1- UP, SW1, SW2, SW3, SW4, SW5, SW6, SW7)	Recreational water	Concentrations of total copper were below the adopted human health criteria in all	The risk to human health from copper in surface water is considered low and	
		Mulwaree River/Offsite (SW8, SW9, SW10)	Citerion (20 mg/L).	samples collected to date.	acceptable.	
Copper	Dissolved	On and Near Site (SW1- UP, SW1, SW2, SW3, SW4, SW5, SW6, SW7)	Site-specific ecological criterion of 0.5 mg/L (EnRiskS, 2021).	Concentrations of dissolved copper were below the adopted ecological criteria in all samples collected to date.	Risk to ecological receptors from the drainage system is low and acceptable.	
		Mulwaree River/Offsite (SW8, SW9, SW10)	95% species protection for freshwater ecosystems (0.0014 mg/L) (ANZG, 2018). ANZECC (2000) Freshwater guidelines for	Concentrations of dissolved copper exceeded the adopted ecological criteria in August 2020, January 2021, July 2021, September 2022 and December 2022 (SW8 and SW10 only). The highest concentrations were	Comparable concentrations upstream and downstream of the Site suggest concentrations of copper are derived from a background source and not a result of impacts from the Site.	

Metal	Total/ Dissolved	Sample Location	Criteria	Summary	Assessment	
			irrigation (5 mg/L) and stock watering (lower limit 0.4 mg/L).	generally reported in the upstream sample (SW9) except during December 2022.		
Zinc	Total	On and Near Site (SW1- UP, SW1, SW2, SW3, SW4, SW5, SW6, SW7)	Recreational water criterion (30 mg/L).	Concentrations of total zinc were below the	Risk to human health associated with zinc in the drainage system is considered to be low and acceptable.	
		Mulwaree River/Offsite (SW8, SW9, SW10)	Recreational water guideline of 30 mg/L.	collected to date.	Risks to human health associated with zinc in offsite surface water are considered to be low and acceptable.	
	Dissolved	On and Near Site (SW1- UP, SW1, SW2, SW3, SW4, SW5, SW6, SW7)	Site-specific ecological criterion of 20 mg/L (EnRiskS, 2021).	Concentrations of dissolved zinc were below the adopted ecological criterion in all samples collected to date.	Risks to ecology associated with zinc in the drainage system is considered to be low and acceptable.	
		Mulwaree River/Offsite (SW8, SW9, SW10)	95% species protection for freshwater ecosystems (ANZG, 2018) corrected for hardness (0.02 mg/L). ANZECC (2000) Freshwater guidelines for irrigation (5 mg/L) and stock water (20 mg/L).	Dissolved zinc has been reported at variable. concentrations above and below the ecological criterion (for 95% species protection) since monitoring began in January 2020. During the most recent monitoring event (December 2022) concentrations of dissolved zinc did not exceed any of the adopted ecological criteria. Concentrations are generally comparable upstream and downstream of the Site.	Comparable concentrations upstream and downstream of the Site suggest concentration are background and not a result of impacts from the Site.	

8. CONCLUSIONS

Routine surface water monitoring was reinstated at Tarago NSW in September 2022 in response to a Prevention Notice issued by the NSW EPA to TfNSW. This was not mandated by the NSW EPA, however TfNSW commenced surface monitoring to assess the risks to community health and safety. Surface water monitoring was completed between 12 and 13 December 2022. Results were compared against historical observations and relevant assessment criteria.

Monitoring results indicate no evidence of offsite migration of contaminants in surface water that would represent an unacceptable human health risk, with no reported exceedances in the adopted human health criteria for the contaminants of concern.

Similarly, monitoring results indicate no evidence of offsite migration of contaminants in surface water that would represent an unacceptable risk to ecology. Concentrations of lead, copper and zinc observed in the Mulwaree River are consistent with background concentrations and do not indicate impacts from the Site.

9. LIMITATIONS

Ramboll prepared this report in accordance with the scope of work as outlined in our proposal (ref: P210) to TfNSW dated 2 September 2022 and in accordance with our understanding and interpretation of current regulatory standards.

A representative program of sampling and laboratory analyses was undertaken as part of this investigation, based on past and present known uses of the site. While every care has been taken, concentrations of contaminants measured may not be representative of conditions between the locations sampled and investigated. We cannot therefore preclude the presence of materials that may be hazardous. Site conditions may change over time. This report is based on conditions encountered at the Site at the time of the report and Ramboll disclaims responsibility for any changes that may have occurred after this time.

The conclusions presented in this report represent Ramboll's professional judgment based on information made available during the course of this assignment and are true and correct to the best of Ramboll's knowledge as at the date of the assessment.

Ramboll did not independently verify all of the written or oral information provided to Ramboll during the course of this investigation. While Ramboll has no reason to doubt the accuracy of the information provided to it, the report is complete and accurate only to the extent that the information provided to Ramboll was itself complete and accurate.

This report does not purport to give legal advice. This advice can only be given by qualified legal advisors.

9.1 User Reliance

This report has been prepared exclusively for TfNSW and may not be relied upon by any other person or entity without Ramboll's express written permission.

10. REFERENCES

ADWG (2011). National Health and Medical Research Council (NHMRC) (2001) National Resource Management Ministerial Council (NRMMC) Australian Drinking Water Guidelines 6, Version 3.5 updated August 2018.

ANZECC (2000). Australian and New Zealand Environment and Conservation Council (ANZECC) & Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ)

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. Available at <u>www.waterquality.gov.au/anz-guidelines</u>

EnRiskS (2021). Advice on risks to human health and the environment: Boyd Street and publicly accessible areas, Tarago NSW.

Goulburn Mulwaree Council (2009). Goulburn Mulwaree Regional State of the Environment Report 2004-2009

NEPM (2013). National Environment Protection Council (NEPC), National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended 2013

NHMRC (2008). National Health and Medical Research Council (NHMRC), National Resource Management Ministerial Council (NRMMC) Guidelines for Managing Risks in Recreational Water

NSW DEC (2007). Contaminated Sites – Guidelines for the Assessment and Management of Groundwater Contamination, Department of Environment and Conservation NSW, Sydney, March 2007.

NSW EPA (2017). *Contaminated Land Management - Guidelines for the NSW Site Auditor Scheme (3rd Edition),* New South Wales Environment Protection Authority, Sydney, NSW, October 2017.

Ramboll (2019). *Tarago Loop Extension: Further Intrusive Assessment and Lead Management Plan*, document reference 318000780-01-Rev3, Ramboll Australia Pty Ltd, September 2019.

Ramboll (2020). *Sampling Analysis and Quality Plan (SAQP) – Surface Water Monitoring, Tarago Lead Management*, document reference 318000780-T24-01-Rev0, Ramboll Australia Pty Ltd, August 2020.

Ramboll - Tarago, NSW

APPENDIX 1 SAQP

Z:\Projects\Transport for NSW\318001376 - Tarago Rail Corridor\7. Reports\T3 - SW Monitoring\202212 December\318001376-T3-SW Monitoring Report (December 2022).docx Intended for Transport for New South Wales

Document type Plan

Date October 2022

Project Number Sampling Analysis and Quality Plan (SAQP) – Surface Water Monitoring

SAMPLING ANALYSIS AND QUALITY PLAN (SAQP) – SURFACE WATER MONITORING TARAGO LEAD MANAGEMENT



TARAGO LEAD MANAGEMENT SAMPLING ANALYSIS AND QUALITY PLAN (SAQP) – SURFACE WATER MONITORING

Project name	Tarago Lead Management
Project no.	318001376-T6-A1
Recipient	Joanne McLoughlin - Transport for New South Wales
	E: Joanne.Mcloughlin@transport.nsw.gov.au
Document type	Plan
Version	1
Date	7/10/2022
Prepared by	Stephen Cadman/Jordyn Kirsch
Checked by	Stephen Maxwell
Approved by	Fiona Robinson
Description	This document comprises the Sampling Analysis and Quality Plan (SAQP) for surface water monitoring associated with
	management of lead contamination from the Tarago rail corridor.

Revision	Date	Prepared by	Checked by	Approved by
0	Draft	6/08/2020	S Maxwell	F Robinson
1	Revised draft	7/10/2022	S Maxwell CEnvP (SC) 41184	F Robinson



Ramboll

50 Glebe Road PO Box 435 The Junction NSW 2291 Australia

T +61 2 4962 5444 https://ramboll.com

Level 2, Suite 18 Eastpoint

This document is issued in confidence to Transport for New South Wales for the purposes of providing a Sampling Analysis and Quality Plan for surface water monitoring at Tarago NSW, and subject to NSW EPA Accredited Site Auditor review. It should not be used for any other purpose.

The report must not be reproduced in whole or in part except with the prior consent of Ramboll Australia Pty Ltd and subject to inclusion of an acknowledgement of the source. No information as to the contents or subject matter of this document or any part thereof may be communicated in any manner to any third party without the prior consent of Ramboll Australia Pty Ltd.

Whilst reasonable attempts have been made to ensure that the contents of this report are accurate and complete at the time of writing, Ramboll Australia Pty Ltd disclaims any responsibility for loss or damage that may be occasioned directly or indirectly through the use of, or reliance on, the contents of this report.

© Ramboll Australia Pty Ltd

Ramboll Australia Pty Ltd. ACN 095 437 442 ABN 49 095 437 442

CONTENTS

1.	INTRODUCTION	1
1.1	Preamble	1
1.2	Background	1
1.3	Regulation	1
1.4	Objective	1
2.	SITE IDENTIFICATION	2
3.	REGULATORY REQUIREMENTS	3
4.	SUMMARY OF CONCEPTUAL SITE MODEL	4
5.	ASSESSMENT CRITERIA	5
5.1	Rationale for Application of Guidelines	5
6.	DATA QUALITY OBJECTIVES	8
6.1	Step 1: State the problem	8
6.1.1	Contaminants of Concern	8
6.2	Step 2: Identify the decisions / goal of the study	8
6.3	Step 3: Identify the information inputs	8
6.4	Step 4: Definition of the Study Boundary	9
6.5	Step 5: Develop the decision rules or analytical approach	9
6.6	Step 6: Specify the performance or acceptance criteria	9
6.6.1	The tolerable limits on decision errors are as follows:	9
6.6.2	Evaluation of Analytical Data	10
6.7	Step 7: Develop a plan for obtaining data	12
7.	SAMPLING PLAN	13
7.1.1	Water Quality Monitoring Performance Criteria	13
8.	REPORTING	15
9.	REFERENCES	16

LIST OF TABLES

Table 2-1: Site Identification	2
Table 4-1 Conceptual Site Model Summary	4
Table 5-1: Hardness Corrections for Tier 1 Freshwater Ecology Guidelines	6
Table 5-2: Guidelines Applied to Sampling Points	6
Table 5-3: Guideline Criteria (mg/L)	7
Table 7-1 Performance Criteria	13

APPENDICES

Appendix 1

Figures

1. INTRODUCTION

1.1 Preamble

Ramboll Australia Pty Ltd (Ramboll) was engaged by Transport for NSW (TfNSW) to complete periodic surface water monitoring upstream and downstream of contamination within the Goulburn – Bombala rail corridor at Tarago, New South Wales, Australia.

1.2 Background

The site is identified as part Lot 22 Deposited Plan (DP) 1202608 and is located in Tarago, NSW. The site occupies an area of approximately three hectares and is located approximately 32 km south of Goulburn.

The Woodlawn Mines Ore Concentrate Load-Out Complex operated within the Goulburn – Bombala rail corridor at Tarago from the 1970s – 1990s. Concentrates were produced at the Woodlawn Mine approximately 6.5 km west and included a zinc concentrate consisting mainly of sphalerite (zinc sulphide), a lead concentrate of galena (lead sulphide) and copper concentrates of chalcopyrite (copper iron sulphide).

An extensive body of work has been completed to characterise contaminant impacts associated with historic operation of the site. This work has included assessment of soil, groundwater and surface water across the site and assessment of soil, groundwater, surface water and airborne dust within the surrounding area. Recent assessments identified contaminants within approximately 900 lineal meters of the rail formation at Tarago. This area is herein referred to as the 'site' and is presented on **Figure 1**, **Appendix 1**.

Offsite discharge of surface water appears to be generally related to three culverts which pass beneath the rail formation onsite. Contaminants of potential concern (CoPC) relevant to receiving surface waters appear limited to metals (aluminium, cadmium, copper, lead, nickel, zinc) which exceed the adopted relevant health and/or ecological assessment criteria.

1.3 Regulation

On 25 March 2020 the NSW Environment Protection Authority (NSW EPA) declared the site as significantly contaminated under Section 11 of the Contaminated Land Management Act 1997 (Declaration Number 20201103). Transport for NSW is currently managing the contamination under a Voluntary Management Proposal (VMP) which includes further assessment of site contamination and remediation to address the potential risks to human health and the environment posed by the contamination.

1.4 Objective

The objective of the surface water monitoring is to collect reliable water quality data, providing a data continuum which forms a basis for assessment of impacts from the site on surrounding surface water receptors.

2. SITE IDENTIFICATION

The site locality is shown in Figure 1, Appendix 1.

The site details are presented in Table 2-1.

Table 2-1: Site Identification

Information	Description
Street Address:	Accessed from Stewart Street and Goulburn Street Tarago NSW
Identifier:	Part Lot 1 DP 595856
Site Area:	Approximately 7.5 ha
Local Government:	Goulburn Mulwaree Shire
Owner:	Transport for NSW
Current Site Use:	Forms part of the Goulburn to Bombala rail line and the Country Regional rail Network (CRN)

Ramboll - Tarago Lead Management

3. REGULATORY REQUIREMENTS

This SAQP has been prepared in general accordance with the following guidance documents:

- 1. Australia and New Zealand Environment and Conservation Council, *Guidelines for Fresh and Marine Water Quality* (ANZECC, 2018)
- 2. National Environment Protection Council (NEPC), *National Environment Protection* (Assessment of Site Contamination) Measure 1999, as amended 2013 (NEPM, 2013)
- 3. NSW EPA, Contaminated Sites: *Guidelines for Consultants Reporting on Contaminated Lands* (NSW EPA 2020)
- 4. NSW EPA, Guidelines for the Site Auditor Scheme (3rd Edition) (NSW EPA, 2017)

4. SUMMARY OF CONCEPTUAL SITE MODEL

A Conceptual Site Model (CSM) was prepared as part of a Detailed Site Investigation prepared by Ramboll (2020). The CSM provides a summary of the source-pathway-receptor linkages for surface water and is summarised in **Table 4-1**.

Exposure Pathway	Onsite Workers	Onsite Ecology	Residents	Community Activities	Offsite Workers	Offsite Ecology	Irrigation and Livestock
Surface Water							
Direct contact	N	Р	N	Ν	Ν	Ρ	Р
Incidental ingestion	Ν	Р	Ν	Ν	Ν	Ρ	Ρ
Root uptake	N/A	Р	N/A	N/A	N/A	Р	N/A
Migration to groundwater	Ν	Р	Ν	Ν	Ν	Р	Р

Table 4-1 Conceptual Site Model Summary

5. ASSESSMENT CRITERIA

The criteria adopted for the assessment of surface water contamination are sourced from the following references:

- National Environment Protection Council (NEPC), National Environment Protection (Assessment of Site Contamination) Measure (NEPM) 1999, as amended 2013 (NEPC, 2013).
- National Health and Medical Research Council (NHMRC) (2001) National Resource Management Ministerial Council (NRMMC) Australian Drinking Water Guidelines 6, Version 3.6 updated March 2021, (ADWG, 2011).
- National Health and Medical Research Council (NHMRC), *National Resource Management Ministerial Council (NRMMC) Guidelines for Managing Risks in Recreational Water* (NHMRC, 2008).
- Department of Environment and Conservation (DEC) *Guidelines for the Assessment and Management of Groundwater Contamination* (DEC, 2007).
- Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG, 2018) (available at www.waterquality.gov.au/anz-guidelines).
- Australian and New Zealand Environment and Conservation Council (ANZECC) & Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ) *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZECC, 2000).
- Advice on risks to human health and the environment: Boyd Street and publicly accessible areas, Tarago NSW, Site specific criteria Protection of human health and terrestrial and/or aquatic ecosystems (EnRiskS, 2020).

5.1 Rationale for Application of Guidelines

The relevance of guidelines was determined based on iterative screening from the broadest and most sensitive water usage scenario which occurs in the Mulwaree River back through agricultural land and public roads to the least sensitive scenario which occurs at the Site.

All results from Mulwaree River samples (SW8 to SW10) have been screened against Tier 1 / screening guidelines relevant to human health (incidental ingestion), freshwater ecology, irrigation and stock watering as each of these receptors occur within the receiving waters (the Mulwaree River). Should results exceed screening guidelines and indicate site contamination as the source, it would be appropriate to apply the guidelines that were exceeded to sampling locations upstream as this would inform further assessment of the Site as the potential source. Previous monitoring results do not indicate site contamination is adversely affecting the Mulwaree River. Site-specific guidelines were developed for Arsenic, Cadmium, Lead, Manganese and Nickel (EnRiskS, 2020) that integrate the ephemeral nature of surface water features between the Mulwaree River and the Site. Additionally, several technical refinements were identified and are relevant to guideline application. These were:

- ADWG (2011) Section 6.3.1 states that guideline values refer to the total amount of the substance present, regardless of its form (e.g., in solution or attached to suspended matter) and so analytical results from unfiltered samples should be assessed against human health criteria. The primary human health risk from contaminants in surface water from the Site is via recreational use. NHMRC (2008) suggests that 10-times the ADWG values may provide a conservative estimate of acceptable recreational exposure guidelines values. This approach was applied to derive recreational exposure criteria.
- ANZG (2018) guidelines for metals in freshwater are adopted from the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC, 2000) which states the major toxic effect of metals comes from the dissolved fraction, so it is valid to filter samples (e.g., to 0.45 µm) and compare the filtered concentration against the trigger values.
- Water hardness is identified as a physical parameter with quantifiable effects. Correction factors are defined in the guidelines to address the effect of water hardness on the bioavailability of cadmium, chromium, lead, nickel and zinc.

To define appropriate hardness correction factors, water was conservatively presumed to be moderately hard based on the Goulburn Mulwaree Regional State of the Environment Report 2004-2009 (Goulburn Mulwaree Council, 2009). Hardness correction factors were adopted from Table 3.4.4 of the *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZECC, 2000) to refine Tier 1 criteria as described in **Table 5-1** below.

Table 5-1: Hardness Corrections for Tier 1 Freshwater Ecology Guidelines

	Original guideline value (mg/L)	Hardness Correction Factor	Corrected guideline value (mg/L)
Cadmium	0.0002	2.7	0.00054
Chromium	0.001	2.5	0.0025
Lead	0.0034	4	0.0136
Nickel	0.011	2.5	0.0275
Zinc	0.008	2.5	0.02

Application of guidelines at each sampling point is summarised in **Table 5-2**.

Table 5-2: Guidelines Applied to Sampling Points

Sampling Point	Location	Human Health - Site Specific ¹	Ecology - Site Specific ¹	Human Health - Recreational Sceening ²	Ecology – Screening ³	Irrigation - Screening ³	Stock Water – Screening ³
SW1-UP	Upstream of Southern Culvert (offsite)	✓	1	1	✓	-	-
SW1	Upstream of Southern Culvert	√	1	1	~	-	-
SW2	Downstream of Southern Culvert	~	√	1	~	-	-
SW3	Upstream of Middle Culvert	✓	1	1	~	-	-
SW4	Downstream of Middle Culvert	~	✓	1	~	-	-
SW5	Upstream of Northern Culvert	~	✓	1	~	-	-
SW6	Downstream of Northern Culvert	✓	1	1	~	-	-
SW7	Dam on farm downstream of Northern Culvert (offsite)	-	-	4	~	~	1
SW8	Mulwaree River upstream of Middle and Northern Culvert Discharge	-	-	4	~	~	4
SW9	Mulwaree River upstream of Southern Culvert Discharge	-	-	4	~	√	4
SW10	Mulwaree River downstream of Middle and Northern Culvert Discharge	-	-	4	~	~	4

¹ EnRiskS (2021)

² ANZG (2018)

³ ANZECC (2000)

Assessment criteria adopted under each guideline are presented in **Table 5-3**.

Table 5-3: Guideline Criteria (mg/L)

Contaminant	Human Health - Site Specific Criteria	Human Health - Recreation Screening	Ecology - Site Specific Criteria	95% Fresh water (ANZG 2018)	Irrigation - Screening	Stock Water - Screening
Total Metals						
Aluminium	-	2	NA	NA	NA	NA
Arsenic	7	0.1	NA	NA	NA	NA
Barium	-	2	NA	NA	NA	NA
Beryllium	-	0.6	NA	NA	NA	NA
Cadmium	1.4	0.002	NA	NA	NA	NA
Chromium	-	0.5	NA	NA	NA	NA
Cobalt	-	-	NA	NA	NA	NA
Copper	-	20	NA	NA	NA	NA
Iron	-	3	NA	NA	NA	NA
Lead	7	0.1	NA	NA	NA	NA
Manganese	350	5	NA	NA	NA	NA
Mercury	-	0.01	NA	NA	NA	NA
Nickel	14	0.2	NA	NA	NA	NA
Zinc	-	30 ^h	NA	NA	NA	NA
Dissolved Meta	ls					
Aluminium	NA	NA	5	0.055ª	20	5
Arsenic	NA	NA	0.5	0.024 ^b	2	0.5-5
Barium	NA	NA	-	-	-	-
Beryllium	NA	NA	-	-	0.5	-
Cadmium	NA	NA	10	0.00054 ^g	0.05	0.01
Chromium	NA	NA	-	0.002.5 ^g	1	1
Cobalt	NA	NA	-	0.0014	0.1	1
Copper	NA	NA	0.5	0.0014	5	0.4-5
Iron	NA	NA	-	-	10	not sufficiently toxic
Lead	NA	NA	0.1	0.0034	5	0.1
Manganese	NA	NA	-	1.9	10	not sufficiently toxic
Mercury	NA	NA	-	0.00006 ^{d, e}	0.002	0.002
Nickel	NA	NA	1	0.0275 ⁹	2	1
Zinc	NA	NA	20	0.02 ^g	5	20

NA – not applicable

blank cell denoted with - indicates no criterion available.

^a Aluminium guidelines for pH > 6.5, based on the pH of groundwater measured at the Site and surrounding area. This is an aesthetic criteria only based on post flocculation problems

^b Guideline value for arsenic (III).

^c Guideline value for chromium (VI).

^{*d*} Guideline value for inorganic mercury.

^e 99% species protection level DGV has been adopted to account for the bioaccumulating nature of this contaminant. ^f Guideline value for m-xylene. Guideline values also exist for both o-xylene and p-xylene as per ANZG (2018). The default guideline value for m-xylene guideline has been adopted as it is the most conservative

^g Hardness correction factor applied to the threshold value as detailed in ANZG 2018

^h Calculated using the ADWG (2011) aesthetic guideline. Insufficient data to set a guideline value based on health considerations

6. DATA QUALITY OBJECTIVES

To achieve the objectives and purpose of the surface water monitoring program, both the field and laboratory programs must result in data that is representative of the conditions at the site. As such, specific Data Quality Objectives (DQOs) have been developed for the tasks to be completed to validate the remediation of the site. The DQO process is a systematic, seven step process that defines the criteria that the validation sampling should satisfy in accordance with the *Guidelines for the NSW Site Auditor Scheme (3rd Edition)* (NSW EPA 2017).

The seven step DQOs process comprises:

- 1. Step 1: State the problem;
- 2. Step 2: Identify the decisions/ goal of the study;
- 3. Step 3: Identify the information inputs;
- 4. Step 4: Define the boundaries of the study;
- 5. Step 5: Develop the decision rules or analytical approach;
- 6. Step 6: Specify the performance or acceptance criteria;
- 7. Step 7: Develop the plan for obtaining data.

The seven step DQO process has been completed for surface water monitoring to be completed before, during and after site remediation.

6.1 Step 1: State the problem

Due to historic loadout of ore concentrate surface water flow over ore impacted soils has been identified to result in migration of total and dissolved metal concentrations from the site. The site has been declared significantly contaminated land by the NSW EPA and a VMP has been prepared to describe how associated risks to human health and the environment will be managed.

6.1.1 Contaminants of Concern

Contaminant of Concern relevant to receiving surface waters appear limited to metals (aluminium, cadmium, copper, lead, nickel, zinc) which exceed the adopted relevant health and/or ecological assessment criteria.

6.2 Step 2: Identify the decisions / goal of the study

The goal of the study is to assess the migration of metal(loid) contamination from the site in surface waters and the impact of migration to surface waters off site.

Based on the decision-making process for assessing urban redevelopment sites, detailed in the *NSW Site Auditor Guidelines, 3rd Edition 2017*, the following decisions must be made with respect to the targeted validation goals:

- 1. Is the data collected of sufficient quality to meet the project objectives?
- 2. Is the data reliable?
- 3. What is the fate and transport of contaminant offsite?
- 4. What are the potential risks to human health and the environment?

6.3 Step 3: Identify the information inputs

Inputs to the decisions will be sourced from:

- 1. Review of historical surface water monitoring results
- 2. Physico-chemical properties collected for each of the 10 surface water sampling locations
- 3. Sampling of surface water and analysis for contaminants of concern

- 4. Analytical results for metal(loid)s in surface water samples from each of the 10 sampling locations
- 5. Quality Assurance / Quality Control data review
- 6. Comparison of the above samples to the assessment criteria outlined in **Section 5**.
- 7. All sample analyses conducted using National Association of Testing Authorities (NATA) registered methods in accordance with ANZECC (1996) and NEPC (1999) guidelines
- 8. All samples appropriately preserved and handled in accordance with the sampling methodology
- 9. PQLs less that the adopted assessment criteria

6.4 Step 4: Definition of the Study Boundary

The spatial boundaries are shown on **Figure 1** and include:

- 1. Three tributaries of the Mulwaree River, one located approximately 100 m west of the rail corridor at CH. 262.600, one adjacent to a culvert on the western side of the rail line at CH 262.600 and one adjacent a culvert on the eastern side of the rail line at CH 262.600.
- Four locations adjacent to culverts, one western side of the rail line at CH 262.300, one on the eastern side of the rail line at CH 262.300, one on the western side of the rail line at CH 262.000 and one on the eastern side of the rail line at CH 262.000.
- 3. The dam located downgradient from the site northern rail culvert forming part Lot A DP 440822, and three locations along the Mulwaree River

The vertical boundaries are limited to the depth of surface waters encountered and accessible.

The temporal boundary includes historical surface water results as well as data collected under this SAQP comprising quarterly monitoring events over pre-remediation, remediation and postremediation periods. Two post remediation surface water monitoring events will be included in the validation report.

6.5 Step 5: Develop the decision rules or analytical approach

The decisions rules for this investigation are as follows:

- 1. Has contaminant migration via surface water been adequately assessed?
- 2. Have contaminant impacts to surface water off site been adequately assessed?
- 3. Is the data reliable?
- 4. Does the data define clear presence / absence of unacceptable risk when assessed against Tier 1 criteria?
- 5. If Tier 1 assessment of risk is not clear, then does Tier 2 / Tier 3 risk assessment define absence of unacceptable risk?
- 6. Are there any remaining data gaps?

6.6 Step 6: Specify the performance or acceptance criteria

- 6.6.1 The tolerable limits on decision errors are as follows:
 - 1. Probability that 95% of data will satisfy the DQIs, therefore a limit on decision error will be 5% that a conclusive statement may be incorrect:
 - a. A 5% probability of a false negative (i.e. assessing that the average concentration of contaminants of concern are less than the assessment criteria when they are not); and
 - b. A 5% probability of a false positive (i.e. assessing that the average concentration of contaminants of concern are more than the assessment criteria when they are not).

The potential for significant errors will be minimised by:

- 1. Completion of QA/QC measures of the investigation data to assess if the data satisfies the DQIs.
- 2. Assessment of whether appropriate sampling and analytical densities were completed for the purposes of the investigation.
- 3. Ensuring that the criteria set for the investigation were appropriate for the land use.

DQIs have been established to set acceptance limits on field and laboratory data collected as part of the investigation and are discussed further below.

6.6.2 Evaluation of Analytical Data

Acceptable limits and the manner of addressing possible decision errors for laboratory analysis associated with water quality monitoring and verification of imported materials are outlined below.

Accuracy: Accuracy is defined as the nearness of a result to the true value, where all random errors have been statistically removed. Internal accuracy is measured using percent recovery '%R' and external accuracy is measured using the Relative Percent Difference '%RPD'.

Internal accuracy will be tested utilising:

Surrogates	Surrogates are QC monitoring spikes, which are added to all field and QA/QC samples at the beginning of the sample extraction process in the laboratory, where applicable. Surrogates are closely related to the organic target analytes being measured, are to be spiked at similar concentrations, and are not normally found in the natural environment;
Laboratory control samples	An externally prepared and supplied reference material containing representative analytes under investigation. These will be undertaken at a frequency of one per analytical batch.
Matrix spikes	Field samples which are injected with a known concentration of contaminant and then tested to determine the potential for adsorption onto the matrix. These will be undertaken at a frequency of 5%.

Recovery data shall be categorised into one of the following control limits:

 70%-130%R confirming acceptable data, note that there are some larger %R for intractable substances.

External accuracy will be determined by the submission of inter-laboratory duplicates at a frequency of 5%. Data will be analysed in accordance with the following control limits:

 70%-130%R confirming acceptable data, note that there are some larger %R for intractable substances.

Any data which does not conform to these acceptance criteria will be examined for determination of suitability for the purpose of site characterisation.

Precision: The degree to which data generated from replicate or repetitive measurements differ from one another due to random errors. Precision is measured using the standard deviation 'SD' or Relative Percent Difference '%RPD'.

Internal precision will be determined by the undertaking of laboratory duplicates, where two sub samples from a submitted sample are analysed. These will be undertaken at a frequency of 10%. A RPD analysis is calculated and results compared to:

 70%-130%R confirming acceptable data, note that there are some larger %R for intractable substances.

Any data which does not conform to these acceptance criteria will be examined for determination of suitability for the purpose of site characterisation.

External precision will be determined by the submission of intra-laboratory duplicates at a frequency of 5%. The external duplicate samples are to be obtained by mixing and then splitting the primary sample to create two identical sub samples. Field duplicate samples are to be labelled with a unique identification that does not reveal the association between the primary and duplicate samples e.g., QA1.

It must be noted that significant variation in duplicate results is often observed (particularly for solid matrix samples) due to sample heterogeneity or concentrations reported near the Practical Quantification Limit (PQL).

A RPD analysis is calculated and results compared to:

 70%-130%R confirming acceptable data, note that there are some larger %R for intractable substances.

Any data which does not conform to these acceptance criteria will be examined for determination of suitability for the purpose of site characterisation.

Blank samples will be submitted with the analytical samples and analysed for the contaminants of concern One field blank will be collected and analysed per matrix type for each batch samples/each day.

The laboratory will additionally undertake a method blank with each analytical batch of samples. Laboratory method blank analyses are to be below the PQLs. Results shall be examined, and any positive results shall be examined. Positive blank results may not be subtracted from sample results.

Positive results may be acceptable if sample analyte concentrations are significantly greater than the amount reported in the blank (ten times for laboratory reagents such as methylene chloride, chloroform, and acetone etc., and five times for all other analytes). Alternatively, the laboratory PQL may be raised to accommodate blank anomalies provided that regulatory guidelines are not compromised by any adjustment made to the PQL.

Completeness: The completeness of the data set shall be judged as:

- 1. The percentage of data retrieved from the field compared to the proposed scope of works. The acceptance criterion is 95%.
- The percentage of data regarded as acceptable based on the above data quality objectives.
 95% of the retrieved data must be reliable.
- 3. The reliability of data based on cumulative sub-standard performance of data quality objectives.
- 4. All PQLs are below adopted assessment criteria.

Where two or more data quality objectives indicate less reliability than what the acceptance criteria dictates, the data will be considered with uncertainty.

Representativeness: Sufficient samples must have been collected.

Samples must be collected and preserved in accordance with the sampling methodology proposed in Step 7 to ensure that the sample is representative of the assessed stratum.

Comparability: The data must show little to no inconsistencies with results and field observations and include likely associates e.g. TPH C6-C9 and BTEX.

Decision Error Protocol

If the data received is not in accordance with the defined acceptable limits outlined in Step 6, it may be considered to be an estimate or be rejected. Determination of whether this data may be used or if re-sampling is required will be based on the following considerations:

- 1. Closeness of the result to the guideline concentrations.
- 2. Specific contaminant of concern (e.g. response to carcinogens may be more conservative).
- 3. The area of site and the potential lateral and vertical extent of questionable information.
- 5. Whether the uncertainty can be effectively incorporated into site management controls.

6.7 Step 7: Develop a plan for obtaining data

The overall design of the sampling plan considers migration of surface water from the site. Further detail is provided in **Section 7**.

7. SAMPLING PLAN

The sampling plan for surface water quality will be based on quarterly monitoring events over pre-remediation, remediation and post-remediation periods. Two post remediation surface water monitoring events will be included in the validation report.

Surface water sampling will target conditions upstream and downstream of three culverts which direct surface water beneath the rail formation onsite. Surface water at the site only occurs after rainfall and is received to the surrounding environment as follows:

- 1. Water passing through the northern culvert discharges to an adjacent agricultural property and during high rainfall events to a dam on the agricultural property.
- 2. Water passing through the middle culvert discharges across a causeway on Boyd Street to an adjacent vacant block.
- 3. Water passing through the southern culvert discharges beneath Goulburn Street to agricultural land in a tributary to the Mulwaree River (approximately 550m east of site)

Surface water samples will be collected upstream and downstream of each culvert and in receiving water bodies as shown on **Figure 1**, **Appendix 1**.

7.1.1 Water Quality Monitoring Performance Criteria

Surface water sampling will be completed in accordance with performance criteria defined in **Table 7-1**.

Table 7-1 Performance Criteria

Category	Validation Criteria								
Accuracy: Accuracy in the collection of field data will be	 Calibrated measurement equipment used. The water quality meter will be calibrated by the technical rental company prior to use. 								
controlled by:	 Appropriate sampling methodologies utilised and complied with. Works to be completed with regard for AS NZS 5667.6-1998 Water quality - Sampling - Guidance on sampling of rivers and streams. 								
	3. Collection of one intra-laboratory duplicate for surface water.								
	4. Rinsate samples are not proposed to be collected due to surface water samples being collected directly into dedicated sampling containers (or field filtered using single use syringes and filters) using disposable nitrile gloves.								
Precision: The degree to which	1. A new pair of disposable nitrile gloves to handle each sample.								
data generated from replicate or repetitive measurements differ from one another due to random	Samples will be placed immediately into laboratory supplied and appropriately preserved sampling vessels.								
errors. Precision of field data will be maintained by:	Samples will be stored in chilled, insulated containers with ice for transportation to the laboratory.								
	4. Sample numbers, preservation and analytical requirements will be recorded on chain of custody documents.								
	5. Samples will be transported to the laboratory under chain of custody conditions.								
Completeness: The completeness of the data set shall be judged by:	1. All locations sampled as outlined in Sections 7.1.1 and Figure 1, Appendix 1.								
	2. Sampling completed by experienced personnel.								
	3. Field documentation completed correctly.								
Representativeness: The representativeness of the field data will be judged by:	 Non-disposable sampling equipment, such as the grab sampler and water quality meter, will be thoroughly decontaminated between locations using Decon 90 solution and deionised rinsate water. 								
	At each location, a pair of disposable nitrile gloves will be worn while sampling and handling the sample; gloves will be replaced between each successive sample.								
	3. Surface water analytical samples will be collected directly into the sampling vessels using an extendable pole sampler where appropriate.								
Comparability: Comparability to	1. Use of the same appropriate sampling methodologies.								
existing field data will be	2. Same sampling depths for surface water (where practical).								
	 Field water quality parameters will be obtained using a calibrated water quality meter and recorded on a field sheet, comprising pH, temperature, total dissolved solids (TDS), dissolved oxygen (DO), redox potential and electrical conductivity (EC). 								

Category	Validation Criteria
	4. Samples for dissolved metal analysis will collected in dedicated disposable 50 mL plastic syringes and field filtered through 0.45 μ m filters directly into a sample bottle containing acid preservative.
	5. Visual and olfactory observations will also be recorded on the field sheet.
	Photographs will be taken of sampling location conditions at the time of sampling.

8. **REPORTING**

On completion of each monitoring event, a report will be prepared documenting the completed sampling, trend analysis, quality assurance / quality control and laboratory reports.

The report shall include the following:

- 1. Executive summary
- 2. Introduction
- 3. Objectives and scope of work
- 4. Summary of completed field sampling and laboratory analysis
- 5. QA/QC review
- 6. Temporal trend analysis
- 7. Conclusions

9. **REFERENCES**

ADWG (2011). National Health and Medical Research Council (NHMRC) (2001) National Resource Management Ministerial Council (NRMMC) Australian Drinking Water Guidelines 6, Version 3.5 updated August 2018.

ANZECC (2000). Australian and New Zealand Environment and Conservation Council (ANZECC) & Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ)

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. Available at www.waterquality.gov.au/anz-guidelines

EnRiskS (2021). Advice on risks to human health and the environment: Boyd Street and publicly accessible areas, Tarago NSW.

NEPM (2013). National Environment Protection Council (NEPC), National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended 2013

NHMRC (2008). National Health and Medical Research Council (NHMRC), National Resource Management Ministerial Council (NRMMC) Guidelines for Managing Risks in Recreational Water

NSW DEC (2007). Contaminated Sites – Guidelines for the Assessment and Management of Groundwater Contamination, Department of Environment and Conservation NSW, Sydney, March 2007.

NSW EPA (2017). *Contaminated Land Management - Guidelines for the NSW Site Auditor Scheme (3rd Edition),* New South Wales Environment Protection Authority, Sydney, NSW, October 2017.

APPENDIX 1 FIGURES



Legend

\blacklozenge	Surface water sampling location
	Rail corridor
	Rail corridor fence
	Area of lead exceedance (within
	Indicative surface water flow pat

- (within rail corridor) low path (ie: not ephemeral)
- Indicative ephemeral surface water flow path



Ramboll - Tarago, NSW

APPENDIX 2 CALIBRATION CERTIFICATE

Z:\Projects\Transport for NSW\318001376 - Tarago Rail Corridor\7. Reports\T3 - SW Monitoring\202212 December\318001376-T3-SW Monitoring Report (December 2022).docx Instrument Serial No. 1

YSI Quatro Pro Plus 11E101629



Item	Test	Pass	Comments
Battery	Charge Condition	\checkmark	
	Fuses	1	
	Capacity	1	
Switch/keypad	Operation	✓	
Display	Intensity	1	
	Operation (segments)	4	
Grill Filter	Condition	\checkmark	
	Seal	×	
PCB	Condition	1	
Connectors	Condition	1	
Sensor	1. pH	1	
	2. mV	1	
	3. EC	1	
	4. D.O	1	
	5. Temp	1	
Alarms	Reener		
7 durino	Settings		
Software	Version		
Data logger	Operation		
Download	Operation		
Other tests:			

Certificate of Calibration

This is to certify that the above instrument has been calibrated to the following specifications:

Sensor	Serial no	Standard Solutions	Certified	Solution Bottle Number	Instrument Reading		
2. pH 7.00		pH 7.00		386467	pH 7.07		
3. pH 4.00		pH 4.00		389384	pH 4.00		
4. mV		236.26mV		393734/393728	236.2mV		
5. EC		2.76mS		385789	2.765mS		
6. Temp		21.2°C		MultiTherm	21.6°C		
7. DO		0.0%		391223	0.0%		

Calibrated by:

Adam Nikolic

Calibration date:

Next calibration due;

5/01/2023

6/12/2022

6/12/22

Ramboll - Tarago, NSW

APPENDIX 3 RESULTS TABLES

Z:\Projects\Transport for NSW\318001376 - Tarago Rail Corridor\7. Reports\T3 - SW Monitoring\202212 December\318001376-T3-SW Monitoring Report (December 2022).docx Table 1: Surface Water Parar

		-							-		
Sample Location	Sample Date	Time	Sample Depth (mm below surface)	Temperature (°C)	Spec Conductivity (µScm-1)	рН	Dissolved Oxygen (mg/L)	Redox (mV)	TDS (ppm)	Turbidity (NTU)	Comments
SW1_UP				I	r				I	I	
SW1_UP	13-Aug-19	7:45	Not recorded	Not recorded	Not recorded	Not recorded	Not recorded	Not recorded	Not recorded	Not recorded	Not recorded
SW1_UP	24-Sep-19 29-Jap-20	Not recorded	100	Not recorded	Not recorded	Not recorded	Not recorded	Not recorded	Not recorded	Not recorded	Clear/slightly brown. Frogs audible.
SW1_UP	1-Apr-20	13:25	200	19.94	584	7.05	4.72	154	374	Not recorded	Clear. No turbidity. No odour. No flow.
SW1_UP	11-Aug-20	Not recorded	100	8	205.6	7.43	10.55	170.7	133.3	Not recorded	Clear to slightly brown. Flowing.
SW1_UP	13-Oct-20	7:37	400	11.89	673	7.39	2.6	94	431	Not recorded	Water dear/brown. Flowing.
SW1_UP	28-Jan-21	8:15	100	16.9	587	7.3	0.1	-41.4	375.7	Not recorded	Clear, low-no odour, no observable contamination.
SW1_UP	13-Jul-21	13:47	300	8.18	662	7.65	6.12	162	Not recorded	Not recorded	Clear, colourless, no odour. Reeds growing adjacent to pond. Flowing.
SW1_UP	12-Sep-22	14:20	100	11.10	570	7.8	4.9	107	371.0	-1.0	Clear, not murky, not turbid, very minor suspended solids, no obvious smells or odours, natural running stream.
SW1_UP	13-Dec-22	8:46	100	12.40	618	7.79	5.47	136	Not recorded	Not recorded	
SW1	29-1ap-20									Not recorded	DRY
SW1	1-Apr-20	12:45	100	17.4	575	6.35	5.88	115	368	Not recorded	Clear to brown, low/no turbidity, minor suspendid solids. No odour. No flow.
SW1	11-Aug-20	Not recorded	100	7.8	206.1	7.44	11.00	169.5	133.9	Not recorded	Brown, slightly turbid, continuous flow.
SW1	13-Oct-20	7:35	50	10.38	678	7.7	2.71	125	434	Not recorded	Water flowing, turbid, yellow/borwn, water level shallow.
SW1	28-Jan-21	8:35	Not recorded	16.5	618	7.35	0.04	175.8	395.5	Not recorded	Clear, no observable contamination, amongst reeds. Clear, no odour, some suspended solids. Shallow sampled at upstream end of
SW1	13-Jul-21	13:56	100	7.93	733	7.77	5.29	76	Not recorded	Not recorded	culvert. Clear, colourless, no odour. Reeds up stream. Sampled at culvert entrance.
											Couldn't get completely 10cm underneath waterbody due to shallow depth,
SW1	12-Sep-22	14:45	10	9.2	533	7.67	4.7	157	347.0	0.6	Clear, not murky, not turbid, very minor suspended solids, no dovious smells or odours, small natural stream flowing into a culvert adjacent to the rail corridor, some vegetation and moss on the surface and within the waterbody.
SW1	13-Dec-22	10:54	100	12.3	623.6	7.59	5.45	140.4	Not recorded	Not recorded	
SW2	1		Surface Shallow			1	1	-			[
SW2 SW2	24-Sep-19 29-Jan-20	Not recorded	water.	Not recorded	Not recorded	Not recorded	Not recorded	Not recorded	Not recorded	Not recorded	DRY
SW2	1-Apr-20	13:50	100	17.5	358	7.25	3.84	163	233	Not recorded	Brown, low-medium turbidity, some suspended solids. No odour. No flow.
SW2	30-Apr-20	17:40	50	9.8	605	6.54	3.32	185.9	391.9	Not recorded	Collected at Goulburn Street footbridge. Clear, not flowing.
SW2	11-Aug-20	Not recorded	100	7.3	213.3	8.13	10.59	185.2	137.8	Not recorded	Clear to slightly turbid. Flowing.
SW2	13-Oct-20 28-lap-21	8:15	200 Not recorded	11.8	650	8.27	5.92	96	416	Not recorded	Water clear, flowing, water level low.
SW2	14-Apr-21	8:47	100	12	677	7.82	9.83	48.3	Not recorded	Not recorded	Clear, no odour.
SW2	13-Jul-21	14:05	100	7.56	670	7.98	5.66	108	Not recorded	Not recorded	Clear, colourless, no odour. Sampled at culvert.
SW2	12-Sep-22	15:05	100	9.40	545	7.81	4.7	172	354	17.1	Clear, not murky, not turbid, very minor suspended solids, no obvious smells or odours, small waterbody flowing from a culvert adjacent to the rail corridor, room unpathting and more on the puffers and within the waterbody.
SW2	13-Dec-22	10:54	100	12.90	625.5	7.92	7.23	130	Not recorded	Not recorded	
SW3				r	r -				r -		
SW3	24-Sep-19	Not recorded	50	Not recorded	Not recorded	Not recorded	Not recorded	Not recorded	Not recorded	Not recorded	Moderate turbidity. Frogs audible.
SW3	29-Jan-20							170		Not recorded	DRY
SW3	11-Aug-20	Not recorded	100	8.9	142.5	7.43	9.43	174.7	92.3	Not recorded	Brown to dear.
SW3	13-Oct-20	8:36	100	11.63	229	7.96	4.84	137	149	Not recorded	Water clear/brown to slightly trubid, flowing.
SW3	28-Jan-21									Not recorded	DRY
SW3	14-Apr-21	9:10	100	10.7	242.4	7	8.06	64.8	Not recorded	Not recorded	Pale yellow, no odour Clear, colourless to pale green/brown, no odour. Algae and reeds growing in
SW3	13-Jul-21	13:17	300	8.54	181	6.79	7.2	186	Not recorded	Not recorded	drainage line. Not flowing. Couldn't get completely 10cm underneath the waterbody due to shallow depth,
SW3	12-Sep-22	15:32	10	9.80	184	6.8	4.7	159	120.0	11.5	brown to light brown, slightly murky, slightly turbid, some suspended solids, no obvious smells or odours, small stream from drain leading into a culvert adjacent to the rail corridor.
SW3	13-Dec-22	9:47	100	11.80	243.5	6	5.95	196	Not recorded	Not recorded	
SW4											
SW4	6-Aug-19	11:35	100	12.4	128.2	8.8	9.74	200	Not recorded	Not recorded	Stagnant pond, clear to slightly yellow.
SW4 SW4	24-Sep-19 29-Jan-20	Not recorded		Not recorded	Not recorded	Not recorded	Not recorded	Not recorded	Not recorded	Not recorded	I UTDIG. Frogs auditole.
SW4	1-Apr-20	15:00	200	20.33	297	6.73	5.24	168	193	Not recorded	Light brown, low turbidity. No odour. No flow.
SW4	30-Apr-20	17:30	50	9	388.3	5.75	3.53	263.1	251.8	Not recorded	Collected at Boyd Street culvert. Flowing.
SW4	11-Aug-20	Not recorded	100	7.4	153.4	7.69	10.42	210.9	99.5	Not recorded	Brown, slightly trubid, full but flow not evident.
SW4 SW4	28-Jan-21	9:10	100	13.1	227.3	7.93	1.12	107	145.5	Not recorded	water nowing, turbid, brown, no ocour. Brown-orange, stagnant, low-moderate turbidity, no observable contamination.
SW4	14-Apr-21	9:38	100	11.5	231.1	7.35	9.77	70	Not recorded	Not recorded	Pale yellow, no odour.
SW4	13-Jul-21	13:28	300	7.95	192	6.87	5.41	173	Not recorded	Not recorded	Clear, colourless, no odour. Not flowing.
SW4	12-Sep-22	15:45	100	9	174.3	6.79	4.9	198	113.0	13.9	Brown, murky, turbid, suspended solids, no obvious smells or odours, small stream and water body coming from a cuivert adjacent to rail corridor, venetation and moss on the surface and within the water body.
SW4	13-Dec-22	9:49	100	13.2	175.5	6.54	4.6	168.1	Not recorded	Not recorded	
SW5					r				r		
SW5	29-Jan-20										
SW5	1-Apr-20									Not recorded	DRY
SW5 SW5	1-Apr-20 11-Aug-20	 Not recorded		11.2	117.9	7.33	 7.94	 163.2	76.7	Not recorded Not recorded Not recorded	DRY DRY Brown, turbid, flow at culvert evident beneath crushed rock.
SW5 SW5 SW5	1-Apr-20 11-Aug-20 13-Oct-20	Not recorded 9:06	 100 50	 11.2 11.95	 117.9 187	 7.33 8.35	 7.94 4.06	 163.2 -3	 76.7 121	Not recorded Not recorded Not recorded Not recorded	DRY DRY Brown, turbid, flow at culvert evident beneath crushed rock. Water not flowing, very shallow, turbid, light brown, no odour.
SW5 SW5 SW5 SW5	1-Apr-20 11-Aug-20 13-Oct-20 28-Jan-21	 Not recorded 9:06 	 100 50	 11.2 11.95 	 117.9 187 	 7.33 8.35 	 7.94 4.06 	 163.2 -3 	 76.7 121 	Not recorded Not recorded Not recorded Not recorded Not recorded	DRY DRY Brown, turbid, flow at culver vident benasth crushed rock. Water not flowing, very shallow, turbidi, ight brown, no odour. DRY
SWS SWS SWS SWS SWS	1-Apr-20 11-Aug-20 13-Oct-20 28-Jan-21 14-Apr-21	 Not recorded 9:06 10:20	 100 50 100	 11.2 11.95 11.6	 117.9 187 251.2	 7.33 8.35 6.85	 7.94 4.06 8.75	 163.2 -3 74.9	 76.7 121 Not recorded	Not recorded Not recorded Not recorded Not recorded Not recorded Not recorded	DRY DRY DRY DRY DRV Under, turbid, flow at culver evident benastin crushed rock. Water not flowing, very shallow, turbid, ight brown, no odour. DRY Pale yellow, no odour. Small pool of water north of culvert, rest of area dry. Truthe, hale brown codour. Sample taken from pudde adjacent to culvert.
SW5 SW5 SW5 SW5 SW5 SW5 SW5	1-Apr-20 11-Aug-20 13-Oct-20 28-Jan-21 14-Apr-21 13-Jul-21 12-Sep-22	 Not recorded 9:06 10:20 12:50 	 100 50 100 100 	 11.2 11.95 11.6 8.71 	 117.9 187 251.2 192 	 7.33 8.35 6.85 6.45 	 7.94 4.06 8.75 9.33 	 163.2 -3 74.9 191 	 76.7 121 Not recorded Not recorded 	Not recorded Not recorded Not recorded Not recorded Not recorded Not recorded Not recorded 	DRY DRY DRY DRV DRV Under, turbid, flow at culver evident benastin crushed rock. Water not flowing, very shallow, turbid, ight brown, no odour. DRY Pale yellow, no odour. Simpli pool of water north of culvert, rest of area dry. Turbid, pale brown, no odour. Sampli paken from puddle adjacent to culvert. Net flowing. DRY
SWS SWS SWS SWS SWS SWS SWS SWS	1-Apr-20 11-Aug-20 13-Oct-20 28-Jan-21 14-Apr-21 13-Jul-21 12-Sep-22 13-Dec-22	 Not recorded 9:06 10:20 12:50 	 100 50 100 100 	 11.2 11.95 11.6 8.71 	 117.9 187 251.2 192 	 7.33 8.35 6.85 6.45 	 7.94 4.06 8.75 9.33 	 163.2 3 74.9 191 	76.7 121 Not recorded	Not recorded	DRY DRY DRY DRV DRV DRV Utild, flow at culver evident benasth crushed rock. Water not flowing, very shallow, turbid, light brown, no odour. DRV Pale yellow, no odour. Simpli pool of water north of culvert, rest of area dry. Turbid, pale brown, no odour. Simpli pale flow flowing. DRV DRY
SWS SWS SWS SWS SWS SWS SWS SWS SWS	1-Apr-20 11-Aug-20 13-Oct-20 28-Jan-21 14-Apr-21 13-Jul-21 12-Sep-22 13-Dec-22	 Not recorded 9:06 10:20 12:50 	 100 50 100 100 	 11.2 11.95 11.6 8.71 	 117.9 187 251.2 192 	 7.33 8.35 6.85 6.45 	 7.94 4.06 8.75 9.33 	 163.2 3 74.9 191 	 76.7 121 Not recorded 	Not recorded Not recorded Not recorded Not recorded Not recorded Not recorded Not recorded 	DRY DRY DRY DRV Brown, turbid, flow at culver evident benastin crushed rock. Water not flowing, very shallow, turbid, ight brown, no odour. DRY Pale yellow, no odour. Sampl pool of water north of culvert, rest of area dry. Turbid, pale brown, no odour. Sample taken from puddle adjacent to culvert. Not flowing. DRY
SWS SWS SWS SWS SWS SWS SWS SWS SW6 SW6	1-Apr-20 11-Aug-20 13-Oct-20 28-Jan-21 14-Apr-21 13-Jul-21 12-Sep-22 13-Dec-22 29-Jan-20 1-Apr-20	 Not recorded 9:06 10:20 12:50 	 100 50 100 100 	 11.2 11.95 11.6 8.71 	 117.9 187 251.2 192 -	 7.33 8.35 6.85 6.45 	 7.94 4.06 8.75 9.33 	 163.2 3 74.9 191 	 76.7 121 Not recorded Not recorded 	Not recorded	DRY DRY DRY DRY DRY DRY DRY DRY Utild, flow at culver evident benasth crushed rock. Water not flowing, very shallow, turbidi, light frown, no odour. DRY Pale yellow, no odour. Simpli pool of water north of culvert, rest of area dry. Turbid, pale brown, no odour. Sampli pool of water north of culvert, rest of area dry. DRY
SW5 SW5 SW5 SW5 SW5 SW5 SW5 SW5 SW5 SW5	1-Apr-20 11-Aug-20 13-Oct-20 28-Jan-21 14-Apr-21 13-Jul-21 12-Sep-22 13-Dec-22 29-Jan-20 1-Apr-20 11-Aug-20	 Not recorded 9:06 10:20 12:50 Not recorded	 100 50 100 100 50	 11.2 11.95 11.6 8.71 8.3	 117.9 187 251.2 192 192 168.3	 7.33 8.35 6.85 6.45 7.47	 7.94 4.06 8.75 9.33 9.33 9.61	 163.2 3 74.9 191 187	 76.7 121 Not recorded Not recorded 109.2	Not recorded	DRY DRY DRY DRV Unitial, flow at culver evident benasth crushed rock. Water not flowing, very shallow, turbidi, sight brown, no odour. DRY Pale yellow, no odour. Small pool of water north of culvert, rest of area dry. Turbid, pale brown, no odour. Sample pool of water north of culvert, rest of area dry. DRY
SW5 SW5 SW5 SW5 SW5 SW5 SW5 SW5 SW5 SW6 SW6 SW6	1-Apr-20 11-Aug-20 13-Oct-20 28-Jan-21 13-Apr-21 13-Jul-21 12-Sep-22 13-Dec-22 29-Jan-20 1-Apr-20 11-Aug-20 13-Oct-20	 Not recorded 9:06 10:20 12:50 Not recorded 	 100 50 100 100 50 50 	 11.2 11.95 11.6 8.71 8.3 	 117.9 187 251.2 192 168.3 	 7.33 8.35 6.85 6.45 7.47 	 7.94 4.06 8.75 9.33 9.61 	 163.2 3 74.9 191 187 	76.7 121 Not recorded Not recorded	Not recorded Not recorded	DRY
SW5 SW5 SW5 SW5 SW5 SW5 SW5 SW6 SW6 SW6 SW6 SW6 SW6	1-Apr-20 11-Aug-20 13-Oct-20 28-Jan-21 14-Apr-21 13-Jul-21 13-Sep-22 13-Dec-22 29-Jan-20 1-Apr-20 11-Aug-20 11-Aug-20 28-Jan-21	 Not recorded 9:06 10:20 12:50 Not recorded Not recorded	 50 100 50 50 	 11.2 11.95 11.6 8.71 8.3 8.3	 117.9 187 251.2 192 192 192 -	 7.33 8.35 6.85 7.47 7.47	 7.94 4.06 8.75 9.33 9.61 9.61	 163.2 74.9 191 187 	76.7 121 Not recorded Not recorded 109.2	Not recorded Not recorded Not recorded Not recorded Not recorded Not recorded 	DRY DRY DRY DRY DRY DRY DRY Utild, flow at culver evident benasth crubed rock. Water not flowing, very shallow, turbid, sight brown, no odour. DRY Pale yellow, no odour. Small pool of water north of culvert, rost of area dry. Turbid, pale brown, no odour. Sample pool of water north of culvert, rost of area dry. DRY
5W5 5W5 5W5 5W5 5W5 5W5 5W6 5W6 5W6 5W6	1-Apr-20 11-Aug-20 13-Oct-20 28-Jan-21 14-Apr-21 13-Jol-21 13-Jol-21 13-Sep-22 29-Jan-20 1-Apr-20 11-Aug-20 11-Aug-20 13-Oct-20 28-Jan-21 14-Apr-21 14-Apr-21	 Not recorded 9:06 10:20 12:50 Not recorded Not recorded 	 50 100 50 50 	 11.2 11.95 11.6 8.71 8.3 8.3 8.3 	 117.9 187 251.2 192 -	 7.33 8.35 6.85 6.85 7.47 7.47	 7.94 4.06 9.33 9.61 9.61 0.61 	 163.2 -3 74.9 191 187 -	76.7 121 Not recorded Not recorded	Not recorded Not recorded	DRY
SW5 SW5 SW5 SW5 SW5 SW5 SW5 SW5 SW6 SW6 SW6 SW6 SW6 SW6 SW6 SW6 SW6	1-Apr-20 11-Aug-20 11-Aug-20 28-Jan-21 14-Apr-21 13-Jul-21 12-Sep-22 13-Dec-22 29-Jan-20 1-Agr-20 13-Oct-20 28-Jan-21 14-Apr-21 13-Jul-21	 Not recorded 9:06 10:20 12:50 Not recorded Not recorded 12:58	 100 50 100 100 100 	 11.2 11.95 11.6 8.71 8.3 9.08	 117.9 187 251.2 192 -	 7.33 8.35 6.85 6.45 7.47 7.47 7.47	 7.94 4.06 9.33 9.61 9.61 9.61 9.73	 163.2 -3 74.9 191 187 187 187 187 -	 76.7 121 Not recorded Not recorded 109.2 109.2 Not recorded	Not recorded Not recorded Not recorded Not recorded Not recorded Not recorded To recorded Not recorded	DRY
5W5 5W5 5W5 5W5 5W5 5W5 5W5 5W5 5W6 5W6	1-Apr-20 11-Aug-20 11-Aug-20 28-Jan-21 14-Apr-21 13-Jal-21 12-Sep-22 29-Jan-20 1-Agr-20 13-Oct-20 28-Jan-21 14-Apr-21 13-Jal-21 12-Sep-22	 Not recorded 9:06 10:20 Not recorded Not recorded 12:58	 100 50 100 100 100 50 50 10 10 10 10 10 10 10 10 10 1	 11.2 11.9 8.3 9.08 9.08	 117.9 187 251.2 192 192 108.3 108.3 173 180.6	 7.33 8.35 6.65 6.65 7.47 7.47 7.32 7.32	 7.94 4.06 8.75 9.33 9.61 9.61 9.73 9.73	 163.2 -3 74.9 191 	Not recorded	Not recorded Not recorded	DRY
50%5 50%5 50%5 50%5 50%5 50%6 50%6 50%6	1-Apr-20 11-Aug-20 11-Aug-20 28-Jan-21 14-Apr-21 13-Jai-21 13-Jai-21 13-Sep-22 29-Jan-20 1-Apr-20 13-Apr-20 13-Apr-21 13-Oct-20 29-Jan-21 14-Apr-21 13-Oct-20 29-Jan-21 14-Apr-21 13-Oct-20 29-Jan-20 14-Apr-21 13-Oct-20 29-Jan-20 14-Apr-21 14-Apr-22 14	Not recorded 9:06 10:20 12:20 Not recorded 12:58 15:58 10:19	 100 50 100 100 50 	 11.2 11.95 11.6 8.71 8.3 9.08 11.8 12.6	 117.9 187 251.2 192 192.2 106.3 173 180.6 20.2	 7.33 8.35 6.65 6.65 7.1 7.47 7.47 7.47 7.32 9.07	 7.94 4.06 8.75 9.33 9.61 9.73 9.73 4.5	 163.2 74.9 191 	Net recorded Net recorded Net recorded II7.0 Net recorded	Not recorded Not recorded Not recorded Not recorded Not recorded Not recorded Content Not recorded Not recorded	DRY
5W5 5W5 5W5 5W5 5W5 5W5 5W6 5W6 5W6 5W6	1-Apr-20 11-Aug-20 11-Aug-20 28-Jan-21 13-Jul-21 13-Jul-21 13-Jul-21 13-Sep-22 29-Jan-20 13-Agr-20 13-Agr-20 13-Agr-20 13-Agr-21 13-Jul-21 13-Jul-21 12-Sep-22 13-Dec-22	 Not recorded 9:06 10:20 12:50 Not recorded 12:58 15:58 10:19	 100 50 100 100 50 50 50 10 10 10 10 10 10 100 	 11.2 11.95 8.71 8.3 9.08 11.8 17.6	 117.9 187 251.2 182 132 168.3 173 180.6 201.2	 6.85 6.45 	 7.94 4.06 9.33 9.33 9.61 9.61 9.73 4.5 5.7	 74.9 187 187 -	 76.7 76.7 121 Not recorded 109.2 Not recorded 117.0 Not recorded	Not recorded	DRY
5W5 5W5 5W5 5W5 5W5 5W5 5W5 5W6 5W6 5W6	1-Apr-20 11-Aug-20 11-Aug-20 28-Jan-21 14-Apr-21 13-Jal-21 13-Jal-21 13-Sep-22 13-Dec-22 29-Jan-20 14-Apr-21 13-Od-20 28-Jan-21 14-Apr-21 13-Od-20 28-Jan-21 14-Apr-21 13-Od-20 29-Jan-20	 Not recorded 9:06 10:20 12:50 Not recorded 12:58 15:58 10:19	 100 50 100 100 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 	 11.2 11.95 8.7 8.3 9.08 11.8 17.6	 117.9 187 251.2 192 192 192.3 196.3 196.3 196.3 197 196.3 197 196.3 197 197 -	 6.85 7.47 7.47 7.47 7.42 9.07 6.53	 7.94 4.06 9.33 9.51 9.51 9.73 4.5 5.7	 24.9 187 187 187 187 187 187 -	76.7 121 Not recorded Not recorded 109.2 Not recorded 117.0 Not recorded 236.6	Not recorded	DRY
5W5 5W5 5W5 5W5 5W5 5W5 5W6 5W6 5W6 5W6	1-Apr-20 11-Aug-20 11-Aug-20 28-3an-21 14-Apr-21 13-3ai-21 13-3ai-21 13-3ai-21 13-58p-22 29-3an-20 1-Apr-20 29-3an-21 14-Apr-21 13-3ai-22 23-3an-21 13-3ai-21 13-3ai-22 23-3ai-20 23-3ai-21 13-3ai-21 13-3ai-22 23-3ai-20 23	 Not recorded 9:06 12:50 Not recorded 12:58 15:58 10:19 Not recorded 10:20 Not recorded	 100 50 100 100 50 	 11.2 11.95 8.7 8.3 8.3 9.08 11.8 17.6 22.1 18.1	 117.9 187 251.2 192 -	 	 7.94 4.06 8.75 9.33 9.33 9.33 9.43 9.45 5.7 8.46 4.45	 74.9 187 187 187 187 187 187 187 -	76.7 76.7 121 Not recorded 109.2 109.2 Not recorded 117.0 Not recorded 122.1	Not recorded	DRY
SW5 SW5 SW5 SW5 SW5 SW5 SW5 SW6	1-Apr-20 11-Aug-20 11-Aug-20 13-Oct-20 28-Jan-21 13-Jul-21 13-Jul-21 13-Sep-22 13-Oct-20 29-Jan-20 13-Agr-20 13-Agr-20 13-Agr-21 13-Jul-21 13-Sep-22 13-Oct-22 29-Jan-20 13-Oct-20 29-Jan-20 13-Jul-21 13-Sep-22 13-Oct-22 13-Oct-22 13-Oct-22 13-Oct-20 13-Jul-21 13-Sep-22 13-Oct-22 13-Sep-22 1	 Not recorded 9:06 10:20 12:50 Not recorded 12:58 15:58 10:19 Not recorded Not recorded Not recorded Not recorded Not recorded Not recorded	 100 50 100 100 50 	 11.2 11.95 11.65 8.7 8.3 9.08 11.8 12.5	 117.9 187 251.2 192 -	 	 7.94 4.06 8.75 9.33 9.33 9.43 9.61 9.73 4.5 5.7 8.46 4.45 7.80	 24.9 -	Not recorded 109.2 Not recorded 117.0 Not recorded 117.0 Not recorded	Not recorded	DRV DRV DRV Brown, turbid, flow at culver evident beneath cruched noc. Water not, flowing, very shallow, turbid, kpit brenen, no odour. Water not, flowing, very shallow, turbid, kpit brenen, no odour. DRV
SW5 SW5 SW5 SW5 SW5 SW5 SW5 SW6	1-Apr-20 11-Aug-20 11-Aug-20 13-3u6-20 28-3ur-21 13-3u6-21 13-3u6-21 13-3u6-21 13-3u6-20 13-4gr-20 13-3u6-20 13-3u6-21 13-3u6-21 13-3u6-21 13-5u6-22 29-3ur-20 29-3ur-20 11-Aug-20 1	 Not recorded 9:06 10:20 12:50 12:50 Not recorded 12:58 15:55 10:19 Not recorded Not recorded Not recorded Not recorded Not recorded	 100 50 100 50 50 	 11.2 11.95 8.7 8.3 8.3 8.3 9.08 11.8 12.5 22.34	 117.9 187 251.1 192 -	 6.85 6.45 7.47 7.47 7.47 2.32 	 7.94 4.06 9.33 9.33 9.33 9.43 9.61 9.61 9.73 4.5 5.7 8.46 4.45 7.80 5.35	 163.2 74.9 191 187 187 -		Not recorded	DRV
5885 5885 5885 5885 5885 5885 5886 5886	1-Apr-20 11-Aug-20 11-Aug-20 13-3u5-20 28-3ur-21 13-3u5-21 13-3u5-21 13-Sep-22 1	 Not recorded 9:06 10:20 12:50 Not recorded 12:58 15:58 10:19 Not recorded Not recorde	 100 50 100 50 10 50 	11.2 11.9 11.9 11.6 8.7 8.3 8.3 9.68 11.8 17.6 23.1 18.1 12.5 23.34 18.4 17.6	 117.9 187 251.2 192 -	 6.85 6.45 7.47 7.47 7.47 7.47 7.47 7.42 9.07 6.53 8.53 7.23 7.23 7.23 7.23 7.23 7.23 7.23 7.23 7.23 7.47 7.47 7.47 7.47 7.47 7.47 7.47 7.47 7.47 7.47 7.42 7.22 7.22 7.42 7.22 7.22 7.22 7.22 7.22 7.26 7.26 7.26 7.26 7.26 7.26 7.26 7.26 7.26 7.26 7.26 7.26 7.26 7.66 	 8.75 9.33 9.33 9.33 9.33 9.43 9.61 9.61 9.73 4.5 5.7 8.46 4.45 5.35 1.80 8.76	 163.2 74.9 -	Not recorded Not recorded Not recorded 117.0 Not recorded 117.0 Not recorded 112.0 Not Recorded 122.0 Not Recorded 123.0 Not R	Not recorded	DRV DRV DRV DRV DRV Brown, turbid, flow at culver evident beneath cucked not. Water not flowing, very shallow, turbid, lipit brown, no odour. DRV Pale vallow, no odour. Small pool of water not of culvert, rest of area dry. Turbid, pale brown, no odour. Small pool of water not of culvert, rest of area dry. DRV DRV DRV DRV DRV DRV DRV DRV Clear to slipitly turbid. Not flowing. DRV Clear to slipitly turbid. John Monter Mone vegetation on the banks and surface of the water body. Sitty, from dam, low level water. Highly turbid. Brown, stability turbid. Brown,
5885 5885 5895 5895 5895 5895 5895 5896 5896	1-Apr-20 11-Aug-20 11-Aug-20 13-3u5-20 28-3ur-21 13-3u5-21 13-3u5-21 13-Sep-22 1	 Not recorded 9:06 10:20 12:50 12:50 Not recorded 12:58 15:58 10:19 Not recorded Not recorded Not recorded Not recorded Not recorded 10:20	 100 50 100 50 	11.2 11.9 11.9 11.6 8.7 8.7 8.3 8.3 9.68 11.8 17.6 21.1 18.1 18.1 12.5 21.34 18.4 11.5 2.5 21.34	 117.9 187 182 192 -	 6.85 6.45 7.47 7.47 7.47 7.42 9.07 6.53 8.53 7.20 7.20 	 8.754 4.06 9.33 9.33 9.33 9.43 9.61 9.61 9.61 9.73 4.5 5.7 8.46 4.45 5.35 1.80 8.76 5.52	 163.2 74.9 -	 76.7 72.7 121 Not recorded 109.2 109.2 Not recorded 117.0 Not recorded 117.0 Not recorded 117.0 Not recorded 112.0 Not recorded 112.0 Not recorded 112.0 Not recorded Not recorded N	Not recorded	DRV
SW5 SW5 SW5 SW5 SW5 SW5 SW6	1-Apr-20 11-Aug-20 11-Aug-20 13-3u5-20 28-3ur-21 13-3u5-21 13-3u5-21 13-Sep-22 13-Sep-22 13-Sep-22 29-3ur-20 13-Aug-20 13-3u5-21 14-Apr-21 13-3u5-21 12-Sep-22 29-3ur-20 29-3ur-20 29-3ur-20 12-Oct-20 29-3ur-20 11-Aug-20 1	 Not recorded 9:06 10:20 12:50 12:50 Not recorded 12:58 15:58 10:19 10:19 Not recorded Not recorded Not recorded Not recorded 11:30	 100 50 100 50 	 11.2 11.9 8.7 8.3 8.3 9.08 11.8 17.6 22.1 18.1 12.5 22.34 18.4 11.5 21.34	 117.9 187 187 192 -	 6.85 6.45 7.47 7.47 7.47 7.47 7.42 9.07 6.53 8.05 7.22 9.07 7.23 7.23 7.23 7.23 7.23 7.23 7.23 7.23 7.23 7.23 7.23 7.23 7.23 7.24 7.25 7.25 7.25 7.25 7.22 7.22 7.23 7.23 7.23 7.23 7.26 7.22 7.26 7.22 7.26 7.26 7.26 7.26 7.26 7.26 7.26 7.26 7.26 7.26 7.26 7.26 7.26 7.26 7.26 7.26 7.26 7.41 7.41 6.69 7.41 6.69	 8.754 4.06 9.73 9.33 9.43 9.61 9.61 9.61 9.73 4.5 5.7 8.46 4.45 5.35 1.80 8.73 1.80 8.552 5.52	 163.2 74.9 -	 76.7 75.7 121 Not recorded 109.2 109.2 Not recorded 117.0 Not recorded 117.0 Not recorded 117.0 Not recorded 112.0 Not recorded 112.0 112.0 Not recorded 112.0 Not recorded 112.0 N	Not recorded	DRV
SW5 SW5 SW5 SW5 SW5 SW5 SW5 SW6	1-Apr-20 11-Aug-20 11-Aug-20 11-Aug-20 22-Jan-21 13-Jal-21 13-Jal-21 13-Jal-21 13-Jal-22 23-Jan-20 13-Occ-22 23-Jan-21 14-Agr-20 13-Occ-22 23-Jan-20 2-Apr-20 13-Occ-22 29-Jan-20 2-Apr-20 13-Jal-21 13-Aug-20 12-Occ-20 22-Jan-20 13-Aug-20 13-Occ-22 29-Jan-20 13-Occ-20 29-Jan-20 13-Occ-20 29-Jan-20 13-Occ-20 29-Jan-20 13-Occ-20 29-Jan-20 13-Occ-20 29-Jan-20 13-Occ-20 29-Jan-20 13-Occ-20 13-	 Not recorded 9:06 12:50 12:50 12:50 Not recorded 12:58 10:19 10:19 10:19 10:19 10:19 Not recorded Not recorded 10:10 10:20 10:19	 100 50 100 100 50 50 50 50 10 100 100 100 100 100 100	11.2 11.9 11.9 8.7 8.7 8.3 8.3 9.08 11.8 17.6 23.1 18.1 12.5 21.34 18.4 11.5 2.1.34 18.4 11.5 2.9 9.9	 117.9 187 182 -	 6.85 6.45 7.47 7.47 7.47 7.47 7.47 7.42 9.07 6.53 8.92 7.23 9.07 7.23 7.26 7.69 7.4 6.51 7.41 6.91	 2,24 4,06 9,23 9,23 9,23 9,24 9,24 9,24 9,24 9,25 9,25 9,25 9,23 9,23 9,23 9,23 9,23 9,23 9,23 9,23 9,23 9,23 9,23 9,23 9,23 9,23 9,23 9,23 9,24 9,24 9,24 9,25 9,25 9,26 9,26 9,26 9,27 9,26 9,27 9,27 9,26 9,27 9,27 	 163.2 74.9 187 187 187 187 187 -	Not recorded Not recorded Not recorded Not recorded 109.2 Not recorded 117.0 Not recorded 117.0 Not recorded 112.0 Not recorded 112. 9.5.1 Not recorded 112. 9.5.1 Not recorded 115.0	Not recorded	DRY
SW5 SW5 SW5 SW5 SW5 SW5 SW5 SW6	1 - Apr-20 11 - Aug-20 11 - Aug-20 13 - Oct-20 28 - Jan-21 13 - Jal-21 13 - Jal-21 13 - Jal-21 13 - Jal-22 29 - Jan-20 13 - Oct-20 28 - Jan-20 13 - Oct-20 28 - Jan-21 14 - Apr-21 13 - Jal-21 13 - Oct-20 28 - Jan-20 29 - Jan-20 20 -	Not recorded 9:06 10:20 12:50 12:58 15:58 10:19 10:00 Not recorded 10:10 Not recorded 11:30 10:51 14:25 9:04 10:25	 100 50 100 100 50 50 10 100 50 10 100 50 10 100 200 100 100 100 100 100	 11.2 11.95 8.7 8.3 8.3 9.08 11.8 11.8 11.8 12.5 21.34 18.4 11.5 7.38 9.9 9.9 17.5	 117.9 187 251.2 	 6.85 6.45 7.47 7.47 7.47 7.41 6.57 7.41 6.91 6.34	 8.75 9.33 9.4 9.61 9.61 9.61 9.61 9.5 5.7 8.46 4.45 5.7 8.45 5.35 1.80 8.52 5.42 5.42 5.45 5.42 5.45 5.42 5.45 5.42 5.42 5.42 5.45 5.42 5.42 5.42 5.42 5.45 5.45 5.45 5.45 5.42 5.45 5.42 5.45 5.10 5.45	 163.2 74.9 191 197 187 187 187 187 187 187 187 187 187 187 -		Not recorded	DRY
SW5 SW5 SW5 SW5 SW5 SW5 SW6	1-Apr-20 11-Aug-20 11-Aug-20 11-Aug-20 11-Aug-20 11-Aug-20 11-Aug-21 13-3ul-22 13-3ul-22 1	Not recorded 9:06 10:20 12:50 12:58 12:58 15:58 10:19 10:00 Not recorded 10:00 Not recorded 11:30 10:51 14:25 9:04 10:25	 100 50 100 100 50 50 50 10 100 50 10 100 200 100 100 100 100 100	11.2 11.95 11.6 0.71 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7	 117.9 187 251.2 	 	 8.75 9.33 9.4 9.61 9.61 9.61 9.61 9.53 4.5 5.7 8.46 4.45 5.7 8.45 5.35 1.89 8.76 5.42 5.10 3.18	 163.2 74.9 191 187 187 187 187 187 187 187 187 187 187 187 187 187 187 187 187 187 187 -		Not recorded Not r	DRV
50%5 50%5 50%5 50%5 50%6 50%6 50%6 50%6	1 - Apr-20 11 - Aug-20 11 - Aug-20 13 - Oct-20 28 - Jan-21 13 - Jul-21 13 - Jul-21 13 - Jul-21 13 - Oct-20 28 - Jan-20 13 - Oct-20 28 - Jan-20 28 - Jan-21 14 - Apr-21 13 - Oct-20 28 - Jan-20 2 Apr-20 28 - Jan-20 2 Apr-20 28 - Jan-20 2 Apr-20 28 - Jan-20 2 Apr-20 28 - Jan-21 13 - Oct-20 28 - Jan-21 13 - Jul-21 13 - Jul-22 13 - Jul-22 14 - Jul-22 14 - Jul-22 14 - Jul-22 15 -	Not recorded 9:06 10:20 12:50 Not recorded 12:55 15:58 10:19 10:09 Not recorded 11:30 10:51 14:25 9:04 10:25	 100 50 100 100 50 50 50 10 10 100 50 10 100 100 100	 11.2 11.95 8.2 8.3 8.3 8.3 9.08 11.8 11.8 11.8 11.8 22.1 11.8 22.1 18.4 11.5 21.34 18.4 11.5 7.38 9.9 17.5 22.16 18	 117.9 187 251.2 182 	 6.85 6.45 6.45 7.47 7.42 9.07 6.53 8.92 7.20 6.53 7.26 6.57 7.41 6.91 6.91 6.91 6.91	 8.75 9.33 9.43 9.33 9.45 9.61 9.61 9.61 9.61 9.53 9.73 4.5 5.7 8.46 4.45 5.7 8.45 5.7 9.53 5.7 9.53 9.53 9.74 9.73 -	 161.2 163.2 74.9 191 197 187 187 187 187 187 187 187 187 187 187 187 187 187 187 187 187 187 187 187 -		Not recorded	DRY
50%5 50%5 50%5 50%5 50%6 50%6 50%6 50%6	1 - Apr-20 11 - Aug-20 11 - Aug-20 13 - Oct-20 28 - Jan-21 13 - Jaf-21 13 - Jaf-21 13 - Jaf-21 13 - Jaf-21 13 - Oct-20 28 - Jan-20 14 - Apr-21 13 - Jaf-21 13 - Jaf-22 29 - Jan-20 20 - Zaf-20 20 -	Not recorded 9:06 10:20 12:50 12:55 15:58 10:19 10:00 Not recorded 11:30 10:51 14:25 9:04 10:25	 100 50 100 100 100 50 50 50 10 10 100 200 100 100 100 100	 11.2 11.95 8.3 8.3 8.3 9.08 11.8 11.8 11.8 11.6 223.1 18.1 18.1 18.1 18.1 18.1 18.1 23.5 21.34 18.4 11.5 7.38 9.9 23.6 18 9.1	 117.9 187 251.2 182 	 6.85 6.45 7.47 7.47 7.47 7.47 7.42 8.52 7.26 7.26 7.26 7.26 7.26 7.26 7.26 7.20 7.24 6.57 7.41 6.91 6.91 7.23 8.53	 8.75 9.33 9.43 9.43 9.43 9.41 9.61 9.61 9.61 9.53 4.5 5.7 8.44 4.45 5.27 5.10 3.18 5.22 5.34	 161.2 163.2 74.9 191 197 187 187 187 187 187 187 187 187 187 -		Not recorded	DRY
50%5 50%5 50%5 50%5 50%6 50%6 50%6 50%6	1 - Apr-20 11 - Aug-20 11 - Aug-20 13 - Oct-20 28 - Jan-21 13 - Jul-21 13 - Jul-21 13 - Jul-21 13 - Oct-20 28 - Jan-20 28 - Jan-20 28 - Jan-20 28 - Jan-20 29 - Jan-20 20 - Zan-20 20 -	Not recorded 9:06 10:20 12:50 12:55 15:58 10:19 10:19 Not recorded 11:30 10:51 14:25 9:04 10:51 14:25 9:04 10:52	 100 50 100 100 100 50 50 50 10 10 100 200 100 100 100 100	11.2 11.2 11.9 6.71 6.71 6.7 6.7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	 117.9 117.9 1197 1197 1197 1197 1192 -	 6.85 6.45 7.47 7.47 7.47 7.47 7.42 8.92 7.23 8.92 7.26 7.26 7.26 7.26 7.26 7.26 7.26 7.26 7.24 6.57 7.41 6.57 7.41 6.51 7.41 6.51 7.25 7.41 6.51 7.25 7.26 7.25 7.26 7.25 7.26 7.25 7.26 7.25 7.26 7.26 7.25 7.26 7.26 7.26 7.26 7.27 7.26 7.26 7.26 7.26 7.26 7.27 7.26 7.26 7.26 7.26 7.26 7.27 7.26 7.27 7.26 7.27 7.26 7.27 7.26 7.27 7.25 7.55 7.5	 8.75 9.33 9.43 9.43 9.43 9.43 9.41 9.61 9.61 9.53 9.73 4.5 5.7 8.44 4.45 5.7 9.53 1.80 8.55 1.80 8.52 5.10 3.18 5.22 9.34 5.22 9.34 5.22 1.25 -	 161.22 163.2 74.9 191 197 187 197 -		Not recorded Not recorded	DRY
50%5 50%5 50%5 50%5 50%5 50%6 50%6 50%6	1-Apr-20 11-Aug-20 11-Aug-20 11-Aug-20 11-Aug-21 13-bit-21 13-bit-21 13-bit-21 13-bit-21 13-bit-21 13-bit-20 28-bit-20 28-bit-21 13-bit-21 1	Not recorded 9:06 12:59 12:59 Not recorded 12:58 10:19 10:00 Not recorded 12:58 10:19 10:01 Not recorded 12:425 9:04 10:51 14:25 9:04 10:51 14:25 9:04 10:29	 100 50 100 100 50 50 50 10 100 100 100 100 100 100	11.2 11.2 11.9 6.7 11.6 8.7 8.3 -	 117.9 137 251.2 132 142.7 168.3 168.3 168.3 100.7 173 180.6 201.2 20	 6.85 	 7.94 4.06 8.75 9.33 9.33 9.33 9.33 9.73 	 163.2 163.2 -3 -3 -3 -3 -3 -3 -3 -4 -4 -4 -4 -4 -4 -4 -4 -4 -4		Not recorded	DRY
50%5 50%5 50%5 50%5 50%5 50%6 50%6 50%6	1-Apr-20 11-Aug-20 11-Aug-20 11-Aug-20 11-Aug-21 11-Aug-21 11-Aug-21 11-Aug-20 11-Apr-20 11-Apr-20 11-Apr-20 22-Jan-20 22-Jan-21 11-Agr-21 13-Jac-21 1	Not recorded 9:06 12:59 Not recorded 12:50 12:59 10:19 10:20 10:51 10:51 14:25 9:04 10:51 14:25 9:04 10:51 11:30 10:51 14:25 9:04	 100 50 100 100 50 50 50 10 10 100 100 100 100 100 1	11.2 11.9 11.9 11.9 11.9 8.71 9.00 11.8 12.5 22.1 18.1 12.5 18.4 11.5 9.9 17.6 9.9 17.5 22.6 18.9 22.6 18.9 22.6 18.9 22.6 18.9 22.6	117.9 137 251.2 132 132 132 133 133 133 1380.6 201.2 201.2 2042 94.7 173 180.6 140.7 133 177 142.6 140.7 133 177 142.6 140.7 133 177 142.6 201.2 201	 6.85 	 7.94 4.06 9.33 9.33 9.53 9.53 9.54 9.73 9.64 9.73 	 24.9 -	Not recorded	Not recorded	DRY
SW5 SW5 SW5 SW5 SW5 SW6	1-Apr-20 11-Aug-20 11-Aug-20 11-Aug-20 11-Aug-21 11-Aug-20 11-Aug-21 11-Sep-22 11-Apr-20 11-Apr-20 11-Apr-20 28-Jan-20 28-Jan-21 13-Jai-21 13-Jai-21 13-Jai-21 13-Sep-22 29-Jan-20 13-Aug-20 13-Aug-20 13-Aug-20 13-Aug-20 13-Aug-20 13-Jai-21 13-Jai-22 1	Not recorded 9:06 12:59 12:59 Not recorded 12:58 10:19 10:20 Not recorded 17:46 11:30 10:51 14:25 9:04 10:52 9:04 10:25 11:01 9:30am 11:19 11:	 100 50 100 100 50 50 50 10 10 100 100 100 100 100 1	11.2 11.95 11.6 8.71 8.3 8.3 8.3 9.00 11.8 17.6 223.1 18.1 12.5 21.34 11.5 7.38 223.1 18.1 12.5 21.34 11.5 7.38 9.9 17.5 22.6 18 9.1 22.6 18 9.1 22.6 18 9.1 22.6 18 9.1 20.12 18.9 13.4 20.12 20.	 117.9 117.9 251.2 132 1192 132 130.3 140.3 -	 6.85 6.45 7.47 7.47 7.47 7.42 7.22 9.07 6.53 8.892 7.20 7.20 7.20 7.20 7.21 7.22 7.26 7.22 7.22 7.26 7.22 7.26 7.22 7.26 7.26 7.20 7.21 7.20 7.21 7.20 7.21 	 8.75 9.33 9.33 9.33 9.45 9.72 4.5 5.7 8.46 4.45 9.73 8.46 4.45 9.73 8.46 4.45 9.73 9.73 9.73 9.73 9.73 9.73 9.73 9.73 9.73 9.73 9.51 9.73 9.74 9.74 9.74 9.74 9.74 9.74 9.74 9.74 9.74 9.74 9.74 9.74 9.74 9.74 9.74 9.74 9.74 9.74 9.74 	 24.9 -	Not recorded Act recorded	Not recorded Not r	DRY
SW5 SW5 SW5 SW5 SW5 SW6	1-Apr.20 11-Aug.20 11-Aug.20 11-Aug.20 11-Aug.20 11-Aug.21 11-Sep.22 11-Sep.22 11-Apr.20 11-Apr.20 28-Jan.20 12-Sep.22 13-Jaf.21 13-Jaf.21 13-Sep.22 29-Jan.20 12-Agr.20 11-Aug.20 12-Agr.20 12-Agr.20 12-Sep.22 13-Jaf.21 13-Jaf.22 1	 Not recorded 9:66 12:59 12:59 Not recorded 12:58 10:19 Not recorded 17:46 13:30 Not recorded 17:46 11:30 10:51 14:25 9:04 10:51 14:25 9:04 11:31 11:30 10:51 11:32 10:52 9:04	 100 50 100 100 100 50 50 10 10 10 10 200 100 100 100 1	11.2 11.95 11.6 8.7 8.3 8.3 8.3 9.08 11.8 1 9.08 11.8 12.5 21.34 18.1 12.5 22.1 18.1 12.5 22.1 18.1 11.5 7.28 9.9 12.5 22.6 18 9.1 20.12 18.9 13.4 8.43 8.43 8.43 8.43 8.43 8.43 8.43 8	 117.9 117.9 251.3 132 201.1 142.7 146.3 146.3 146.3 146.3 146.3 146.3 146.3 146.5 140.5 142.6 142.6 142.6 142.6 142.5 	 6.85 6.45 	 8.75 9.33 9.33 9.33 9.33 9.33 9.51 9.72 4.5 5.7 8.46 4.45 9.73 8.46 4.45 9.73 8.46 4.45 9.73 3.18 8.76 5.52 4.51 3.18 5.52 4.51 3.18 5.52 4.51 5.52 4.51 5.52 		Not recorded Not recorded Not recorded 112.0 Not recorded 115.0 Not recorded 115.0 Not recorded	Not recorded Not r	DRY
SW5 SW5 SW5 SW5 SW5 SW5 SW6	1-Apr-20 11-Aug-20 11-Aug-20 11-Aug-20 11-Aug-21 11-Aug-21 11-Aug-21 11-Aug-21 12-Sep-22 13-Dec-22 29-Jan-20 2-Apr-20 12-Agr-20 12-Agr-20 12-Sep-22 29-Jan-20 12-Agr-20 12	 Not recorded 9:06 12:50 12:50 Not recorded 12:58 10:19 10:50 Not recorded 17:46 10:51 13:30 Not recorded 17:46 10:51 13:30 10:51 13:30 10:51 13:30 10:51 13:30 10:51 13:30 10:51 13:30 10:51 13:30 10:51 13:30 10:51 13:30 10:51 13:30 10:51 13:30 10:51 13:30 10:52 10:52 1	 100 50 100 100 100 50 50 10 10 100 100 100 100 100 1	 11.2 11.95 8.7 8.7 8.3 8.3 8.3 9.08 9.08 9.08 9.08 9.08 9.08 9.08 9.08 11.8 9.0 9.1 9.1 9.1 9.1 9.1 9.1 9.1 9.1 9.1 9.1 9.1 9.1 9.1 9.1 9.1 9.1 9.1 9.1 9.1 	 117.9 117.9 1292 1192 1192 1102 100.3 100.3 100.3 	 6.85 6.45 	 8.75 9.33 9.33 9.33 9.33 9.33 9.45 9.73 4.5 5.7 8.46 4.45 8.46 4.45 9.73 1.80 5.52 5.10 3.09 8.41 5.12 5.1 5.35	 74.9 191 	Not recorded	Not recorded Not r	DRY
SW5 SW5 SW5 SW5 SW5 SW5 SW6	1-Apr-20 11-Aug-20 11-Aug-20 11-Aug-21 11-Aug-21 11-Aug-21 11-Aug-21 11-Aug-21 12-Sep-22 11-Aug-20 11-Aug-20 11-Aug-20 11-Aug-20 11-Aug-20 12-Sep-22 12-Sep-22 12-Sep-20 11-Aug-20 12-Aug-20 1	 Not recorded 9:06 10:20 12:50 12:58 10:19 10:50 Not recorded 17:46 11:30 10:51 13:20 Not recorded 17:46 11:30 10:51 13:30 10:51 13:30 10:51 13:30 10:51 13:30 Not recorded 17:46 11:30 10:51 13:30 13:	 100 50 100 100 50 50 50 10 100 100 100 100 100 100	11.2 11.95 11.6 8.7 8.3 8.3 8.3 8.3 9.08	 251.3 187 192 192 192 192 192 192 192 192 192 192 192 193 192 193 193 -	 6.85 6.45 7.47 7.47 7.47 7.42 9.07 8.53 7.22 9.07 7.22 9.07 7.23 7.24 6.53 7.41 6.53 7.42 7.23 7.24 7.23 7.23 7.24 7.25 7.41 7.27 7.23 7.23 7.26 7.42 7.23 7.26 7.20 7.20 7.22 7.23 7.22 7.23 7.24 7.25 7.25 7.26 7.41 7.27 7.21 7.22 7.23 7.26 7.20 7.25 7.26 7.20 7.21 7.21 7.21 7.21 7.21 7.21 7.21 7.72 7.72 7.72 7.72 7.72 7.76 7.24 	 8.75 9.33 9.33 9.33 9.33 9.45 9.73 4.5 5.7 8.46 4.45 9.73 4.5 5.7 8.46 4.45 9.73 4.5 5.7 9.73 4.5 5.7 9.73 1.00 5.35 5.1 3.09 8.61 7.82 3.09 8.61 7.82 3.09 8.61 7.82 3.09 8.61 7.82 	 74.9 191 197 197 	Not recorded	Not recorded	DRY
SW5 SW5 SW5 SW5 SW5 SW5 SW6	1-Apr-20 11-Aug-20 11-Aug-20 11-Aug-21 11-Aug-21 11-Aug-21 11-Aug-21 12-Sep-22 11-Aug-20 11-Aug-20 11-Aug-20 11-Aug-20 11-Aug-20 12-Sep-22 13-Dec-22 29-Jan-20 2-Apr-20 12-Aug-20 12-Aug-20 13-Jal-21 13-Jal-22 23-Jan-20 23	Not recorded 9:06 10:20 12:50 12:50 Not recorded 12:58 10:10 10:20 Not recorded 12:58 10:10 10:51 10:51 10:51 10:51 10:51 10:51 10:52 9:04 10:52 9:04 10:52 9:04 10:52 9:04 10:52 9:04 10:52 9:04 10:52 10:55 10	 100 50 100 100 	11.2 11.95 11.6 8.7 8.7 8.3 8.3 9.08 11.8 17.6 23.1 18.1 12.5 23.4 18.4 11.5 7.38 9.9 23.6 18 9.1 22.6 18 9.1 23.6 18 9.1 23.6 18 9.1 23.6 18 9.1 23.6 18 9.1 23.6 18 9.1 23.6 18 9.1 23.6 23.6 23.6 23.6 23.6 23.6 24 25.0 25.0 25.0 25.0 25.0 25.0 25.0 25.0	 117.9 117.9 127.1 251.3 132 -	 6.85 6.45 	 8.75 9.33 9.33 9.33 9.43 9.61 9.73 4.5 5.7 8.46 4.45 8.46 4.45 8.46 5.27 8.46 5.35 1.80 6.20 5.1 5.1 5.2 1.68 6.29 5.2 5.1 5.2 	 74.9 191 391 397 197 197 	Not recorded	Not recorded	DRY
SW5 SW5 SW5 SW5 SW5 SW6	1-Apr-20 11-Aug-20 11-Aug-20 11-Aug-21 11-Aug-21 11-Aug-21 11-Aug-21 12-Sep-22 11-Aug-20 13-Aug-20 1	Not recorded 9:06 10:20 12:50 12:50 Not recorded 12:58 10:19 10:20 Not recorded 11:20 Not recorded 11:25 10:51 14:25 10:51 14:25 10:51 14:25 10:51 14:25 10:51 14:25 10:51 14:25 10:51 14:25 10:51 14:25 10:51 14:25 10:51 14:50 10:51 14:50 10:51 14:50 10:51 14:50 10:51 14:50 10:51 14:50 10:51 14:50 10:51 14:50 10:51 14:50 10:51 14:50 10:51 15:55 15	 100 50 100 100 		 251.2 132 	 	 8.75 9.33 9.33 9.43 9.61 9.61 9.61 9.73 4.5 5.7 8.46 5.57 8.45 5.10 5.10 5.52 5.10 5.10 5.22 5.10 5.22 5.35 5.35 5.35 5.35 5.35 5.35 5.35 5.35 5.35 5.35 5.35 5.35 5.35 5.35 5.35 5.35 	 1	Mot recorded	Not recorded Not r	DRV
SW5 SW5 SW5 SW6	1. Apr. 20 1. Apr. 20 1. Aug. 20 1. Aug. 20 1. Aug. 20 2. Aug. 21 1. Aug. 20 1. Aug. 20 2. Aug. 21 1. Aug. 20 2. Aug. 21 1. Aug. 20 2. Aug. 20 1. Aug. 20 1. Aug. 20 1. Aug. 20 2. Aug. 20 1. Aug	Not recorded 9:06 10:20 12:50 12:50 Not recorded 12:58 10:19 10:20 10:10 10:50 10:51 10:5	 100 50 100 100 		 117.9 187 192 	 	 8.75 9.33 9.33 9.33 9.43 9.61 9.61 9.61 9.61 9.61 9.73 9.73 9.73 9.73 9.73 9.73 	 163.2 173.2 173.		Not recorded Not recorded	DRV
SW5 SW5 SW5 SW5 SW6	1. Apr. 20 1.1. Apr. 20 1.1. Aug. 20 1.1. Aug. 20 1.1. Aug. 20 2.2. Jan. 20 1.3. Apr. 20 2.3. Apr. 20 1.3. Apr. 20 2.3. Apr. 20 3. Apr	Not recorded	 100 50 100 100 50 		 117.9 187 192 192 	 	 	 		Not recorded	DRV
SW5 SW5 SW5 SW5 SW6	1. Apr. 20 1.1 -Aug. 20 1.1 -Aug. 20 1.1 -Aug. 20 2.2 -Jan. 20 1.3 -Jac. 21 1.3 -Jac. 21 1.3 -Jac. 21 2.2 -Jan. 20 1.4 -Apr. 21 1.4 -Apr. 20 1.4 -Apr. 21 1.4 -Apr. 21 1.3 -Jac. 21 2.2 -Jan. 20 2.4 -Jan. 20 2.2 -Jan. 20 2.4 -Jan. 20 2.2 -Jan. 20 2.4 -Jan. 20 2.2 -Jan. 20 2.4 -Jan. 20 2.2 -Jan. 20 2.4	Not recorded 9:06 10:20 12:50 Not recorded 12:58 10:19 10:10 10:51 10:51 10:51 11:30 10:51 11:30 10:51 14:25 9:04 11:30 10:51 14:25 9:04 11:30 10:51 14:25 9:04 11:30 10:51 14:25 9:04 11:30 10:51 14:25 10:24 11:30 10:51 14:25 10:24 11:30 10:51 14:25 10:24 11:30 10:51 11:30 10:51 11:30 10:51 11:30 10:51 11:30 10:51 11:30 10:51 11:30 10:51 11:30 10:51 11:30 10:51 11:30 10:51 11:30 10:51 11:30 10:51 11:30 10:51 11:30 10:51 11:30 10:51 11:30 10:51 11:30 10:51 11:30 10:51 11:30 10:52 10:25 1	 100 50 100 100 50 50 50 10 100 100 100 100 100 100		 251.2 187 192 	 	 8.75 9.33 9.33 9.33 9.43 9.41 9.41 9.41 9.41 9.43 9.73 9.73 9.74 9.73 9.74 9.74 9.74 9.74 9.75 9.75 9.74 9.75 9.75 9.76 9.78 9.78 9.78 9.78 9.78 9.78 9.78 9.78 9.78 9.78 9.78 9.79 9.78 9.78 9.78 9.78 9.78 9.78 9.78 	 () (() (() (() () (()		Not recorded Not recorded	DRV
SW5 SW5 SW5 SW5 SW6	1. Apr. 20 1.1 - Aug. 21 1.3 - Mc - 20 2.2 - Jan - 20 1.4 - Apr. 21 1.3 - Mc - 20 2.2 - Jan - 20 1.4 - Apr. 21 1.3 - Mc - 20 2.2 - Jan -	Not recorded 9:06 12:50 Not recorded 12:58 12:58 10:19 10:51 10:55 10:52 10:51 10:51 10:55 10:52 10:51 10:55 10:52 10:5	 100 50 100 100 50 50 50 10 10 10 50 50 10 10 10 10 10 10 10 10 10 1		 117.9 187 251.2 	 	 	 		Not recorded Not recorded	DRV
SW5 SW5 SW5 SW5 SW5 SW5 SW6	۱. Apr. 20 1.1 - Aug. 21 1.2 - Bar. 20 1.3 - Jul. 21 1.3 - Sep. 22 1.3 - Apr. 20 1.4 - Apr. 21 1.3 - Cat. 20 2.8 - Jan. 20 1.3 - Cat. 20 2.8 - Jan. 20 1.3 - Cat. 20 2.8 - Jan. 21 1.4 - Apr. 21 1.3 - Jul. 21 2.8 - Jan. 20 2.8 - Jan. 21 1.4 - Apr. 21 1.3 - Jul. 21 2.8 - Jan. 20 2.8 - Jan. 21 1.4 - Apr. 21 1.3 - Jal. 21 1.3 - Jal. 21 1.4 - Apr. 21 </td <td> Not recorded 9:06 12:59 Not recorded 12:50 12:58 12:58 10:19 10:51 10:5</td> <td> 100 100 -</td> <td> 11.2 11.2 11.9 11.9 11.9 11.9 11.9 11.9 11.9 1.</td> <td> 117.9 137.7 231.2 132 132 </td> <td> 6.85 6.45 </td> <td> 7.94 4.06 9.33 9.33 9.33 9.53 9.54 9.73 9.74 9.73 9.74 9.74 9.74 9.73 9.74 9.74 9.73 9.74 9.74 9.74 9.74 9.74 9.74 9.74 9.74 9.74 9.74 9.74 9.74 9.74 9.74 9.74 9.74 9.74 9.74 </td> <td> </td> <td></td> <td>Not recorded Not r</td> <td>Dev Dev Dev Dev Dev Dev Dev Dev Dev Dev</td>	Not recorded 9:06 12:59 Not recorded 12:50 12:58 12:58 10:19 10:51 10:5	 100 100 -	11.2 11.2 11.9 11.9 11.9 11.9 11.9 11.9 11.9 1.	 117.9 137.7 231.2 132 132 	 6.85 6.45 	 7.94 4.06 9.33 9.33 9.33 9.53 9.54 9.73 9.74 9.73 9.74 9.74 9.74 9.73 9.74 9.74 9.73 9.74 9.74 9.74 9.74 9.74 9.74 9.74 9.74 9.74 9.74 9.74 9.74 9.74 9.74 9.74 9.74 9.74 9.74 	 		Not recorded Not r	Dev
SW5 SW5 SW5 SW5 SW5 SW6	1.4pr20 11.4ug20 11.4ug20 12.4ug21 13.4ug21 13.4ug21 13.4ug21 13.4ug21 13.4ug21 13.4ug21 13.4ug21 13.4ug20 11.4ug20 11.4ug20 11.4ug20 13.4ug20 14.4ug20 13.4ug20 14.4ug20 14.4ug20 14.4ug20 14.4ug20 14.4ug2	Not recorded 9:06 12:59 Not recorded 12:50 12:58 12:58 10:19 10:51 10:5	 100 50 100 100 100 50 	11.2 11.2 11.9 11.9 6.7 1.1.6 6.7 1 6.3 6.3 6.3 1.1.8 1 1.2 2.2 1 1.8 1 1.2 2.2 1 1.8 1 1.5 7 2.3 8 7 2.2 1 1.8 1 1.5 7 2.3 8 7 2.2 1 1 1 1 1 2 2 1 1 1 1 2 2 1 1 1 1 2 2 1 1 1 1 2 2 1 1 1 1 2 2 1 1 1 1 1 2 2 1	 117.9 137. 251.2 132 132 	 6.85 6.45 	 7.94 4.06 8.75 9.33 9.33 9.33 9.33 9.33 9.74 9.74 9.74 9.74 9.74 9.74 9.74 9.74 9.74 9.74 9.74 9.74 9.74 	 		Not recorded Not r	DRY
SW5 SW5 SW5 SW5 SW5 SW5 SW6	1.4pr.20 1.1-Apr.20 1.1-Aug.20 1.1-Aug.20 1.1-Aug.20 1.1-Agr.21 1.3-Abr.21 1.3-Abr.20 2.2-3ar.20 1.4-Apr.21 1.3-Abr.21 1.3-Abr.21 1.3-Abr.21 1.3-Abr.21 1.3-Abr.21 1.3-Abr.21 1.3-Abr.20 2.3-Apr.20 2.3-Apr.20 2.3-Apr.20 2.3-Apr.20 2.3-Apr.20 2.3-Apr.20 2.3-Apr.20 2.3-Apr.20 2.3-Apr.20 2.3-Apr.20 2.3-Apr.20 2.3-Apr.20 2.3-Apr.20 2.3-Apr.20 1.3-Abr.21 1.3-Abr.	Not recorded 9:06 10:20 12:50 12:55 10:20 10:10 10:10 10:51 10:52	 100 100 -	11.2 11.2 11.9 11.9 6.7 11.6 7 6.3 6.7 6.3 6.3 6.3 6.3 6.3 7 6.3 7	 117.9 137.7 251.2 142.7 142.7 160.3 100.7 100	 6.85 6.45 	 8.75 9.33 9.33 9.33 9.33 9.33 9.33 9.33 9.33 9.33 9.53 5.22 5.10 5.22 5.10 5.22 5.10 5.22 5.23 	 145.2 145.2 145.2 145.2 147 147 147 147 147 147 147 147		Not recorded Not R	DRY
SW5 SW5 SW5 SW5 SW5 SW5 SW6	1.4pr.20 1.1-Apr.20 1.1-Aug.20 1.1-Aug.20 1.1-Aug.20 1.1-Aug.21 1.3-bit 2.1 1.3-bit 2.1 1.3-bit 2.1 1.3-bit 2.2 1.3-bit 2.2 1.3-bit 2.2 1.1-Agr.20 1.1-Agr.20 1.1-Agr.20 1.1-Agr.21 1.3-bit 2.2 1.3-bit 2.2 1.3-	Not recorded 9:06 10:20 12:50 12:50 12:50 10:20 10:20 10:20 10:20 10:20 10:20 10:21 10:20 10:21 10:20 10:21 10:20 10:21 10:20 10:21 10:20 10:21 10:20 10:21 10:20 10:21 10:20 10:21 10:20 10:2	 100 100 100 		 117.9 117.9 251.3 122 132 1122 132 132 133 130 120 	 6.85 6.45 	 2.7.94 4.06 9.73 9.33 9.33 9.43 9.45 9.73 9.74 	 14. 14. 14. 14. 14. 14.		Not recorded Not r	DRY
SW5 SW5 SW5 SW5 SW5 SW5 SW6	۱. Apr. 20 1.1 - Aug. 20 1.1 - Apr. 20 1.1 - Apr. 20 1.1 - Apr. 20 2.2 - Jan. 20 1.3 - Jul. 21 1.3 - Jul. 21 </td <td> Not reconded 9:06 10:20 12:50 12:50 12:58 10:10 10:20 10:20 10:50 10:50 10:51 10:5</td> <td> 100 100 -</td> <td></td> <td> 117.9 117.9 251.3 132 132 132 132 132 132 132 13</td> <td> </td> <td> </td> <td> 14.3.2 14.3.2 14.3.3 14.3 14.3 14.7 147 147 147 147 147 147 147 14</td> <td></td> <td>Not recorded Not recorded</td> <td>DRY DRY DRY DRY DRY DRY DRY DRY DRY DRY</td>	Not reconded 9:06 10:20 12:50 12:50 12:58 10:10 10:20 10:20 10:50 10:50 10:51 10:5	 100 100 -		 117.9 117.9 251.3 132 132 132 132 132 132 132 13	 	 	 14.3.2 14.3.2 14.3.3 14.3 14.3 14.7 147 147 147 147 147 147 147 14		Not recorded Not recorded	DRY
SW5 SW5 SW5 SW5 SW5 SW6	۱. Apr. 20 1. J. Aug. 20 1. J. Oce. 20 2. J. J. Oce. 20 2. J. J. Col. 20 2. J. Aug. 20 1. J Ge. 20 2 Aug. 20 2 Aug. 20 </td <td> Not recorded 9:06 10:20 12:50 12:50 12:58 10:10 10:20 10:20 10:20 10:20 10:51 10:20 10:51 10:51 10:51 10:51 10:51 10:51 10:51 10:51 10:51 10:51 10:51 10:51 10:51 10:51 10:51 10:50 10:51 10:50 10:5</td> <td> 100 100 100 </td> <td></td> <td> 117.9 117.9 137.7 132 132 132 132 132 132 133 136.3 137 138.6 138 139 139 139 139 139 139 139 139</td> <td> </td> <td> </td> <td> 14</td> <td></td> <td>Not recorded Not r</td> <td>DRY DRY DRY DRY DRY DRY DRY DRY DRY DRY</td>	Not recorded 9:06 10:20 12:50 12:50 12:58 10:10 10:20 10:20 10:20 10:20 10:51 10:20 10:51 10:51 10:51 10:51 10:51 10:51 10:51 10:51 10:51 10:51 10:51 10:51 10:51 10:51 10:51 10:50 10:51 10:50 10:5	 100 100 100 		 117.9 117.9 137.7 132 132 132 132 132 132 133 136.3 137 138.6 138 139 139 139 139 139 139 139 139	 	 	 14		Not recorded Not r	DRY
SW5 SW5 SW5 SW5 SW5 SW5 SW6	۱. Apr. 20 1. J. Aug. 21 1. J. J. J. 21 1. J. J. 22 1. J. Apr. 20 1. J. Ore. 20 2. J. Apr. 20 2. Apr. 20 2. J. Apr. 20 <td> Not reconded 9:06 10:20 12:50 12:50 12:58 10:10 10:20 10:20 10:20 10:51 10:5</td> <td> 100 100 100 </td> <td></td> <td> 117.9 117.9 132 132 132 132 132 132 132 132</td> <td> </td> <td> </td> <td> 14</td> <td></td> <td>Not recorded Not r</td> <td>DRY DRY DRY DRY DRY DRY DRY DRY DRY DRY</td>	Not reconded 9:06 10:20 12:50 12:50 12:58 10:10 10:20 10:20 10:20 10:51 10:5	 100 100 100 		 117.9 117.9 132 132 132 132 132 132 132 132	 	 	 14		Not recorded Not r	DRY

 SW10
 12-108-22

 Notes
 ...

 L = litre
 ...

 ppm = parts per million
 ...

 µdicm-1 = microSimmens per centimetre
 ...

 n/s = mill Volta
 ...

				Eample Type		Curfe ee Weter	Curfe ee Weber	Curfe en Weben	Curfe ee Weter	Curfe ee Weter	Curfe ee Weter	Curfe on Weber	Curfe ee Weter	Curface Water	
					Sample Type:		Surface water	Surface water	Surrace water	Surface water	Surrace Water				
	_						- 20 1 20	520-Ap12286	520-Au23115	520-0025141	521-Ja34960	521-Ap22552	N21-JI30451	522-5600368	N22-De0031035
	-				Sample dat	e:	29-Jan-20	1-Apr-20	11-Aug-20	13-Oct-20	28-Jan-21	14-Apr-21	13-Jul-21	12-Sep-22	13-Dec-22
	-			Sa	Sample ID:		SW1	SW1	SW1	SW1	<u>5W1</u>	SW1	SW1	SW1	SW1
					Project Name:	Tarago Sw	Tarago SW	Tarago SW	Tarago Sw	Tarago SW	Tarago SW	Tarago SW	Tarago SW Monitoring	Tarago SW Monitoring	
	-				Project No: Sample Location		Monitoring 318000780	318001376	318001376-001						
							Tarago Rail Loop	Tarago Rail Loop	Tarago Rail Loon	Tarago Bail Loop	Tarago Rail Loon	Tarago Rail Loon	Tarago Rail Loop	Tarago Bail Corridor	Tarago Bail Corridor
		City Conselfie	the state to see all	Ecological				Grah Sample	Grah Sample	Grab Sample	Grah Sample	Grah Sample	Grah Sample	Grab Sample	Grab Sample
	Site Specific	Site Specific	Health-based	Sceening Criteria	Sumpring P	ctiloui		Clear to brown		Grub Sumple	Grab Sample	orab Sumple	Grab Sample	Clear, colourless, very	Grub Sumple
	Human Health	Ecology Criteria	Screening Criteria	(ANZG 95%				low/po_turbidity						minor suspended solids	
	Critoria	(Southern	(Recreational	Protection) Fresh				iow/no curbialcy,						na adaur. Boods up	
	Citteria	Culvert) ^a	Waters) ^b					minor suspendia				Clear, no odour,		no ouour. Reeus up	
			-	Water				solids. No odour.		Water flowing.	Clear, no	some suspended	Clear, colourless, no	stream, minor vegetation	Clear, colourless, no
									Brown, slightly	turbid.	observable	solids. Shallow	odour. Reeds up	on the surface and within	odour. Reeds up stream.
Guidelines					Sample Des	cription:	DRY		turbid, continuous	vollow/brown_water	contamination	campled at	stroam Sampled at	the waterbody. Sampled	Sampled at culvert
									flow.	yellow/brown, water	contanination,	sampled at	scream. Sampled ac	at culvert entrance,	Sampled at curvert
										level shallow.	amongst reeus	upstream end of	cuivert entrance.	unable to completely	entrance.
												culvert		submerge sample	
														container 10cm below	
														water surface	
						1								water surface.	
Analyte grouping/Analyte					Units	LOR									
Total Metals															
Aluminium	-	NA	2 ^d	NA	mg/L	0.05	-	0.13	0.88	0.61	< 0.05	< 0.05	< 0.05	0.17	< 0.05
Arsenic	7	NA	NA	NA	ma/L	0.001	-	0.004	< 0.001	0.004	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Barium	-	NA	20	NA	ma/L	0.001	-	0.15	0.04	0.36	0.12	0.08	0.07	0.06	0.07
Beryllium	-	NA	0.6	NA	mg/L	0.001	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Cadmium	1.4	NA	NA	NA	mg/L	0.0002	-	0.0013	< 0.0002	0.0021	0.0005	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Chromium	-	NA	0.5	NA	mg/L	0.001	-	< 0.001	0.002	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Cobalt	-	NA	-	NA	mg/L	0.001	-	0.014	< 0.001	0.007	0.002	< 0.001	< 0.001	< 0.001	< 0.001
Copper	-	NA	20	NA	mg/L	0.001	-	0.019	0.003	0.014	0.005	0.001	0.002	0.002	0.001
Iron	-	NA	3	NA	mg/L	0.05	-	4.5	0.91	1.41	1.1	0.07	0.18	0.94	0.23
Lead	7	NA	NA	NA	mg/L	0.001	-	0.056	0.001	0.032	0.007	< 0.001	0.002	0.005	< 0.001
Manganese	350	NA	NA	NA	mg/L	0.005	-	0.76	0.024	0.706	0.28	0.032	0.036	0.093	0.026
Mercury	-	NA	0.01	NA	mg/L	0.0001	-	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	0.0001	< 0.0001
Nickel	14	NA	NA	NA	mg/L	0.001	-	0.003	0.002	0.002	< 0.001	< 0.001	< 0.001	< 0.001	0.001
Zinc	-	NA	30	NA	mg/L	0.005	-	0.2	0.02	0.32	0.086	0.009	0.025	0.026	0.019
Dissolved Metals															
Dissolved Aluminium	NA	5	NA	NA	mg/L	0.05	-	-	0.54	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Dissolved Arsenic	NA	0.5	NA	NA	mg/L	0.001	-	-	< 0.001	< 0.001	0.003	< 0.001	< 0.001	<0.001	< 0.001
Dissolved Barium	NA	-	NA	-	mg/L	0.001	-	-	0.04	0.11	0.12	0.08	0.06	0.05	0.06
Dissolved Beryllium	NA	-	NA	-	mg/L	0.001	-	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Dissolved Cadmium	NA	0.01	NA	NA	mg/L	0.0002	-	-	0.0003	0.0005	0.0002	< 0.0002	< 0.0002	<0.0002	< 0.0002
Dissolved Chromium	NA	NA	NA	0.0025	mg/L	0.001	-	-	0.001	< 0.001	< 0.001	< 0.001	< 0.001	<0.001	< 0.001
Dissolved Cobalt	NA	NA	NA	0.0014	mg/L	0.001	-	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	<0.001	< 0.001
Dissolved Copper	NA	0.5	NA	NA	mg/L	0.001	-	-	0.003	0.002	0.005	< 0.001	0.001	< 0.001	< 0.001
Dissolved Iron	NA	-	NA	-	mg/L	0.05	-	-	0.34	< 0.05	0.13	< 0.05	0.14	0.16	0.1
Dissolved Lead	NA	0.1	NA	NA	mg/L	0.001	-	-	0.004	< 0.001	< 0.001	< 0.001	0.001	< 0.001	< 0.001
Dissolved Manganese	NA	NA	NA	1.9	mg/L	0.005	-	-	0.018	0.044	0.12	0.029	0.035	0.048	0.024
Dissolved Mercury	NA	NA	NA	0.00006	mg/L	0.0001	-	-	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Dissolved Nickel	NA	1	NA	-	mg/L	0.001	-	-	0.002	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Dissolved Zinc	NA	20	NA	-	mg/L	0.005	-	-	0.045	0.073	0.058	0.005	0.025	0.02	0.016
			1												

- indicates no criterion available NA indicates non-applicable LOR = Limit of Reporting Concentrations below the LOR noted as <value NOC = No observed contamination
 Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG Australia and New Zealand Environment and Conservation Council (2000) Australian and New Zealand Guidelines for Fresh and Marine Water Quality.
 ANZECC, NEPM and NHMRC guidelines for mercury are based on total mercury.
 ^aEnRiskS (2020) Advice on risks to human health and the environment: Boyd Street and publicly accessible areas, Tarago NSW
 ^bRecreational criteria adopted are 10 × Australian Drinking Water Gudielines ADWG (2011)
 ^cANZG (2018) Australian and New Zealand Guidelines for Fresh and Marine Water Quality.
 ^dThe recreational criteria for aluminium is based on aesthtic issues post flocculation and is not indicative of risks to human health. Concentrations in blue bold font exceed human health recreational screening or site specific criteria Concentrations in grey box exceed ecological screening or site specific criteria


					Sample Typ	۵.	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
					Lah ID	c.	S19-Au17273	S19-Se37061	-	S20-An12287	S20-Au23116	S20-0c25321	S21-1a34959	S21-An22331	N21-1130450	S22-Se00368	N22-De0031034
					Sample date	9:	13-Aug-19	24-Sep-19	29-Jan-20	1-Apr-20	11-Aug-20	13-Oct-20	28-Jan-21	14-Apr-21	13-Jul-21	12-Sep-22	13-Dec-22
					Sample ID:		SW1-UP	SW1-UP	SW1_UP	SW1-UP	SW1_UP	SW1_UP	SW1_UP	SW1_UP	SW1_UP	SW1_UP	SW1_UP
					Project Nan	ne:	Tarago SW	Tarago SW	Tarago SW	Tarago SW	Tarago SW	Tarago SW	Tarago SW	Tarago SW	Tarago SW	Tarago SW Monitoring	Tarago SW Monitoring
	_			Ecological	Ducie et Nov	-	Monitoring	Monitoring	Monitoring	Monitoring	Monitoring	Monitoring	Monitoring	Monitoring	Monitoring	210001276	218001276 001
	Site Specific	Site Specific	Health-based	Sceening Criteria	Project No:		318000780	318000780	318000780	318000780	318000780	318000780	318000780	318000780	318000781	J18001376	318001376-001
	Human Health	(Southern	(Recreational	(ANZG 95%	Sample Loc	ation	Tarago Rali Loop	Tarago Rail Loop	Tarago kali Loop	Tarago kali Loop	Tarago Rail Loop	Tarago kali Loop	Tarago Rail Loop	Tarago Rail Loop	тагадо кан Loop	Tarago Rall Corridor	Tarago Rail Corridor
	Criteria®	Culvert) ^a	Waters) ^b	Water ^c	Sampling M	ethod:	Grab Sample	Grab Sample	-	Grab Sample	Grab Sample	Grab Sample	Grab Sample	Grab Sample	Grab Sample	Grab Sample	Grab Sample
Guidelines					Sample Des	cription:	Not recorded.	Clear/slightly brown.	DRY	Clear. No turbidity. No odour.	Clear to slightly brown. Flowing.	Water clear/brown, flowing.	Clear, low-no odour, no observable contamination	Clear, no odour. Fence panel stack at downstream end. Flowing	Clear, colourless, no odour. Reeds growing adjacent to pond. Flowing.	Clear, colourless, very minor suspended solids no odour. Reeds growing adjacent to pond. Flowing.	Clear, colourless, very minor suspended solids no odour. Reeds growing adjacent to pond. Flowing.
Analyte grouping/Analyte					Units	LOR											
Inorganics									l	l							
Ammonia (as N)	-	L -	0.5	0.9	ma/l	0.01	0.01	< 0.01	-	-	-	-	-	-	-	-	
Conductivity (at 25@°C)	-	-	-	-	uS/cm	100	820	730	-	-	-	-	-	-	-	-	-
Nitrate & Nitrite (as N)	-	-	-	-	mg/L	0.05	< 0.05	< 0.05	-	-	-	-	-	-	-	-	
Nitrate (as N)	-	-	50	3.5	mg/L	0.02	< 0.02	< 0.02	-	-	-	-	-	-	-	-	-
Nitrite (as N)	-	-	30	-	mg/L	0.02	< 0.02	< 0.02	-	-	-	-	-	-	-	-	-
pri (di 25@°C) Phosphate total (as P)	-	-		-	pH units	0.1	/.9	/.6	-	-	-	-	-	-	-	-	
Total Dissolved Solids Dried at 180°C ± 2°C	-	-	-	-	ma/L	0.005	0.05	0.05	-	-	-	+ -	-	-	-	-	+ -
Total Kjeldahl Nitrogen (as N)	-	-	0.8	-	mg/L	0.2	<0.2	<0.2	-	-	-	-	-	-	-	-	-
Total Nitrogen (as N)	-	-	-	-	mg/L	0.2	<0.2	<0.2	-	-	-	-	-	-	-	-	-
Total Suspended Solids Dried at 105°C	-	-	-	0.7	mg/L	0.005	<0.005	5.6	-	-	-	-	-	-	-	-	
Turbidity	-	-	-	-	NTU	1	1	1.3	-	-	-	-	-	-	-	-	
Total Metals						1			l								
Aluminium	-	NA	2 ^d	NA	ma/l	0.05	-	-	-	< 0.05	0.85	< 0.05	< 0.05	< 0.05	< 0.05	<0.05	< 0.05
Arsenic	7	NA	NA	NA	mg/L	0.001	-	-	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Barium	-	NA	20	NA	mg/L	0.001	-	-	-	0.1	0.05	0.1	0.11	0.08	0.07	0.05	0.06
Beryllium	-	NA	0.6	NA	mg/L	0.001	-	-	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Cadmium	1.4	NA	NA	NA	mg/L	0.0002	-	-	-	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Chromium	-	NA	0.5	NA	mg/L	0.001	-	-	-	< 0.001	0.002	< 0.001	< 0.001	< 0.001	< 0.001	<0.001	< 0.001
Copper	-	NA	20	NA	mg/L	0.001	-	-	-	< 0.001	0.001	< 0.001	< 0.001	< 0.001	< 0.001	<0.001	0.001
Iron	-	NA	3	NA	mg/L	0.05	-	-	-	0.26	0.93	0.12	0.19	0.07	0.06	0.07	0.12
Lead	7	NA	NA	NA	mg/L	0.001	-	< 0.001	-	< 0.001	< 0.001	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Manganese	350	NA	NA	NA	mg/L	0.005	-	-	-	0.044	0.026	0.022	0.054	0.037	0.009	0.01	0.024
Mercury	-	NA	0.01	NA	mg/L	0.0001	-	-	-	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	0.0001	< 0.0001
Nickel	14	NA	NA	NA	mg/L	0.001	-	-	-	< 0.001	0.002	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.001
ZINC	-	NA	30	NA	mg/L	0.005	-	-	-	0.011	0.011	0.009	< 0.005	0.005	< 0.005	<0.005	< 0.005
Dissolved Metals																	
Dissolved Aluminium	NA	5	NA	NA	ma/l	0.05	< 0.05	< 0.05	-	-	0.45	< 0.05	< 0.05	< 0.05	< 0.05	<0.05	< 0.05
Dissolved Arsenic	NA	0.5	NA	NA	mg/L	0.001	< 0.001	0.001	-	-	< 0.001	< 0.001	0.003	< 0.001	< 0.001	< 0.001	< 0.001
Dissolved Barium	NA	-	NA	-	mg/L	0.001	0.1	0.1	-	-	0.04	0.1	0.12	0.08	0.05	0.05	0.07
Dissolved Beryllium	NA	-	NA	-	mg/L	0.001	< 0.001	< 0.001	-	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Dissolved Cadmium	NA	0.01	NA	NA	mg/L	0.0002	< 0.0002	<0.0002	-	-	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Dissolved Chromium	NA	NA NA	NA NA	0.0025	mg/L	0.001	< 0.001	0.001	-	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	<0.001	< 0.001
Dissolved Copper	NA	0.5	NA	0.0014 NA	mg/L	0.001	< 0.001	<0.001	-	-	0.001	< 0.001	0.001	< 0.001	< 0.001	<0.001	< 0.001
Dissolved Iron	NA	-	NA	-	mg/L	0.05	< 0.05	< 0.05	-	-	0.3	< 0.05	< 0.05	< 0.05	< 0.05	<0.05	0.07
Dissolved Lead	NA	0.1	NA	NA	mg/L	0.001	< 0.001	0.001	-	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Dissolved Manganese	NA	NA	NA	1.9	mg/L	0.005	< 0.005	0.005	-	-	0.02	0.022	0.056	0.034	0.007	0.009	0.027
Dissolved Mercury	NA	NA	NA	0.00006	mg/L	0.0001	< 0.0001	< 0.0001	-	-	<0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	<0.0001	< 0.0001
Dissolved Nickel	NA	1	NA	-	mg/L	0.001	< 0.001	< 0.001	-	-	0.002	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Dissolved Zinc	NA	20	NA	-	mg/L	0.005	< 0.005	0.005	-	-	0.008	< 0.005	< 0.005	< 0.005	< 0.005	<0.005	< 0.005
Total Recoverable Hydrocarbons - 2013 NEP	M Fractions						11		1	1				L	L	I	·
Naphthalene	-	-	17	16	µg/L	10	<10	<10	-	-	-	-	-	-	-	-	-
TRH >C10-C16	-	-	-	-	µg/L	50	<50	<50	-	-	-	-	-	-	-	-	
TRH >C10-C16 less Naphthalene (F2)	-	-	-	-	µg/L	50	<50	<50	-	-	-	-	-	-	-	-	-
TRH >C10-C40 (total)*	-	-	-	-	µg/L	100	<100	<100	-	-	-	-	-	-	-	-	
IKH >C10-C34	-	-	-	-	µg/L	100	<100	<100	-	-	-	-	-	-	-	-	
TRH C6-C10	-	-	-	-	μg/L μα/Ι	20	<200	<20			-	-	-	-	-	-	+ -
TRH C6-C10 less BTEX (F1)	-	-	-	-	µg/L	20	<20	<20	-	-	-	-	-			-	-
BTEX		1	10	050		1 .	11 .1	1 .1			1					1	
Dell2elle Ethylbenzene		-	10	950	µg/L	1	<1	<1	-	-	-						-
m&p-Xylenes	-	-		-	μα/L	2	<1	<2	-	-	-	+ -				-	-
o-Xylene	-	-	-	-	µg/L	1	<1	<2	-	-	-	-	-	-	-	-	-
Toluene	-	-	8000	180	µg/L	1	<1	<2		-	-	-	-		<u> </u>		
Xylenes - Total	-	-	6000	200	µg/L	3	<3	<3	-	-	-	-	-	-	-	-	-

- indicates no criterion available
 NA indicates non-applicable
 LOR = Limit of Reporting
 Concentrations below the LOR noted as <value
 NOC = No observed contamination
 Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG 2018)
 Australian and New Zealand Environment and Conservation Council (2000) Australian and New Zealand Guidelines for Fresh and Marine Water Quality.
 ANZECC, NEPM and NHMRC guidelines for mercury are based on total mercury.
 ^aEnRiskS (2020) Advice on risks to human health and the environment: Boyd Street and publicly accessible areas, Tarago NSW
 ^bRecreational criteria adopted are 10 x Australian Drinking Water Guidelines ADWG (2011)
 ^cANZG (2018) Australian and New Zealand Guidelines for Fresh and Marine Water Guidelines ADWG (2011)
 ^cANZG (2018) Australian and New Zealand Guidelines for Fresh and Marine Water Guidelines ADWG (2011)
 ^cConcentrations in blue bold font exceed human health recreational screening or site specific criteria
 Concentrations in grey box exceed ecological screening or site specific criteria

Client: TfNSW Job No: 3180001376 Project Name: December 2022 Surface Water Monitoring Report 12-01-23



						1.1						1	1				
					Sample Type:	Surfa	ace Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
					Lab ID	S19	-Se37062	-	S20-Ap12288	S20-My01341	S20-Au23117	S20-Oc25143	S21-Ja34961	S21-Ap22333	N21-JI30452	S22-Se00368	N22-De0031036
					Sample date:	24	-Sep-19	29-Jan-20	1-Apr-20	30-Apr-20	11-Aug-20	13-Oct-20	28-Jan-21	14-Apr-21	13-Jul-21	12-Sep-22	13-Dec-22
					Sample ID:		SW2	SW2	SW2	SW2	SW2	SW2	SW2	SW2	SW2	SW2	SW2
					Project Name	Tarago G	W Monitoring	Tarago SW Monitoring	Tarago SW Monitoring	Tarago SW Monitoring	Tarago SW Monitoring	Tarago SW Monitoring	Tarago SW Monitoring	Tarago SW Monitoring	Tarago SW Monitoring	Tarago SW Monitoring	Tarago SW Monitoring
					Froject Name.	Tatago a	w Monitoring	Tarago SW Monitoring	Talago Sw Homeoring	Talago SW Monitoring	Tarago SW Horittoring	Tarago SW Monitoring	Tarago Sw Monitoring	rarage SW Homeoring	Tarago SW Homeoning	Tarago SW Homeoning	Tarago SW Monitoring
				[Project No:	318	3000780	318000780	318000780	318000780	318000780	318000780	318000780	318000780	318000781	318001376	318001376-001
		Site Specific	Health-based	Ecological	Sample Location	Tarag	o Rail Loop	Tarago Bail Loop	Tarago Rail Loop	Tarago Rail Loop	Tarago Rail Loop	Tarago Rail Loop	Tarago Rail Loop	Tarago Rail Loop	Tarago Rail Loop	Tarago Bail Corridor	Tarrago Bail Corridor
	Site Specific	Ecology Criteria	Screening Criteria	Sceening Criteria	bumpie zoeution			Tarago Ran 200p	·	· 3 - ·			·	Turugo Run 200p	Tarago Ran 200p	rarage han corridor	ranago nan corridor
	Human Health	(Southern	(Recreational	(ANZG 95%	Sampling Methor	l: Gral	h Sample	-	Grab Sample	Grab Sample	Grab Sample	Grab Sample	Grab Sample	Grab Sample	Grab Sample	Grab Sample	Grab Sample
	Criteria ^a	Culvert) ^A	Waters) ^B	Protection) Fresh	oumping recitor		bumpie		orab bampie	Grab Sample	drub bumpie	drub bumpie	Grub Sumple	Grab Bampie	orab bampic	orab bampie	ordo odnipie
		current)	indicity)	Water													
																Clear, colourless, no	Clear, colourless, no odour.
									Brown, low-medium	Collected at Goulburn			Light brown low		Clear colourless no	odour. Sampled at	Sampled at culvert, reeds
Guidelines					Sample Descripti	on: (lear	DRY	turbidity, some	Street footbridge Not	Clear to slightly turbid.	Water clear, flowing,	turbidity no observable	Clear no odour	odour. Sampled at	culvert, minor	and minor vegetation
our de la companya de					oumpie Desempti			Bitti	suspended solids. No	flowing	Flowing.	water level low.	contamination	cical, no odou	culvert	vegeatation and moss on	within waterbody. Small
									odour.	nowing.			contamination		cuivert.	the surface and within	piece of sheet metal at
																the waterbody.	mouth of culvert.
Analyta analysiaa (Analyta					Unite												
Analyte grouping/Analyte					Units	LOR											
Inorganics	1				I							1	1				
Ammonia (as N)		· .	0.5	0.9	ma/l	0.01	0.15	-	-	-	-	-	-	-	-	-	-
Conductivity (at 25@°C)	-		-	-	uS/cm	100	520	-	-	-	-	-	-	-	-	-	-
Nitrate & Nitrite (as N)	-	-	-	-	ma/l	05	0.22	-	-	-	-	-	-	-	-	-	-
Nitrate (as N)	-	-	50	3.5	mg/L	0.02	0.22	-	-	-	-	-	-	-	-	-	-
Nitrite (as N)	-	-	30	-	mg/L	0.02	< 0.02	-	-	-	-	-	-	-	-	-	-
pH (at 25@°C)	-	-	-	-	pH units	0.1	8	-	-	-	-	-	-	-	-	-	-
Phosphate total (as P)	-	-	-	-	mg/L	0.05	< 0.05	-	-	-	-	-	-	-	-	-	-
Total Dissolved Solids Dried at 180°C ± 2°C	-	-	-	-	mg/L C	.005	0.29	-	-	-	-	-	-	-	-	-	-
Total Kjeldahl Nitrogen (as N)	-	-	0.8	-	mg/L	0.2	<0.2	-	-	-	-	-	-	-	-	-	-
Total Nitrogen (as N)	-	-	-	-	mg/L	0.2	0.22	-	-	-	-	-	-	-	-	-	-
Total Suspended Solids Dried at 105°C	-	-	-	0.7	mg/L C	.005 <	0.005	-	-	-	-	-	-	-	-	-	-
Turbidity	-	-	-	-	NTU	1	3	-	-	-	-	-	-	-	-	-	-
Total Metals					r				I	1		I	T	T	Т	Т	ſ
Aluminium	-	NA	2 ^d	NA	mg/L	0.05	-	-	0.08	0.06	0.95	< 0.05	< 0.05	< 0.05	< 0.05	<0.05	< 0.05
Arsenic	7	NA	NA	NA	mg/L C	.001	-	-	0.002	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Barium	-	NA	20	NA	mg/L C	.001	-	-	0.1	0.08	0.05	0.11	0.1	0.08	0.07	0.05	0.06
Beryllium	-	NA	0.6	NA	mg/L C	.001	-	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	<0.001	< 0.001
Cadmium	1.4	NA	NA	NA	mg/L 0	.0002	-	-	0.0019	0.0004	< 0.0002	0.0007	< 0.0002	< 0.0002	< 0.0002	<0.0002	< 0.0002
Chromium	-	NA	0.5	NA	mg/L C	.001		-	0.001	< 0.001	0.002	< 0.001	< 0.001	< 0.001	0.006	<0.001	0.001
Cobait	-	NA	-	NA	mg/L C	.001	-	-	0.004	0.002	< 0.001	< 0.001	0.001	< 0.001	< 0.001	<0.001	< 0.001
Lion	-	NA	20	NA	mg/L C	.001	-	-	0.023	0.006	0.004	0.004	0.004	< 0.001	0.001	<0.001	0.001
Load	- 7	NA	5	NA	mg/L C	0.05	-	-	0.94	0.75	1	< 0.05	0.41	0.14	0.14	0.19	0.24
Manganoso	250	NA	NA	NA	mg/L C	.001 (0.003	-	0.02	0.006	0.003	0.004	0.002	< 0.001	< 0.001	<0.001	0.001
Mercury	330	NA	0.01	NA	mg/L 0	0001	-		< 0.0001	< 0.0001	< 0.0001	< 0.001	< 0.0001	< 0.002	< 0.0001	<0.024	< 0.0001
Nickol	14	NA	NA	NA	mg/L 0	0001			0.0001	< 0.0001	0.002	< 0.0001	< 0.0001	< 0.0001	0.0001	<0.0001	0.0001
Zinc	14	NA	20	NA	mg/L C	005		_	0.002	0.001	0.002	0.001	0.001	0.001	0.001	0.001	0.002
200	-	NA		NA	mg/∟ u	.005		-	0.35	0.16	0.028	0.096	0.033	0.011	0.014	0.006	0.008
Disaster d Matala																	
Dissolved Metals	NIA	-	NIA	NIA		0.05	. 0. 05			1	0.43	1.0.05	1.0.0E	1.0.05	1.0.05	10.05	1 0 0E
Arconic (filtered)	NA	 	NA	NA	mg/L (0.05 <	0.001	-	-	-	0.47	< 0.05	< 0.05	< 0.05	< 0.05	<0.05	< 0.05
Barium (filtered)	NA	0.5	NA	110	mg/L C	001	0.001	-	-	-	< 0.001	0.11	0.004	0.001	0.001	<0.001	0.001
Beryllium (filtered)	NA	-	NA	-	mg/L C	.001	0.07	-			< 0.04	0.11	< 0.001	< 0.08	< 0.00	<0.001	< 0.00
Cadmium (filtered)	ΝA	0.01	NA	 ΝΔ	mg/L 0	0002 0	0014	-	1		< 0.001	0.0007	< 0.001	< 0.001	< 0.001	<0.001	< 0.001
Chromium (filtered)	NA	NA	NA	0.0025	ma/l r	.001 -	0.001	-	-	-	< 0.0002	< 0.0007	< 0.001	< 0.0002	< 0.0002	<0.0002	< 0.0002
Cobalt (filtered)	NA	NA	NA	0.0014	ma/l 0	.001 <	0.001	-	-	-	< 0.001	< 0.001	0.001	< 0.001	< 0.001	<0.001	< 0.001
Copper (filtered)	NA	0.5	NA	NA	mg/L 0	.001 (0.015	-	-	-	0.003	0.003	0.007	< 0.001	< 0.001	<0.001	< 0.001
Iron (filtered)	NA	-	NA	-	mg/L	0.05 <	0.05	-	-	-	0.31	< 0.05	< 0.05	< 0.05	< 0.05	0.08	0.06
Lead (filtered)	NA	0.1	NA	NA	mg/L C	.001 0	0.014	-	-	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Manganese (filtered)	NA	NA	NA	1.9	mg/L C	.005 0	0.014	-	-	-	0.015	0.017	0.22	0.06	0.011	0.028	0.034
Mercury (filtered)	NA	NA	NA	0.00006	mg/L 0	.0001 <	0.0001	-	-	-	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Nickel (filtered)	NA	1	NA	-	ma/l (.001 <	0.001	-	-	-	0.002	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Zinc (filtered)	NA	20	NA	-	mg/L (005	0.2	-	-	-	0.02	0.13	0.028	0.009	0.006	0.021	≤ 0.005
		_0									0.02	0.15	0.020	0.005	0.000	0.021	
Total Recoverable Hydrocarbons - 2013 NEPM	M Fractions				· · · · · ·				•	,				*			·
Naphthalene	-	-	17	16	µg/L	10	<10	-	-	-	-	-	-	-	-	-	-
TRH >C10-C16	-	-	-	-	µg/L	50	<50	-	-	-	-	-	-	-	-	-	-
TRH >C10-C16 less Naphthalene (F2)	-	-	-	-	ug/L	50	<50	-	-	-	-	-	-	-	-	-	-
TRH >C10-C40 (total)*	-	-	-	-	ua/L	100 .	<100	-	-	-	-	-	-	-	-	-	-
TRH >C16-C34	-	-	-	-	µg/L	100	<100	-	-	-	-	-	-	-	-	-	-
TRH >C34-C40	-	-	-		µg/L	100 .	<100	-	-	-	-	-	-	-	-	-	-
TRH C6-C10	-	-	-		µg/L	20	<20	-	-	-	-	-	-	-	-	-	-
TRH C6-C10 less BTEX (F1)	-	-	-	-	µg/L	20	<20	-		-	-	-	-			-	-
BTEX		1		051					T	1	1	I	I	1	1	1	
Benzene	-	-	10	950	µg/L	1	<1	-	-	-	-	-	-	-	-	-	-
cuypenzene	-	-	3000	80	µg/L	1	<2	-	-	-	-	-	-	-	-	-	-
map-xylenes	-	-	-	-	µg/L	2	<2	-	-	-	-	-	-	-	-	-	-
o-xyiene	-	-	-	-	µg/L	1	<2	-	-	-	-	-	-	-	-	-	-
Tuluene Vylanos - Total	-	-	8000	100	µg/L	2	<2	-	-	-		-	-	+ -		-	-
Ayiciica - Totai			0000	200	P9/ L	J	~	+	-	-	-			-			-

- indicates no criterion available NA indicates non-applicable LOR = Limit of Reporting Concentrations below the LOR noted as <value NOC = No observed contamination Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG 2018) Australian and New Zealand Environment and Conservation Council (2000) Australian and New Zealand Guidelines for Fresh and Marine Water Quality. ANZECC, NEPM and NHWRC guidelines for mercury are based on total mercury. [®]EnRisk (2020) Advice on risks to human health and the environment: Boyd Street and publicly accessible areas, Tarago NSW [®]Recreational criteria adopted are 10 x Australian Drinking Water Guidelines ADWG (2011) [^]ANZG (2018) Australian and New Zealand Guidelines for Fresh and Marine Water Quality. [®]The recreational criteria for aluminium is based on aesthtic issues post flocculation and is not indicative of risks to human health. Concentrations in blue bold font exceed human health recreational screening or site specific criteria Concentrations in grey box exceed ecological screening or site specific criteria



Project Name: December 2022 Surface Water Monitoring Report 12-01-23

Image: state in the						Sample Type Lab ID Sample date	e:	Surface Water S19-Se37063	Surface Water	Surface Water S20-Ap12289	Surface Water S20-Au23118	Surface Water S20-Oc25145 13-Oct-20	Surface Water	Surface Water S21-Ap22334	Surface Water N21-JI30453	Surface Water S22-Se00368	Surface Water N22-De0031037
Hart Hart <t< th=""><th></th><th></th><th></th><th></th><th></th><th>Sample ID:</th><th>54</th><th>SW3</th><th>SW3</th><th>SW3</th><th>SW3</th><th>SW3</th><th>SW3</th><th>SW3</th><th>SW3</th><th>SW3</th><th>SW3</th></t<>						Sample ID:	54	SW3	SW3	SW3	SW3	SW3	SW3	SW3	SW3	SW3	SW3
Image: Problem Tarper being and the set of the						Project Nam	ne:	Tarago SW Monitoring	Tarago SW Monitoring	Tarago SW	Tarago SW	Tarago SW	Tarago SW	Tarago SW	Tarago SW	Tarago SW Monitoring	Tarago SW Monitoring
Physical		-				Project No.		219000790	219000790	Monitoring	Monitoring	Monitoring	Monitoring	Monitoring	Monitoring	219001276	219001276-001
Partner <		-	Site Specific		Ecological	Sample Loca	ation	Tarago Rail Loop	Tarago Rail Loop	Tarago Rail Loop	Tarago Rail Loop	Tarago Rail Loop	Tarago Rail Loop	Tarago Rail Loop	Tarago Rail Loop	Tarago Rail Corridor	Tarago Rail Corridor
Image Image <th< td=""><td></td><td>Site Specific</td><td>Ecology Criteria</td><td>Health-based Screening Criteria</td><td>Sceening Criteria (ANZG</td><td>Sampling M</td><td>ethod:</td><td>Grab Sample</td><td>-</td><td>Grab Sample</td><td>Grab Sample</td><td>Grab Sample</td><td>Grab Sample</td><td>Grab Sample</td><td>Grab Sample</td><td>Grab Sample</td><td>Grab Sample</td></th<>		Site Specific	Ecology Criteria	Health-based Screening Criteria	Sceening Criteria (ANZG	Sampling M	ethod:	Grab Sample	-	Grab Sample	Grab Sample	Grab Sample	Grab Sample	Grab Sample	Grab Sample	Grab Sample	Grab Sample
Index outputIndex output<	Guidelines	Criteria ^a	(Middle and Northern Culverts) ^a	(Recreational Waters) ^b	95% Protection) Fresh Water ^c	Sample Des	cription:	Moderate turbidity.	DRY	Brown to yellow, medium turbidity, some brown matter at surface.	Brown to clear.	Water clear/brown to slightly trubid, flowing.	DRY	Pale yellow, no odour	Clear, colourless to pale green/brown, no odour. Algae and reeds growing in drainage line. Not flowing.	Slightly murky, slightly turbid, light brown to brown, some suspended solids, no odour. Algae and reeds growing in drainage line, unable to completely submerge sample container 10cm below water surface. Not flowing.	Clear, colourless to pale yellow/brown. Low flow, staining observed in culvert
Image: Part of the sector o	Analyte grouping/Analyte					Units	LOR										
Simple March Bar And	Inorganics																
chale Mathematic chale Mathematic Non <td>Ammonia (as N)</td> <td>-</td> <td></td> <td>0.5</td> <td>0.9</td> <td>mg/L</td> <td>0.01</td> <td>0.001</td> <td>-</td> <td>-</td> <td></td> <td></td> <td>-</td> <td></td> <td>-</td> <td>-</td> <td>-</td>	Ammonia (as N)	-		0.5	0.9	mg/L	0.01	0.001	-	-			-		-	-	-
Decision of the second	Conductivity (at 25@°C)	-	-	-	-	μS/cm	100	170	-	-	-	-	-	-	-	-	-
Description Image	Nitrate & Nitrite (as N)	-	-	-		mg/L	0.05	3.8	-	-	-	-	-	-	-	-	-
Normal I <td>Nitrate (as N)</td> <td>-</td> <td></td> <td>50</td> <td>3.5</td> <td>mg/L</td> <td>0.02</td> <td>3.7</td> <td>-</td> <td>-</td> <td>-</td> <td>-</td> <td>-</td> <td>-</td> <td>-</td> <td>-</td> <td>-</td>	Nitrate (as N)	-		50	3.5	mg/L	0.02	3.7	-	-	-	-	-	-	-	-	-
Name I	NICTICE (AS N) pH (at 25@%C)	-	-	30	-	mg/L	0.02	<0.02	-	-	-	-	-	-	-	-	-
Schlegender graffer vergen r </td <td>Phosphate total (as P)</td> <td>-</td> <td>-</td> <td>-</td> <td>-</td> <td>ma/l</td> <td>0.05</td> <td>0.06</td> <td>-</td> <td></td> <td>-</td> <td>-</td> <td>-</td> <td>-</td> <td>-</td> <td>-</td> <td></td>	Phosphate total (as P)	-	-	-	-	ma/l	0.05	0.06	-		-	-	-	-	-	-	
Banger barger ba	Total Dissolved Solids Dried at 180°C ± 2°C	-	-	-	-	mg/L	0.005	0.13	-	-	-	-	-	-	-	-	-
Weight Mark Unit Mark 	Total Kjeldahl Nitrogen (as N)	-	-	0.8	-	mg/L	0.2	0.6	-	-	-	-	-	-	-	-	-
	Total Nitrogen (as N)	-	-	-	-	mg/L	0.2	4.4	-	-	-	-	-	-	-	-	-
	Iotal Suspended Solids Dried at 105°C		-	-	0.7	mg/L	0.005	0.0072		-	-			-	-	-	
Contact ·< ·< ·< ·< ·< ·< ·< ·< ·< ·< ·< ·< ·< ·< ·< ·< ·< ·< ·< ·< ·< ·<						NIO	1	57		-	_		_		_	-	
mems mems them	Aluminium	-	NA	2 ^d	NA	ma/l	0.05	-	-	0.92	0.61	0.46	-	0.16	0.3	0.26	0.25
Sinish Constant Con	Arsenic	7	NA	NA	NA	mg/L	0.001	-	-	0.004	< 0.001	0.003	-	0.002	< 0.001	0.002	0.001
Sequence -<	Barium	-	NA	20	NA	mg/L	0.001	-	-	0.1	0.05	0.07	-	0.06	0.04	0.05	0.08
Cardian 1.4 Ma Ma Pack P	Beryllium	-	NA	0.6	NA	mg/L	0.001	-	-	< 0.001	< 0.001	< 0.001	-	< 0.001	< 0.001	<0.001	< 0.001
Change 1 Nu 0.5 Nu nu 0.01 1.00 0.00 0.00 <td>Cadmium</td> <td>1.4</td> <td>NA</td> <td>NA</td> <td>NA</td> <td>mg/L</td> <td>0.0002</td> <td>-</td> <td>-</td> <td>0.021</td> <td>0.0011</td> <td>0.0036</td> <td>-</td> <td>0.0011</td> <td>0.0003</td> <td>0.0016</td> <td>0.0045</td>	Cadmium	1.4	NA	NA	NA	mg/L	0.0002	-	-	0.021	0.0011	0.0036	-	0.0011	0.0003	0.0016	0.0045
Solphi - Sol Sol Sol - - - Sol Sol - Sol Sol - Sol	Chromium	-	NA	0.5	NA	mg/L	0.001	-	-	0.002	0.001	0.001	-	0.001	< 0.001	<0.001	0.002
DefinitionImageNo <td>Copper</td> <td>-</td> <td>NA</td> <td>20</td> <td>NA</td> <td>mg/L</td> <td>0.001</td> <td>-</td> <td>-</td> <td>0.008</td> <td>0.001</td> <td>0.12</td> <td>-</td> <td>0.001</td> <td>0.001</td> <td>0.004</td> <td>0.003</td>	Copper	-	NA	20	NA	mg/L	0.001	-	-	0.008	0.001	0.12	-	0.001	0.001	0.004	0.003
assrsfNM<	Iron	-	NA	3	NA	mg/L	0.05	-	-	1.8	0.6	1.4	-	1.4	0.82	1.4	0.67
Name Name	Lead	7	NA	NA	NA	mg/L	0.001	0.014	-	0.17	0.011	0.051	-	0.017	0.008	0.024	0.015
deman i Mid Origin Mid mg/m M	Manganese	350	NA	NA	NA	mg/L	0.005	-	-	0.52	0.017	0.042	-	0.071	0.011	0.24	0.3
mining 14 NA NA MA MA <th< td=""><td>Mercury</td><td>-</td><td>NA</td><td>0.01</td><td>NA</td><td>mg/L</td><td>0.0001</td><td>-</td><td>-</td><td>< 0.0001</td><td>< 0.0001</td><td>< 0.0001</td><td>-</td><td>< 0.0001</td><td>< 0.0001</td><td>0.0001</td><td>< 0.0001</td></th<>	Mercury	-	NA	0.01	NA	mg/L	0.0001	-	-	< 0.0001	< 0.0001	< 0.0001	-	< 0.0001	< 0.0001	0.0001	< 0.0001
mm - M <thm< th=""> <thm< th=""> M</thm<></thm<>	Nickel	14	NA	NA	NA	mg/L	0.001	-	-	0.036	0.002	0.011	-	0.004	0.001	0.004	0.008
Display NA S NA NA <th< td=""><td>Zinc</td><td>-</td><td>NA</td><td>30</td><td>NA</td><td>mg/L</td><td>0.005</td><td>-</td><td>-</td><td>4</td><td>0.22</td><td>0.74</td><td>-</td><td>0.25</td><td>0.054</td><td>0.34</td><td>0.97</td></th<>	Zinc	-	NA	30	NA	mg/L	0.005	-	-	4	0.22	0.74	-	0.25	0.054	0.34	0.97
Annual (filtered) NA	Dissolved Metals																
ArrowNA0.5NANANAM	Aluminium (filtered)	NA	5	NA	NA	mg/L	0.05	0.3	-	-	0.69	0.4	-	0.08	0.28	0.26	0.08
Bartun (Breed) NA - NA - mad 0.00 0.08 - 0.05 0.07 0.05 0.001 0.003 0.05 0.01 0.003 0.01 0.003 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 <th< td=""><td>Arsenic (filtered)</td><td>NA</td><td>0.5</td><td>NA</td><td>NA</td><td>mg/L</td><td>0.001</td><td>0.001</td><td>-</td><td>-</td><td>< 0.001</td><td>0.002</td><td>-</td><td>0.002</td><td>< 0.001</td><td>0.001</td><td>0.001</td></th<>	Arsenic (filtered)	NA	0.5	NA	NA	mg/L	0.001	0.001	-	-	< 0.001	0.002	-	0.002	< 0.001	0.001	0.001
International (international international international international international (international international internatinternational international international international internation	Barium (filtered)	NA	-	NA	-	mg/L	0.001	0.08	-	-	0.05	0.07	-	0.05	0.04	0.05	0.07
add MA MA <t< td=""><td>Beryllium (filtered)</td><td>NA</td><td>-</td><td>NA</td><td>-</td><td>mg/L</td><td>0.001</td><td>< 0.001</td><td>-</td><td></td><td>< 0.001</td><td>< 0.001</td><td>-</td><td>< 0.001</td><td>< 0.001</td><td><0.001</td><td>< 0.001</td></t<>	Beryllium (filtered)	NA	-	NA	-	mg/L	0.001	< 0.001	-		< 0.001	< 0.001	-	< 0.001	< 0.001	<0.001	< 0.001
chai tha tha <td>Caamium (filtered)</td> <td>NA</td> <td>0.01</td> <td>NA</td> <td>NA</td> <td>mg/L</td> <td>0.0002</td> <td>0.0053</td> <td>-</td> <td>-</td> <td>0.001</td> <td>0.0033</td> <td>-</td> <td>0.001</td> <td>0.0002</td> <td>0.0015</td> <td>0.0038</td>	Caamium (filtered)	NA	0.01	NA	NA	mg/L	0.0002	0.0053	-	-	0.001	0.0033	-	0.001	0.0002	0.0015	0.0038
Congregation NA	Cobalt (filtered)	NA	NA NA	NA	0.0025	ma/L	0.001	0.001	-	-	< 0.001	< 0.001	-	0.001	< 0.001	0.001	0.001
Image NA - Ma - mg/L 0.03 - - 0.46 1.1 - 1.1 0.54 0.08 0.01 Mage Aud NA	Copper (filtered)	NA	0.5	NA	NA	mg/L	0.001	0.027	-	-	0.016	0.1	-	0.037	0.009	0.033	0.038
Image in the image inthe image in the image in the image in the image in	Iron (filtered)	NA	-	NA	-	mg/L	0.05	0.33	-	-	0.46	1.1	-	1.1	0.54	0.98	0.31
Manganeg (mereg) NA	Lead (filtered)	NA	0.1	NA	NA	mg/L	0.001	0.011	-	-	0.009	0.023	-	0.013	0.003	0.012	0.006
metury immety ma	manganese (filtered)	NA	NA	NA	1.9	mg/L	0.005	0.015	-	-	0.014	0.029	-	0.065	0.008	0.23	0.27
Nume NM A AM - Ingl_ 0.001 0.002 - - 0.002 0.011 - 0.003 0.001 0.01 0.011 0.011 0.011 0.011 0.011 0.011 0.011 0.011 0.011 0.011 0.011 0.011 0.011 0.011 0.011	Mercury (filtered)	NA NA	NA 1	INA NA	0.00006	mg/L	0.0001	< 0.0001	-	-	< 0.0001	< 0.0001	-	< 0.0001	< 0.0001	<0.0001	< 0.0001
Image	Zinc (filtered)	NA NA	20	NA	-	mg/L	0.001	0.002	-	-	0.002	0.011	-	0.003	0.001	0.004	0.007
Total Recoverable Hydrocarbons - 2013 NEPM Fractions Image: Constraint of the co	2			110		1119/L	0.005	0.95			0.2	0.7		0.23	0.040	0.52	0.07
Map/Langene - <th< td=""><td>Total Recoverable Hydrocarbons - 2013 NEPM</td><td>Fractions</td><td></td><td>17</td><td>16</td><td>115/1</td><td>10</td><td><10</td><td></td><td>1</td><td> </td><td></td><td></td><td></td><td>1</td><td>1</td><td>1</td></th<>	Total Recoverable Hydrocarbons - 2013 NEPM	Fractions		17	16	115/1	10	<10		1	 				1	1	1
TRH > C10-C16 less Naphthalene (F2) ·	TRH >C10-C16	-	-	-	- 10	μg/L μα/l	50	<10	-	-	-	-	-	-	-	-	-
RH > Clo. Cdo (total)* - <td>TRH >C10-C16 less Naphthalene (F2)</td> <td>- 1</td> <td>- 1</td> <td>_</td> <td>-</td> <td>ua/L</td> <td>50</td> <td>< 50</td> <td>-</td> <td>-</td> <td>-</td> <td>-</td> <td>-</td> <td>-</td> <td>-</td> <td>-</td> <td>-</td>	TRH >C10-C16 less Naphthalene (F2)	- 1	- 1	_	-	ua/L	50	< 50	-	-	-	-	-	-	-	-	-
TRH > C16-C34 -	TRH >C10-C40 (total)*	-	- 1	-	-	μq/L	100	<100	-	- 1	-	-	- 1	-	-	-	-
rRH > C34-C40 - - - μg/L 100 <100 - <td>TRH >C16-C34</td> <td>-</td> <td>-</td> <td>-</td> <td>-</td> <td>µg/L</td> <td>100</td> <td><100</td> <td>-</td> <td>-</td> <td>-</td> <td>-</td> <td>-</td> <td>-</td> <td>-</td> <td>-</td> <td>-</td>	TRH >C16-C34	-	-	-	-	µg/L	100	<100	-	-	-	-	-	-	-	-	-
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	TRH >C34-C40	-	-	-	-	µg/L	100	<100	-	-	-	-	-	-	-	-	-
Information Image: Solution Ima	IRH C6-C10 loss BTEV (E1)	-	-	-	-	µg/L	20	<20	-	-	-	-	-	-	-	-	-
BFEX Break Second Seco	IKE CO-CIU IESS BIEX (FI)	-	-	-	-	µg/L	20	<20	-	-	-	-	-	-	-	-	-
Brazen - 10 950 µg/L 1 <1 - <	DTEY	•											·				
Construction C	BIEA	-	-	10	950	110/1	1	<1	-	-	_	-		-	-		
m&p-Xylenes -	Ethylbenzene	-		3000	80	ua/L	1	<2	-	-	-	-	-	-	-	-	-
o-Xylene - <	m&p-Xylenes	-	-	-	-	µg/L	2	<2	-	-	-	-	-	-	-	-	-
Toluene - 8000 180 µg/L 1 <2 - <td>o-Xylene</td> <td>-</td> <td>-</td> <td>-</td> <td>-</td> <td>µg/L</td> <td>1</td> <td><2</td> <td>-</td> <td>-</td> <td>-</td> <td>-</td> <td>-</td> <td>-</td> <td>-</td> <td>-</td> <td>-</td>	o-Xylene	-	-	-	-	µg/L	1	<2	-	-	-	-	-	-	-	-	-
	Toluene	-	-	8000	180	µg/L	1	<2	-	-	-	-	-	-	-	-	-
	xyienes - Totai	-	-	6000	200	µg/L	3	<3	-	-	-	-	-	-	-	-	-

- indicates no criterion available
LDR = Limit of Reporting
Concentrations below the LOR noted as <value
NOC = No observed contamination
Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG 2018)
Australia and New Zealand Environment and Conservation Council (2000) Australian and New Zealand Guidelines for Fresh and Marine Water Quality
ANZECC, NEPM and NHMRC guidelines for mercury are based on total mercury.
 ^aEnRiskS (2020) Advice on risks to human health and the environment: Boyd Street and publicly accessible areas, Tarago NSW
^bRecreational criteria adopted are 10 x Australians for Fresh and Marine Ster Quality.
 ^cANZG (2018) Australian and New Zealand Guidelines for Fresh and Marine Water Quality.

^dThe recreational criteria for aluminium is based on aesthtic issues post flocculation and is not indicative of risks to human health. Concentrations in blue bold font exceed human health recreational screening or site specific criteria Concentrations in grey box exceed ecological screening or site specific criteria

Client: TfNSW Job No: 3180001376

RAMBOLL

					Sample Typ	e:	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
	-			-	Lab ID Sample date		S19-Au07234	S19-Se37064	- 29-1ap-20	S20-Ap12290	S20-My01342	S20-Au23119	S20-Oc25147	S21-Ja34962	S21-Ap22335	N21-JI30453	S22-Se00368	N22-De0031039
	-			F	Sample ID:		SW4	SW4	SW4	SW4	SW4	SW4	SW4	SW4	SW4	SW4	SW4	SW4
					Project Nan	le:	Tarago SW	Tarago SW	Tarago SW	Tarago SW	Tarago SW	Tarago SW	Tarago SW	Tarago SW	Tarago SW	Tarago SW	Tarago SW	Tarago SW
				-	Project No.		Monitoring	Monitoring	Monitoring	Monitoring	Monitoring	Monitoring	Monitoring	Monitoring	Monitoring	Monitoring	Monitoring	Monitoring
	-	Site Specific	Health-based	Ecological	Project No:	tion	Tarago Bail Loop	318000780	318000780	318000780	318000780	Tarago Bail Loop	Tarago Bail Loop	Tarago Bail Loop	Tarago Bail Loop	318000780	316001376	JISUUIJ/6-UUI
	Site Specific	Ecology Criteria	Screening Criteria	Sceening Criteria	Sample Loc	tion	Tarago Rali Loop	Tarago Rali Loop	Tarago Rali Loop	Tarago Rali Loop	Tarago Rali Loop	Tarago Rali Loop	Tarago Rali Loop	Tarago Rali Loop	Tarago Rali Loop	Tarago Rali Loop	Tarago Rall Corridor	Tarago Rall Corridor
	Criteria ^a	(Middle and	(Recreational	(ANZG 95%) Protection) Fresh	Sampling M	ethod:	Grab Sample	Grab Sample	-	Grab Sample	Grab Sample	Grab Sample	Grab Sample	Grab Sample	Grab Sample	Grab Sample	Grab Sample	Grab Sample
		Northern Culverts)"	Waters) ^o	Water ^c							Collected at Boyd	Brown, slightly	Water flowing,	Brown-orange,			Brown, murky,	Brown, murky,
Guidelines					Sample Des	cription:	Stagnant pond, clear to slightly yellow.	Turbid.	DRY	Light brown, low turbidity. No odour.	Street culvert. Flowing.	trubid, full but flow not evident.	turbid, brown, no odour.	stagnant, low- moderate turbidity, no observable contamination	Pale yellow, no odour	Clear, colourless, no odour. Not flowing.	turbid, some suspended solids, no odour. Not flowing, minor vegetation on the surface and within	turbid, some suspended solids, no odour. Not flowing, water appears to pool at this location
Analyte grouping/Analyte					Units	LOR												
Inorganics																		
Ammonia (as N)		-	0.5	0.9	mg/L	0.01	< 0.01	0.09	-		- 1	-	-			-		-
Conductivity (at 25@°C)	-	-	-	-	µS/cm	100	170	180	-	-	-	-	-	-	-	-	-	-
Nitrate & Nitrite (as N) Nitrate (as N)	-	-	- 50	- 3.5	mg/L mg/l	0.05	<0.05	2.1	-	-	-	-		-	-	-	-	
Nitrite (as N)	-		30	-	mg/L	0.02	<0.02	<0.02					-		_	-		-
pH (at 25@°C)	-	-	-	-	pH units	0.1	6.9	6.5	-	-	-	-	-	-	-	-	-	-
Prosprate total (as P) Total Dissolved Solids Dried at 180°C ± 2°C	-	-	-	-	mg/L mg/l	0.01	0.03	<0.01	-	-	-	-		-	-	-	-	
Total Kjeldahl Nitrogen (as N)	-	-	0.8	-	mg/L	0.2	1.2	1.6	-	-	-	-	-	-	-	-	-	-
Total Nitrogen (as N)	-	-	-	0.7	mg/L	0.2	1.2	3.7	-	-	-	-	-	-	-	-	-	-
Turbidity	-	-	-	0.7	Mg/L NTU	0.005	0.007	0.012	-	-	-	-	-	-	-	-	-	
(dibility)					NIU	1	Ū	35										
Total Metals			4															
Aluminium	-	NA	2 ^d	NA	mg/L	0.05	-	-	-	0.18	0.49	0.59	0.36	0.23	0.18	0.25	0.28	0.66
Barium	-	NA	20	NA	mg/L mg/L	0.001	-	-	-	0.02	0.002	< 0.001	0.003	0.003	0.003	< 0.001	0.002	0.002
Beryllium	-	NA	0.6	NA	mg/L	0.001	-	-	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	<0.001	< 0.001
Cadmium	1.4	NA	NA	NA	mg/L	0.0002	-	-	-	0.019	0.04	0.003	0.019	0.0066	0.0025	0.0025	0.0015	0.0035
Cobalt	-	NA NA	0.5	NA NA	mg/L	0.001	-	-	-	< 0.001	0.001	0.001	0.001	< 0.001	0.001	0.001	0.002	0.002
Copper	-	NA	20	NA	mg/L	0.001	-	-	-	0.13	0.31	0.04	0.19	0.13	0.09	0.032	0.044	0.059
Iron	-	NA	3	NA	mg/L	0.05	-	-	-	0.68	0.83	0.57	1.3	1.8	1.4	0.64	1.3	0.88
Lead	350	NA NA	NA NA	NA NA	mg/L	0.001	0.013	0.055	-	0.055	0.13	0.015	0.038	0.045	0.027	0.01	0.029	0.033
Mercury	-	NA	0.01	NA	mg/L	0.0001	-	-	-	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	<0.0001	< 0.0001
Nickel	14	NA	NA	NA	mg/L	0.001	-	-	-	0.037	0.12	0.006	0.038	0.027	0.451	0.004	0.004	0.009
Zinc	-	NA	30	NA	mg/L	0.005	-	-	-	3.2	7	0.56	2.6	1.2	1.27	0.5	0.29	0.63
Dissolved Metals													I					
Aluminium (filtered)	NA	5	NA	NA	mg/L	0.05	0.17	0.38	-	-	-	0.63	0.28	0.05	0.19	0.34	0.32	0.19
Arsenic (filtered)	NA	0.5	NA	NA	mg/L	0.001	0.001	0.001	-	-	-	< 0.001	0.002	0.005	0.002	< 0.001	0.001	< 0.001
Barium (filtered) Beryllium (filtered)	NA	-	NA	-	mg/L	0.001	0.04	0.05	-	-	-	0.04	0.08	0.07	0.05	0.04	0.04	0.06
Cadmium (filtered)	NA	0.01	NA	NA	mg/L	0.0002	0.0056	0.013	-	-	-	0.0029	0.018	0.0051	0.0021	0.0025	0.0013	0.003
Chromium (filtered)	NA	NA	NA	0.0025	mg/L	0.001	0.001	0.001	-	-	-	< 0.001	< 0.001	< 0.001	< 0.001	0.001	<0.001	< 0.001
Lobait (filtered)	NA	NA 0.5	NA	0.0014	mg/L	0.001	<0.001	0.003	-	-	-	< 0.001	0.004	0.001	< 0.001	< 0.001	0.002	0.001
Iron (filtered)	NA	-	NA	- INA	mg/L	0.001	0.15	0.2	-	-	-	0.47	0.16	0.28	0.89	0.52	0.91	0.49
Lead (filtered)	NA	0.1	NA	NA	mg/L	0.001	0.008	0.033	-	-	-	0.011	0.023	0.007	0.016	0.006	0.015	0.01
Manganese (filtered)	NA	NA	NA	1.9	mg/L	0.005	0.015	0.2	-	-	-	0.041	0.38	0.26	0.014	0.015	0.12	0.11
Nickel (filtered)	NA	1 1	NA	0.00006	mg/L	0.0001	< 0.0001	< 0.0001	-	-	-	0.0001	0.0001	0.0001	0.421	< 0.0001	<0.0001	< 0.0001
Zinc (filtered)	NA	20	NA		mg/L	0.005	1.2	2.6		-	-	0.5	2.5	0.82	0.95	0.52	0.26	0.58
Total Recoverable Hydrocarbons - 2013 NEP	M Fractions																	
Naphthalene		-	17	16	mg/L	10	<10	<10	-	-	-	-	-	-	-	-	-	-
TRH >C10-C16 less Naphthalene (F2)	-	-	-	-	mg/L mg/l	50 50	< 50	< 50	-	-	-	-	-	-	-	-	-	
TRH >C10-C40 (total)*	-	-	-	-	mg/L	100	<100	<100	-	-	-	-	-	-	-	-	-	
TRH >C16-C34	-	-	-	-	mg/L	100	<100	<100	-	-	-	-	-	-	-	-	-	-
TRH >C34-C40 TRH C6-C10	-	-	-	-	mg/L	100	<100	<100	-	-	-	-	-	-	-	-	-	-
TRH C6-C10 less BTEX (F1)	-	-		-	mg/L	<u>20</u> <u>2</u> 0	<20	<20	-	-	-		-	-	-	-	-	
· ·																		
BTEX																		
Benzene		-	10	950	mg/L	1	<1	<1							-			-
Ethylbenzene	-	-	3000	80	mg/L	1	<1	<2	-	-	-	-	-	-	-	-	-	-
nap-Aylenes	-	-	-		mg/L mg/l	2	<2	<2	-	-							-	
Toluene		-	8000	180	mg/L	1	<1	<2		-	-	-	-		-	-	-	-
Xylenes - Total	-	-	6000	200	mg/L	3	<3	<3	-	-	-	-	-	-	-	-	-	-

- indicates no criterion available
LOR = Limit of Reporting
Concentrations below the LOR noted as <value
NOC = No observed contamination
Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG 2018)
Australian and New Zealand Environment and Conservation Council (2000) Australian and New Zealand Guidelines for Fresh and Marine Water Quality.
ANZECC, NEPM and NHMRC guidelines for mercury are based on total mercury.
^aEnRiskS (2020) Advice on risks to human health and the environment: Boyd Street and publicly accessible areas, Tarago NSW
^bRecreational criteria adopted are 10 x Australian Drinking Water Guidelines ADWG (2011)
^cANZG (2018) Australian and New Zealand Guidelines for Fresh and Marine Water Quality.
^cThe recreational criteria for aluminium is based on aestitic issues post flocculation and is not indicative of risks to human health.
Concentrations in blue bold font exceed human health recreational screening or site specific criteria
Concentrations in grey box exceed ecological screening or site specific criteria

Job No: 3180001376 Project Name: December 2022 Surface Water Monitoring Report 12-01-23

Client: TfNSW



Client: TfNSW Job No: 3180001376

Project Name: December 2022 Surface Water Monitoring Report 12-01-23

					Sample Typ	e:	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
					Lab ID		-	-	S20-Au23120	S20-Oc25149	-	S21-Ap22336	N21-JI30455	S22-Se00368	-
	-				Sample date	e:	29-Jan-20	1-Apr-20	11-Aug-20	13-Oct-20	28-Jan-21	14-Apr-21	13-Jul-21	12-Sep-22	13-Dec-22
	4				Sample ID:		SW5	SW5	SW5	SW5	SW5	SW5	SW5	SW5	SW5
					Project Nan	ne:	Tarago SW	Tarago SW	Tarago SW	Tarago SW	Tarago SW	Tarago SW	Tarago SW Monitoring	Tarago SW Monitoring	Tarago SW Monitoring
	-	Site Specific	Health-based	Ecological	Ducient No.		Monitoring	Monitoring	Monitoring	Monitoring	Monitoring	Monitoring	210000700	210001276	210001276 001
	Site Specific	Ecology Criteria	Screening Criteria	Sceening Criteria	Project No:		318000780	318000785	318000785	318000785	318000780	318000780	318000780	318001376	318001376-001
	Human Health	(Middle and	(Recreational	(ANZG 95%	Sample Loc	ation	Tarago Rail Loop	Tarago Rail Loop	Tarago Rail Loop	Tarago Rail Loop	Tarago Rail Loop	Tarago Rail Loop	Tarago Rail Loop	Tarago Rail Corridor	Tarago Rail Corridor
	Criteria ^a	Northern	Waters) ^b	Protection) Fresh											
		Culverts) ^a	Watersy	Water ^c	Sampling M	lethod:	-	-	Grab Sample	Grab Sample	Grab Sample	Grab Sample	Grab Sample	Grab Sample	Grab Sample
									Brown, turbid, flow	Water not flowing.		Pale yellow, no	Turbid pale brown pe		
Guidelines					Sample Des	scription:	DRY	DRY	at culvert evident beneath crushed rock.	very shallow, turbid, light brown, no odour.	DRY	odour. Small pool of water north of culvert, rest of area drv	odour. Sample taken from puddle adjacent to culvert. Not flowing.	DRY	DRY
Analyte grouning (Analyte					Unite	LOP									
Analyte grouping/ Analyte					Units	LOK									
Inorganics						· · · · · · · · · · · · · · · · · · ·			•						
Ammonia (as N)	-	-	0.5	0.9	mg/L	0.01	-	-	-	-	-	-	-	-	-
Conductivity (at 25@°C)	-	-	-	-	µS/cm	100	-	-	-	-	-	-	-	-	-
Nitrate & Nitrite (as N)	-	-	-	-	mg/L	0.05	-	-	-	-	-	-	-	-	-
Nitrite (as N)	-	-	0C	3.5	mg/L	0.02	-	-	-	-	-	-	-	-	-
nH (at 25@°C)	-	-		-	nH unite	0.02		-	-	-	-	-		-	-
Phosphate total (as P)	-	-	-	-	ma/L	0.05	-	-	-	-	-	-	-	-	-
Total Dissolved Solids Dried at 180°C ± 2°C	-	-	-	-	mg/L	0.005	-	-	-	-	-	-	-	-	-
Total Kjeldahl Nitrogen (as N)	-	-	0.8	-	mg/L	0.2	-	-	-	-	-	-	-	_	-
Total Nitrogen (as N)	-	-	-	-	mg/L	0.2	-	-	-	-	-	-	-	-	-
Total Suspended Solids Dried at 105°C	-	-	-	0.7	mg/L	0.005	-	-	-	-	-	-	-	-	-
Turbidity	-	-	-	-	NTU	1	-	-	-	-	-	-	-	-	-
Tatal Matala															
		NA	be	NIA	ma m //	0.05			1.0	11		0.20	1.2		
Aluminium	- 7	NA	20	NA	mg/L	0.05	-	-	1.8	11	-	0.29	1.3	-	-
Barium		NA NA	20	ΝA	mg/L	0.001		-	0.001	0.003	-	0.002	0.001		-
Bervllium	-	NA	0.6	NA	mg/L	0.001	-	-	< 0.001	< 0.001	-	< 0.001	< 0.04		-
Cadmium	1.4	NA	NA	NA	mg/L	0.0002	-	-	0.0009	0.0021	-	0.0009	0.0008	-	-
Chromium	-	NA	0.5	NA	mg/L	0.001	-	-	0.003	0.011	-	0.001	0.002	-	-
Cobalt	-	NA	-	NA	mg/L	0.001	-	-	< 0.001	0.003	-	< 0.001	< 0.001	-	_
Copper	-	NA	20	NA	mg/L	0.001	-	-	0.019	0.074	-	0.022	0.021	-	-
Iron	-	NA	3	NA	mg/L	0.05	-	-	1.5	8.9	-	0.97	1.1	-	-
Lead	/	NA	NA	NA	mg/L	0.001	-	-	0.01	0.031	-	0.003	0.005	-	-
Marguny	350	NA	NA 0.01	NA	mg/L	0.005	-	-	0.012	0.15	-	0.061	0.017		-
Niekol	14	NA NA	0.01	NA NA	mg/L	0.0001	-	-	< 0.0001	< 0.0001	-	< 0.0001	< 0.0001	-	-
Zinc	14	NA NA	20	NA NA	mg/L	0.001	-	-	0.002	0.007	-	0.004	0.003		-
Zilic	-	INA	50	INA	TTIG/L	0.005	-	-	0.11	0.5	-	0.19	0.18	-	-
Dissolved Metals															
Aluminium (filtered)	NA	5	NA	NA	ma/L	0.05	-	-	3.2	0.28	-	0.25	1.1	-	-
Arsenic (filtered)	NA	0.5	NA	NA	mg/L	0.001	-	-	0.001	0.002	-	0.001	< 0.001	-	-
Barium (filtered)	NA	-	NA	-	mg/L	0.001	-	-	0.03	0.08	-	0.07	0.04	-	-
Beryllium (filtered)	NA	-	NA	-	mg/L	0.001	-	-	< 0.001	< 0.001	-	< 0.001	< 0.001	-	-
Cadmium (filtered)	NA	0.01	NA	NA	mg/L	0.0002	-	-	0.0009	0.001	-	0.0006	0.0006	-	-
Chromium (filtered)	NA	NA	NA	0.0025	mg/L	0.001	-	-	0.003	< 0.001	-	< 0.001	0.002	-	-
Copper (filtered)	NA	NA	NA	0.0014	mg/L	0.001	-	-	< 0.001	0.001	-	< 0.001	< 0.001	-	-
Trop (filtered)	NA NA	0.5	NA NA	NA	mg/L	0.001	-	-	0.016	0.045	-	0.019	0.018	-	
Lead (filtered)	NA	0.1	NA	- ΝΔ	ma/l	0.001	-	-	0.006	0.04	-	0.74	0.78	-	
Manganese (filtered)	NA	NA	NA	1.9	ma/l	0.005	-	-	0,008	0.09	-	0.044	0.013	-	-
Mercury (filtered)	NA	NA	NA	0.00006	ma/l	0.0001	-	-	< 0.0001	< 0.0001	-	< 0.0001	< 0.0001	-	-
Nickel (filtered)	NA	1	NA	-	ma/l	0.001	-	-	0,002	0.003	-	0.004	0.003	-	-
Zinc (filtered)	NA	20	NA	-	ma/L	0.005	-	-	0.094	0.14	-	0.17	0.13	-	-
						2.000	1							I	1
Total Recoverable Hydrocarbons - 2013 NEPM	Fractions														
Naphthalene	-	-	17	16	µg/L	10	-	-	-	-	-	-	-	-	-
TRH >C10-C16	-	-	-		µg/L	50	-	-	-	-	-	-	-	-	
TRH >C10-C16 less Naphthalene (F2)	-	-	-	-	µg/L	50	-	-	-	-	-	-	-	-	-
TRH >C10-C40 (total)*	-	-	-	-	µg/L	100	-	-	-	-	-	-	-	-	-
IRH >C16-C34	-	-	-	-	µg/L	100	-	-	-	-	-	-	-	-	-
ткп >C34-C40 ТРН C6-C10	-	-	-	-	µg/L	100	-	-	-	-	-	-	-	-	-
TRH C6-C10 less BTEX (F1)	-	-	-	-	μg/L μα/l	20		-	-	-	-			-	-
	-	-			µ9/ L	20	-	-	-	-	-	-	-	-	-
							•	•	•					·	
BTEX															
Benzene	-	-	10	950	µg/L	1	-	-	-	-	-				
Etnylbenzene	-	-	3000	80	µg/L	1	-	-	-	-	-	-	-	-	
	-	-	-	-	µg/L	2	-	-	-	-	-	-	-	-	-
	-	-	- 8000	- 180	μg/L	1	-	-	-	-	-	-	-	-	-
Xvlenes - Total	-	-	6000	200	μg/L μα/l	3		-	-	-	-			-	-
Ayreneo Total	-		0000	200	µy/L	J	-	-	-	-	-	-	-	-	-

- indicates no criterion available LOR = Limit of Reporting Concentrations below the LOR noted as <value NOC = No observed contamination Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG 2018) Australia and New Zealand Environment and Conservation Council (2000) Australian and New Zealand Guidelines for Fresh and Marine Water Quality. ANZECC, NEPM and NHMRC guidelines for mercury are based on total mercury.
 ^aEnriskS (2020) Advice on risks to human health and the environment: Boyd Street and publicly accessible areas, Tarago NSW

^bRecreational criteria adopted are 10 x Australian Drinking Water Gudielines ADWG (2011)

^cANZG (2018) Australian and New Zealand Guidelines for Fresh and Marine Water Quality.

The recreational criteria for aluminium is based on aesthtic issues post flocculation and is not indicative of risks to human health. Concentrations in blue bold font exceed human health recreational screening or site specific criteria Concentrations in grey box exceed ecological screening or site specific criteria



Client: TfNSW Job No: 3180001376 Project Name: December 2022 Surface Water Monitoring Report

Table 8: SW6 Analytical Results

12-01-23	5 nepore														
					Sample Typ	e:	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
					Lab ID		-	-	S20-Au23121	-	-	-	N21-JI30451	S22-Se00368	N22-De0031039
					Sample dat	e:	29-Jan-20	1-Apr-20	11-Aug-20	13-Oct-20	28-Jan-21	14-Apr-21	13-Jul-21	12-Sep-22	13-Dec-22
	-				Sample ID:		SW6	SW6	SW6	SW6	SW6	SW6	SW6	SW6	SW6
					Project Nan	ne:	Tarago Sw Monitoring	Tarago SW Monitoring	Tarago SW Monitoring	Tarago SW Monitoring	Tarago SW Monitoring	Tarago SW	Tarago SW	Tarago SW Monitoring	Tarago SW Monitoring
	-				Project No:		318000780	318000785	318000785	318000785	318000785	318000785	318000785	318001376	318001376-001
	-			Ecological	Sample Loc	ation	Tarago Bail Loop	Tarago Pail Loop	Tarago Pail Loop	Tarago Pail Loop	Tarago Rail Loop	Tarago Bail Loop	Tarago Pail Loop	Tarago Bail Corridor	Tarago Bail Corridor
		Site Specific	Health-based	Sceening	Sample Loc	ation	Tarago Kali Loop	rarago itali Loop	Tarago Rail Loop		Tarago Rail Loop	Tarago Kali Loop	Tatago Kali Loop	Tarago Kan Corndor	
	Site Specific	Ecology Criteria	Screening Criteria	Criteria (ANZG	Sampling M	ethod:	-	-	Grab Sample	Grab Sample	Grab Sample	Grab Sample	Grab Sample	Grab Sample	Grab Sample
		(Middle and	(Recreational	95%											p
Guidelines	Criteria ^a	Northern Culverts) ^a	Waters) ^b	Protection) Fresh Water ^c	Sample Des	cription:	DRY	DRY	Brown, slightly turbid. Not flowing.	DRY	DRY	DRY	Clear to slightly turbid, pale yellow/brown, no odour. Flowing slightly.	slightly turbid, some suspended solids, no odour. Flowing slightly, minor vegetation on the surface and banks of the water body. Unable to completely submerge sample container 10cm	Cloudy yellow/brown with some suspended solids, no odour. Not flowing. Minor vegetation on the banks and within water body.
						1.00									
Analyte grouping/Analyte					Units	LOR									
Inorganics					11			I	1	J	J	I		I	1
Ammonia (as N)	-	-	0.5	0.9	mg/L	0.01	-	-	-	-	-	-	-	-	-
Conductivity (at 25@°C)	-	-	-	-	μS/cm	100	-	-	-	-	-	-	-	-	-
Nitrate & Nitrite (as N)	-	-	-	- 2 E	mg/L	0.05		-	-	-	-	-	-	-	
Nitrite (as N)	-	-	30 30	3.5	mg/L mg/l	0.02	++ -	-		-	-	-	-	-	-
pH (at 25@°C)	-	-	-	-	pH units	0.02	-	-	-	-	-	-	-	-	-
Phosphate total (as P)	-	-	-	-	mg/L	0.05		-	-	-	-	-	-	-	-
Total Dissolved Solids Dried at 180°C ± 2°C	-	-	-	-	mg/L	0.005	-	-	-	-	-	-	-	-	-
Total Kjeldahl Nitrogen (as N)	-	-	0.8	-	mg/L	0.2	-	-	-	-	-	-	-	-	-
Total Nitrogen (as N)	-	-	-	-	mg/L	0.2	-	-	-	-	-	-	-	-	
Turbidity	-	-	-	0.7		0.005	-	-	-	-	-	-	-	-	
Turblatty	-	-	-	-	NIU	1	-	-	-	-	-	-	-	-	
Total Metals						1	11								
Aluminium	-	NA	2 ^d	NA	mg/L	0.05	-	-	1.8	-	-	-	2.4	1.1	4
Arsenic	7	NA	NA	NA	mg/L	0.001	-	-	0.002	-	-	-	0.002	0.002	0.003
Barium	-	NA	20	NA	mg/L	0.001	-	-	0.06	-	-	-	0.05	0.07	0.08
Beryllium	-	NA	0.6	NA	mg/L	0.001	-	-	< 0.001	-	-	-	< 0.001	<0.001	< 0.001
Chromium	1.4	NA	NA	NA	mg/L	0.0002	-	-	0.0072	-	-	-	0.004	0.002	0.003/
Cobalt	-	NA NA	0.5	NA NA	mg/L	0.001	-	-	0.003	-	-	-	0.003	0.002	0.004
Copper	-	NA	20	NA	mg/L	0.001	-	-	0.1	-	-	-	0.12	0.068	0.069
Iron	-	NA	3	NA	mg/L	0.05	-	-	1.4	-	-	-	1.9	1.9	4.5
Lead	7	NA	NA	NA	mg/L	0.001	-	-	0.022	-	-	-	0.022	0.022	0.052
Manganese	350	NA	NA	NA	mg/L	0.005	-	-	0.018	-	-	-	0.021	0.1	0.17
Mercury	-	NA	0.01	NA	mg/L	0.0001	-	-	< 0.0001	-	-	-	< 0.0001	0.0001	< 0.0001
Nickel	14	NA	NA	NA	mg/L	0.001	-	-	0.029	-	-	-	0.022	0.012	0.012
Zinc	-	NA	30	NA	mg/L	0.005	-	-	0.9	-	-	-	0.67	0.43	1.2
Discolar d Madala														l	L
Dissolved Metals	NA	E	NA	NA	mg/l	0.05	11	1	2.4			1	2.7	2.6	0.34
Arcenic (filtered)	NA	0.5	ΝA	NA	mg/L	0.03	-	-	0.001	-	-	-	0.002	0.002	0.001
Barium (filtered)	NA	-	NA	-	mg/L	0.001	-	-	0.05	-	-	-	0.02	0.04	0.05
Beryllium (filtered)	NA	-	NA	-	mg/L	0.001	-	-	< 0.001	-	-	-	< 0.001	<0.001	< 0.001
Cadmium (filtered)	NA	0.01	NA	NA	mg/L	0.0002	-	-	0.0063	-	-	-	0.0034	0.0013	0.0025
Chromium (filtered)	NA	NA	NA	0.0025	mg/L	0.001	-	-	0.003	-	-	-	0.003	0.003	< 0.001
Cobalt (filtered)	NA	NA	NA	0.0014	mg/L	0.001	-	-	< 0.001	-	-	-	< 0.001	0.001	0.001
Copper (filtered)	NA	0.5	NA NA	NA	mg/L	0.001		-	0.088	-	-	-	0.11	0.056	0.043
l ead (filtered)	NA NA	- 0.1	NA NA	- NA	mg/L	0.05			0.013	-		-	1./	0.01	0.02
Manganese (filtered)	NA	NA	NA	1.9	mg/L	0.001	-	-	0.013	-	-	-	0.013	0.04	0.12
Mercury (filtered)	NA	NA	NA	0.00006	mg/L	0.0001	-	-	< 0.0001	-	-	-	< 0.0001	< 0.0001	< 0.0001
Nickel (filtered)	NA	1	NA	-	mg/L	0.001	-	-	0.026	-	-	-	0.019	0.012	0.008
Zinc (filtered)	NA	20	NA	-	mg/L	0.005	-	-	0.79	-	-	-	0.53	0.25	0.79
														l	<u> </u>
Iotal Recoverable Hydrocarbons - 2013 NEP	M Fractions		17	16		10	П								T
	-	-	-		µg/L	50	-	-	-	-	-	-	-	-	t
TRH >C10-C16 less Naphthalene (F2)	-	-	-	-	μα/I	50	 	-	-	-	-	-	-	-	-
TRH >C10-C40 (total)*	-	-	-	-	Jug/L	100		-	-	-	-	-	-	-	-
TRH >C16-C34	-	-	-	-	µg/L	100	-	-	-	-	-	-	-	-	-
TRH >C34-C40	-	-	-	-	µg/L	100	-	-	-	-	-	-	-	-	-
TRH C6-C10	-	-	-	-	µg/L	20		-	-	-	-	-	-	-	
IRH C6-C10 less BTEX (F1)	-	-	-	-	µg/L	20		-	-	-	-	-	-	-	-
	1	I				I	ш	1	1	I	I	I		1	L
BTEX															
Benzene	-	-	10	950	µg/L	1	-	-	-	-	-	-		-	
Ethylbenzene	-	-	3000	80	µg/L	1	-	-	-	-	-	-	-	-	-
m&p-Xylenes	-	-	-	-	µg/L	2		-	-	-	-	-	-	-	
	-	-	-	-	µg/L	1		-	-	-	-	-	-	-	
	-	-	6000	180	µg/L	1		-	-	-	-	-	-	-	
	-	-	0000	200	P3/ L			-	-	-	-	-	-	-	

- indicates no criterion available LOR = Limit of Reporting Concentrations below the LOR noted as <value NOC = No observed contamination Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG Australia and New Zealand Environment and Conservation Council (2000) Australian and New Zealand Guidelines for Fresh and Marine Water Quality. ANZECC, NEPM and NHMRC guidelines for mercury are based on total mercury.
 ^aEnRiskS (2020) Advice on risks to human health and the environment: Boyd Street and publicly accessible areas, Tarago NSW
 ^bRecreational criteria adopted are 10 x Australian Drinking Water Guidelines ADWG (2011)
 ^cANZEC (2018) Australian and New Zealand Guidelines for Fresh and Marine Water Quality.

^cANZG (2018) Australian and New Zealand Guidelines for Fresh and Marine Water Quality.

^dThe recreational criteria for aluminium is based on aesthtic issues post flocculation and is not indicative of risks to human health. Concentrations in blue bold font exceed human health recreational screening or site specific criteria Concentrations in grey box exceed ecological screening or site specific criteria



Client: TfNSW Job No: 3180001376

Project Name: December 2022 Surface Water Monitoring Report

Table 9: SW7 Analytical Results

.2-01-23															
					Sample Type	:	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
	-				Lah ID	-	S20-1a29060	S20-An12291	S20-Au23122	S20-0c25163	S21-la34963	S21-An22337	N21-1130457	S22-Se00368	N22-De0031040
	-				Sample date		29-1an-20	2-Anr-20	11-Aug-20	12-Oct-20	28-lan-21	14-Anr-21	13-10-21	13-Sep-22	13-Dec-22
					Sample ID:	-	SW7	SW7	SW7	SW7	SW7	SW7	SW7	SW7	SW7
							Tarago SW	Tarago SW	Tarago SW	Tarago SW	Tarago SW	Tarago SW	Tarago SW		
					Project Nam	e:	Monitoring	Monitoring	Monitoring	Monitoring	Monitoring	Monitoring	Monitoring	Tarago SW Monitoring	Tarago SW Monitoring
					Project No:		318000780	318000780	318000780	318000780	318000780	318000780	318000780	318001376	318001376-001
	Health-based	Ecological			Comple Lees	tion	Tarago Bail Loop	Tarago Bail Loon	Tarago Bail Loon	Tarago Bail Loop	Taraga Bail Loon	Tarago Bail Loon	Tarago Bail Loon	Tarago Bail Corridor	Taraga Bail Corridor
	Screening	Sceening	ANZECC Fresh	ANZECC Fresh	Sample Loca	tion	Tarago Raii Loop	тагадо кан соор	Тагадо кан соор	Tarago Rali Loop	Tarago Rail Loop	Tarago Rali Loop	Tarago Rali Loop	Tarago Rali Corridor	Tarago Rall Corridor
	Criteria	Criteria (ANZG	Water	Water Guidelines	Complian M		Crah Camarla	Crah Camala	Cueh Cemela	Creh Comula	Crah Canania	Crah Canania	Crah Canania	Creh Comple	Creh Carrala
	(Pecreational	95%	Guidelines -	Check Weter ^C	Sampling Me	ethoa:	Grab Sample	Grab Sample	Grab Sample	Grab Sample	Grab Sample	Grab Sample	Grab Sample	Grab Sample	Grab Sample
	(Recreational Waters) ^b	Protection)	Irrigation ^c	Stock water										Light brown to brown,	
Guidelines	waters)	Fresh Water ^c			Sample Des	cription:	Silty, from dam, low level water.	Highly turbid.	Brown, turbid.	Water slightly trubid, brown, not flowing.	Light brown, low- moderate turbidity, no observable contamination	Pale brown, dark colour to dam, earthy odour	Slightly turbid, palye yellow/brown, no odour. Reeds growing in pond. Not flowing.	slightly murky, slightly turbid, suspended solids, no odour. Reeds growing in pond. Not flowing, minor vegetation on the surface and within the watorbody	Clear, slightly brown, no odour. Reeds and vegetation growing throuhgout water body. Dead vegetation at bottom of water body
Analyte grouping/Analyte					Units	LOR									
Analyte grouping/ Analyte					Units .	LOK									
Inorganics							1.1								
Ammonia (as N)	0.5	0.9	-	-	mg/L	0.01	0.02	-	-	-	-	-	-	-	-
Conductivity (at 25@°C)	-	-	-	-	µS/cm	100	580	-	-	-	-	-	-	-	-
Nitrate & Nitrite (as N)	-	-	400	100	mg/L	0.05	< 0.05	-	-	-	-	-	-	-	-
Nitrate (as N)	50	3.5	30	10	mg/L	0.02	< 0.02	-	-	-	-	-	-	<u> </u>	-
Nitrite (as N)	30	-	-	-	mg/L	0.02	< 0.02	-	-	-	-	-	-	-	-
pH (at 25@°C)	-	-	-	800-1200	pH units	0.1	7.4	-	-	-	-	-	-	-	-
Phosphate total (as P)	-	-	-	-	mg/L	0.05	0.69	-	-	-	-	-	-	-	-
Total Dissolved Solids Dried at 180°C ± 2°C	-	-	-	-	mg/L	0.005	0.56	-	-	-	-	-	-	-	-
Total Kjeldahl Nitrogen (as N)	0.8	-	-	25-125	mg/L	0.2	15	-	-	-	-	-	-	-	-
Total Nitrogen (as N)	-	-	-	-	mg/L	0.2	15	-	-	-	-	-	-	-	-
Total Suspended Solids Dried at 105°C	-	0.7	-	-	mg/L	0.005	0.25	-	-	-	-	-	-	-	-
Turbidity	-	-			NTU	1	160	-	-	-	-	-	-	-	-
Total Metals															
Aluminium	2 ^d	NA	NA	NA	mg/L	0.05	-	0.29	1.7	0.33	0.41	0.15	0.46	0.2	0.22
Arsenic	NA	NA	NA	NA	ma/L	0.001	0.016	0.004	0.003	0.005	0.003	0.002	0.002	0.002	0.003
Barium	20	NA	NA	NA	mg/L	0.001	-	0.08	0.04	0.05	0.09	0.04	0.04	0.03	0.03
Bervllium	0.6	NΔ	NΔ	NΔ	mg/L	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Cadmium	NΔ	NΔ	NΔ	NΔ	mg/L	0.0002	0.0016	0.000	0.0014	0.0003	< 0.001	0.0004	< 0.001	<0.001	< 0.001
Chromium	0.5	NA	NA	NA	mg/L	0.001	-	0.001	0.002	0.001	< 0.0002	< 0.001	0.001	<0.001	0.001
Cobalt	-	NA	NA	NA	mg/L	0.001	0.002	0.002	< 0.001	< 0.001	0.002	< 0.001	< 0.001	< 0.001	< 0.001
Conner	20	NA	NA	NA	mg/L	0.001	0.021	0.022	0.027	0.014	0.006	0.009	0.011	0.004	0.004
Iron	3	NA	NA	NA	mg/L	0.05	-	4.22	1.8	3	4	3.3	3.8	3.3	5
Lead	NΔ	NΔ	NΔ	NΔ	mg/L	0.001	0.037	0.02	0.025	0.012	0.009	0.006	0.006	0.003	0.004
Manganese	NΔ	NΔ	NΔ	NΔ	mg/L	0.001	1 1	0.02	0.032	0.063	0.005	0.072	0.083	0.003	0.16
Mercury	0.01	NA	NA	NA	mg/L	0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Nickol	NA	NA	NA	NA	mg/L	0.0001	0.012	0.006	0.003	0.003	0.003	0.002	0.002	0.002	0.002
Zinc	20	NA NA	NA NA	NA NA	mg/L	0.001	0.012	0.000	0.005	0.005	0.003	0.002	0.002	0.002	0.002
ZIIIC	30	NA	INA	INA	mg/L	0.005	0.28	0.15	0.30	0.065	0.044	0.082	0.1	0.014	0.026
N 1 1 1 1 1 1												L	L		
Dissolved Metals							1.0	1							
Dissolved Aluminium	NA	0.055	5	20	mg/L	0.05	-	-	0.95	0.18	0.52	0.14	0.37	0.08	< 0.05
Dissolved Arsenic	NA	NA	0.5	2	mg/L	0.001	0.011	-	0.001	0.004	0.005	0.001	0.001	0.002	0.002
Dissolved Barium	NA	-	-	-	mg/L	0.001	-	-	0.03	0.05	0.05	0.03	0.04	0.03	0.03
Dissolved Beryllium	NA	-	-	0.5	mg/L	0.001	< 0.001	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Dissolved Cadmium	NA	0.00054	0.01	0.05	mg/L	0.0002	0.0005	-	0.001	< 0.0002	< 0.0002	< 0.0002	< 0.0002	<0.0002	< 0.0002
Dissolved Chromium	NA	0.0025	1	1	mg/L	0.001	-	-	0.002	< 0.001	0.001	< 0.001	< 0.001	0.001	< 0.001
Dissolved Cobalt	NA	0.0014	1	0.1	mg/L	0.001	0.002	-	< 0.001	< 0.001	0.002	< 0.001	< 0.001	< 0.001	< 0.001
Dissolved Copper	NA	0.0014	0.5	0.1	mg/L	0.001	0.009	-	0.019	0.013	0.007	0.008	0.008	0.003	0.004
Dissolved Iron	NA	-	-	10	mg/L	0.05	-	-	0.57	2.4	1.8	1.6	2.5	2.6	2.6
Dissolved Lead	NA	0.0034	0.1	5	mg/L	0.001	0.017	-	0.005	0.009	0.004	0.003	0.004	0.002	0.002
Dissolved Manganese	NA	1.9	10	2.5	mg/L	0.005	0.68	-	0.028	0.056	1	0.063	0.07	0.035	0.15
Dissolved Mercury	NA	0.00006	0.002	0.002	mg/L	0.0001	< 0.0001	-	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	<0.0001	< 0.0001
Dissolved Nickel	NA	-	1	2	mg/L	0.001	0.009	-	0.003	0.003	0.002	0.002	0.002	0.001	0.001
Dissolved Zinc	NA	0.02	20	5	mg/L	0.005	0.087	-	0.26	0.051	0.031	0.057	0.082	0.01	0.018
Total Recoverable Hydrocarbons - 2013 NEPI	M Fractions														
Naphthalene	17	16	-	-	μg/L	10	<10	-	-	-	-	-	-	-	-
TRH >C10-C16	-	-	-	-	µg/L	50	<50	-	-	-	-	-	-	-	-
TRH >C10-C16 less Naphthalene (F2)	-	-	-	-	µg/L	50	<50	-	-	-	-	-	-	-	-
TRH >C10-C40 (total)*	-	-	-	-	µg/L	100	<100	-	-	-	-	-	-	-	-
TRH >C16-C34	-	-	-	-	µg/L	100	<100	-	-	-	-	-	-	-	-
TRH >C34-C40	-	-	-	-	μg/L	100	<100	-	-	-	-	-	-	-	-
TRH C6-C10	-	-	-	-	μg/L	20	<20	-	-	-	-	-	-	-	-
TRH C6-C10 less BTEX (F1)	-	-	-	-	µg/L	20	<20	-	-	-	-	-	-	-	-
· · ·															
BTEX															
Benzene	10	950	-	-	µa/L	1	< 1	-	-	-	-	-	-	-	-
Ethylbenzene	3000	80	-	-	ua/L	1	< 1	-	-	-	-	-	-	-	-
m&p-Xvlenes	-	-	-	-	ua/L	2	< 2	-	-	-	-	-	-	-	-
o-Xvlene	-	-	-	-	un/l	1	< 1	-	-	1 -	-	-	-	-	-
Toluene	8000	180	-	-	ua/L	1	2	-	-	-	-	-	-	-	-
Xvlenes - Total	6000	200	-	-	un/l	3	< 3	-	-	1 -	-	-	-	-	-
,					- 2/ -				•		•	1		•	

- indicates no criterion available LOR = Limit of Reporting Concentrations below the LOR noted as <value NOC = No observed contamination Australian and New Zealand Guidelines for Fresh Australia and New Zealand Environment and Conservation Council (2000) Australian and New Zealand Guidelines for Fresh and Marine Water Quality. ANZECC, NEPM and NHMRC guidelines for mercury are based on total mercury.
 ^aEnriskS (2020) Advice on risks to human health and the environment: Boyd Street and publicly accessible areas, Tarago NSW
 ^bPecreational criteria adopted are 10 x Australian Drinking Water Guidelines ADWG (2011)

¹EnRiskS (2020) Advice on risks to human health and the environment: Boyd Street and publicly accessible areas, Tarago NSW ^bRecreational criteria adopted are 10 x Australian Drinking Water Gudielines ADWG (2011) ⁶ANZG (2018) Australian and New Zealand Guidelines for Fresh and Marine Water Quality. ^dThe recreational criteria for aluminium is based on aesthtic issues post flocculation and is not indicative of risks to human health. Concentrations in blue font exceed human health recreational screening criteria Concentrations in **pold** exceed erological screening criteria Concentrations in **ibole** exceed irrigation screening criteria Concentrations in *italics* exceed stockwatering screening criteria



Client: TfNSW Job No: 3180001376 Project Name: December 2022 Surface Water Monitoring Report

Table 10: SW8 Analytical Results

12-01-23															
					Sample Type	:	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
					Lab ID		S20-Ja29061	S20-Ap12292	S20-Au23123	S20-Oc25165	S21-Ja34964	S21-Ap22338	N21-JI30457	S22-Se00368	N22-De0031041
					Sample date	:	29-Jan-20	2-Apr-20	10-Aug-20	12-Oct-20	28-Jan-21	14-Apr-21	13-Jul-21	13-Sep-22	12-Dec-22
					Sample ID:		SW8	SW8	SW8	SW8	SW8	SW8	SW8	SW8	SW8
					Duciest Nam		Tarago SW	Tarago SW	Tarago SW	Tarago SW	Tarago SW	Tarago SW	Tarago SW	Tavage CW/ Menihering	Tarago SW
					Project Nam	e:	Monitoring	Monitoring	Monitoring	Monitoring	Monitoring	Monitoring	Monitoring	Tarago Sw Monitoring	Monitoring
					Project No:		318000780	318000780	318000780	318000780	318000780	318000780	318000780	318001376	318001376-001
		Ecological													
	Health-based	Sceening Criteria	ANZECC Fresh	ANZECC Fresh	Sample Loca	tion	Tarago Rail Loop	Tarago Rail Loop	Tarago Rail Loop	Tarago Rail Loop	Tarago Rail Loop	Tarago Rail Loop	Tarago Rail Loop	Tarago Rail Corridor	Tarago Rail Corridor
	Screening Criteria	(ANZG 95%	Water Guidelines -	Water Guidelines -	Sampling Me	thod:	Grah Sample	Grab Sample	Grab Sample	Grab Sample	Grab Sample	Grab Sample	Grab Sample	Grab Sample	Grab Sample
	(Recreational	Protection) Fresh	Irrigation ^c	Stock Water ^c	Sumpring Pic	liioui	Grub Sumple	Grab Sample	Grub Sumple	orab Sample	Grab Sample	Grub Sumple	Grub Sumple	Grub Sumple	Grub Sumple
Guidelines	Waters) ^b	Water ^c	Ingation	Stock water	Sample Desc	cription:	Clear, vegetation. Not flowing.	Grease at surface, lots of algae growing on plants.	Water flowing, level high, turbid.	Water flowing, clear/brown.	Clear, low turbidity, no observable contamination	Clear, no odour, leaf litter on surface	Clear, colourless, no odour. Reeds growing in river. Flowing.	Clear, colourless, very minor suspended solids, no odour. Reeds growing in river. Flowing, minor vegetation on the banks of the stream and within the water body	Clear, colourless, no odour. Reeds growing on river bank. Flowing. Very minor vegetation within water body.
Analyte grouping/Analyte					Units	LOR									
Inorganics															l
Ammonia (as N)	0.5	0.9		-	ma/l	0.01	< 0.01	-	_	-	-	-	-	-	-
Conductivity (at 25@°C)	-	-	-	-	uS/cm	100	1000	-	-						
Nitrate & Nitrite (as N)	-	-	400	100	ma/l	0.05	<0.05	-	-	-	-	-	-	-	-
Nitrate (as N)	50	3.5	30	10	mg/L	0.03	<0.03	-	-	-	-	-	-	_	_
Nitrite (as N)	30	-	-	-	ma/l	0.02	<0.02	-	-	-	-	-	-	-	-
pH (at 25@°C)	-	-	-	800-1200	pH units	0.02	7.7	-	-	-	-	-	-	-	-
Phosphate total (as P)	-	-	-	-	ma/l	0.05	0.04	-	-	-	-	-	-	-	-
Total Dissolved Solids Dried at 180°C + 2°C	-	_	-	-	mg/L	0.005	0.01	_	-	-	_	_	-	_	_
Total Kieldahl Nitrogen (as N)	0.8	-	-	25-125	ma/l	0.005	0.55	-	-	-	-	-	-	-	-
Total Nitrogen (as N)	-	-	-	-	mg/L	0.2	0.5	-	-	-	-	-	-	-	-
Total Suspended Solids Dried at 105°C	-	0.7	-	-	ma/L	0.005	0.0064	-	-	-	-	-	-	-	-
Turbidity	-	-			NTU	1	2.7	-	-	-	-	-	-	-	-
					1 1110										
Total Metals												•		•	•
Aluminium	2 ^d	NA	NA	NA	ma/L	0.05	-	< 0.05	0.72	< 0.05	< 0.05	< 0.05	< 0.05	0.09	0.26
Arsenic	0.1	NA	NΔ	NA	mg/l	0.001	< 0.001	0.001	< 0.001	0.001	< 0.001	< 0.001	< 0.001	<0.001	< 0.001
Barium	2	NA	NA	NA	ma/L	0.001	-	0.12	0.02	0.08	0.1	0.06	0.06	0.07	0.08
Bervllium	0.6	NA	NA	NA	ma/L	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Cadmium	0.002	NA	NA	NA	ma/l	0.0002	< 0.0002	< 0.0002	0.0003	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Chromium	0.5	NA	NA	NA	ma/L	0.001	-	< 0.001	0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.002	< 0.001
Cobalt	-	NA	NA	NA	ma/L	0.001	< 0.001	0.003	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.001
Copper	20	NA	NA	NA	ma/L	0.001	< 0.001	< 0.001	0.008	< 0.001	< 0.001	0.001	0.002	0.003	0.003
Iron	3	NA	NA	NA	ma/l	0.05	-	3.2	0.76	0.51	0.27	0.17	0.3	0.51	0.66
Lead	0.1	NA	NA	NA	ma/L	0.001	< 0.001	< 0.001	0.002	0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.002
Manganese	5	NA	NA	NA	ma/L	0.005	0.37	1.9	0.035	0.066	0.12	0.033	0.07	0.13	0.4
Mercury	0.01	NA	NA	NA	mg/L	0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	<0.0001	< 0.0001
Nickol	0.2	NA	NA	NA	mg/L	0.001	0.001	0.002	0.002	0.001	< 0.001	0.002	0.001	0.002	0.002
Zinc	30	NA			mg/L	0.001	< 0.001	0.002	0.002	0.001	< 0.001	0.002	0.001	0.002	0.002
Zine	50	NA	NA	NA	IIIg/L	0.005	< 0.005	0.022	0.12	0.009	< 0.005	0.011	0.024	0.029	0.025
Dissolved Motols															
Dissolved Metals	NIA	0.055	20			0.05	11	1	0.41	10.05	10.05	10.05	10.05	10.05	± 0.0E
Dissolved Aluminium	NA	0.055	20	5	mg/L	0.05	-	-	0.41	< 0.05	< 0.05	< 0.05	< 0.05	<0.05	< 0.05
Dissolved Alsellic	NA NA	0.024	2	0.5-5	mg/L	0.001	< 0.001	-	< 0.001	< 0.001	0.003	< 0.001	< 0.001	<0.001	< 0.001
Dissolved Bandlium	INA NA	-	-	-	riig/L	0.001	-	-	0.02	0.09	0.11	0.06	0.06	0.07	0.07
Dissolved DeryIIIuIII	NA NA	-	0.5	-	mg/L	0.001	< 0.001	-	< 0.001	< 0.0001	< 0.001	< 0.001	< 0.001	<0.0001	< 0.001
Dissolved Caumium	NA NA	0.00054	0.05	0.01	mg/L	0.0002	< 0.0002	-	0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	<0.0002	< 0.0002
	INA NA	0.0025	1	1	ma/L	0.001		-	0.001	< 0.001	< 0.001	< 0.001	< 0.001	<0.001	< 0.001
Dissolved Copper	INA NA	0.0014	0.1		mg/L	0.001	< 0.001	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	<0.001	< 0.001
Dissolved Iron	INA NA	0.0014	5	0.4-5	mg/L	0.001	< 0.001	-	0.007		0.003	<u> </u>	0.002	0.003	0.002
Dissolved Lead	NA NA	0.0034	10		mg/L	0.05	- 0.001	-	0.31	U.15	0.09	0.07	0.10	<u> </u>	0.09
Dissolved Manganese	NA NA	1.0	10	not sufficiently toyic	mg/L	0.001	0.33	-	0.001	0.001	0.001	V 0.001	0.001	0.10	0.001
Dissolved Marcury	NA NA	0.00006	0.002		mg/L	0.000	- 0.0001	-	< 0.020	< 0.004	< 0.001	< 0.001	< 0.001	<0.001	< 0.001
Dissolved Mercury	NA NA	0.00006	0.002	0.002	IIIg/L	0.0001	< 0.0001	-	< 0.0001	< 0.0001	< 0.001	< 0.0001	< 0.0001	<0.0001	< 0.0001
Dissolved NICKEI	INA NA	0.0275		1	IIIG/L	0.001	< 0.001	-	0.002	0.001	< 0.001	0.002	0.001	0.001	100.0
Dissolved Zinc	NA	0.02	5	20	mg/L	0.005	< 0.005	-	0.1	0.01	< 0.005	0.008	0.018	0.023	0.011
Total Recoverable Hydrosonhone 2012 1150	A Exactions					l	Ш	l			l	l	l	I	
Nanhthalono	17	16				10									
	1/	10	-	-	µg/L	10	<10	-	-	-				-	-
	-	-	-	-	µg/L	50	<50	-	-	-	-	-	-	-	-
IRH >C10-C16 less Naphthalene (F2)	-	-	-	-	µg/L	50	<50	-	-	-	-	-	-	-	-
IKH >C10-C40 (total)*	-	-	-	-	µg/L	100	<100	-	-	-	-	-	-	-	-
IKH >016-034	-	-	-	-	µg/L	100	<100	-	-	-	-	-	-	-	-
IRH >C34-C40	-	-	-	-	µg/L	100	<100	-	-	-	-	-	-	-	-
TRH C6-C10	-	-	-	-	µg/L	20	<20	-	-	-	-	-	-	-	-
TRH C6-C10 less BTEX (F1)	-	-	-	-	µg/L	20	<20	-	-	-	-	-	-	-	-
	l						<u> </u>								
DTEV															
DIEA Poptopo	10	050				-	11								
Denzene	10	950	-	-	µg/L	1	< 1	-	-	-	-	-	-	-	-
Ethylbell2elle	3000	σU	-	-	µg/L	1	< 1	-	-	-	-		-	-	-
	-	-	-	-	µg/L	2	< 2	-	-	-	-	-	-	-	-
U-Aylene	-	-	-	-	µg/L	1	< 1	-	-	-	-	-	-	-	-
Toluene Vulance Tatal	8000	180	-	-	µg/L	1	< 1	-	-	-	-	-	-	-	-
Aylenes - Toldi	6000	200	-	-	µg/L	3	< 3	-	-	-	-		-	-	-

- indicates no criterion available LOR = Limit of Reporting Concentrations below the LOR noted as <value NOC = No observed contamination Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG 2018) Australia and New Zealand Environment and Conservation Council (2000) Australian and New Zealand Guidelines for Fresh and Marine Water Quality. ANZECC, NEPM and NHMRC guidelines for mercury are based on total mercury.
 ^aEnRiskS (2020) Advice on risks to human health and the environment: Boyd Street and publicly accessible areas, Tarago NSW
 ^bRecreational criteria adopted are 10 x Australian Drinking Water Gudielines ADWG (2011)

^cANZG (2018) Australian and New Zealand Guidelines for Fresh and Marine Water Quality.

⁴The recreational criteria for aluminium is based on aesthtic issues post flocculation and is not indicative of risks to human health. Concentrations in blue font exceed human health recreational screening criteria Concentrations in grey box exceed ecological screening criteria Concentrations in **bold** exceed irrigation screening criteria Concentrations in *italics* exceed stockwatering screening criteria



Client: TfNSW Job No: 3180001376

Project Name: December 2022 Surface Water Monitoring Report 12-01-23

Table 11: SW9 Analytical Results

					Sample Typ	e:	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
					Lab ID		S20-Ja29062	S20-Ap12293	S20-Au23124	S20-Oc25167	S21-Ja34965	S21-Ap22339	N21-JI30459	S22-Se00368	N22-De0031042
					Sample date	e:	29-Jan-20	2-Apr-20	20-Aug-20	12-Oct-20	28-Jan-21	14-Apr-21	13-Jul-21	13-Sep-22	12-Dec-22
	-				Sample ID:		SW9	SW9	SW9	SW9	SW9	SW9	SW9	SW9	SW9
					Project Nan	ne:	Tarago Sw Monitoring	Tarago SW Monitorina	Tarago Sw Monitoring	Tarago Sw Monitoring	Monitoring	Tarago Sw Monitoring	Monitoring	Tarago Sw Monitoring	Monitoring
					Project No:		318000780	318000780	318000780	318000780	318000780	318000780	318000780	318001376	318001376-001
					Commission		Tarras Dail Lass	Tarrasa Dail Lasa	Tarras Deillaan	Tarrana Dail Laan	Tarras Dail Lass	Tarras Dail Laan	Tarrasa Dail Lasa	Tanaga Dail Camidan	Tanaa Dail Camidan
	Health-based	Ecological			Sample Loc	ation	Tarago Rali Loop	Tarago Rali Loop	Tarago Rali Loop	Tarago Rali Loop	Tarago Rail Loop	Tarago Rali Loop	Tarago Rail Loop	Tarago Rall Corridor	Tarago Rall Corridor
	Screening Criteria	Sceening Criteria (ANZG 95%	ANZECC Fresh Water Guidelines -	ANZECC Fresh Water Guidelines -	Sampling M	ethod:	Grab Sample	Grab Sample	Grab Sample	Grab Sample	Grab Sample	Grab Sample	Grab Sample	Grab Sample	Grab Sample
	(Recreational Waters) ^B	Protection) Fresh	Irrigation ^D	Stock Water ^E										Light brown to	Clean alightly because
Guidelines		water			Sample Des	cription:	Stagnant pond. Algae and fish present. Slightly turbid.	Non-turbid, slightly brown, not flowing but full.	High level, brown, slightly turbid, bubbles at surface.	Water flowing, clear/brown, slightly turbid.	Clear, low turbidity, no observable contamination	Very pale yellow, no odour	Clear, colourless, no odour. Flowing.	brown, slightly murky, slightly turbid, no odour. Flowing, minor vegetation and moss on the banks of the stream and within the waterbody.	very slightly turbid, no odour. Grasses growing along river bank. River flowing. Erosion observed on river bank from recent heavy rainfall
Analyte grouping/Analyte					Units	LOR									
······,···]·····]····]···															
Inorganics						•									
Ammonia (as N)	0.5	0.9	-	-	mg/L	0.01	-	-	-	-	-	-	-	-	
Lonductivity (at 25@°C)	-	-	-	-	µS/cm	100	-	-	-	-	-	•	-	-	-
Nitrate & Nitrite (as N)	- 50	- 25	400	100	mg/L	0.05	-	-	-	-	-	-	-	-	
Nitrite (as N)	30	- 3.5		- 10	mg/L	0.02		-	-	-	-	-	-	-	t <u>-</u>
nH (at 25@°C)	-	-	-	800-1200	nH unite	0.02		-	-	-	-	-	-	-	t <u>-</u>
Phosphate total (as P)	-	-	-	-	ma/l	0.1					-				<u> </u>
Total Dissolved Solids Dried at 180°C ± 2°C	-	-	-	-	ma/l	0.005	-	-	-	-	-	-	-	-	-
Total Kieldahl Nitrogen (as N)	0.8	-	-	25-125	mg/L	0.005	-	-	-		-	· .	-	-	-
Total Nitrogen (as N)	-	-	-	-	mg/L	0.2	-	-	-	-	-	-	-	-	-
Total Suspended Solids Dried at 105°C	-	0.7	-	-	mg/L	0.005	-	-	-	-	-	-	-	-	-
Turbidity	-	-			NTU	1	-	-	-	-	-	-	-	-	-
Total Metals						-				-	1	-			
Aluminium	2 ^d	NA	NA	NA	mg/L	0.05	-	0.05	0.53	< 0.05	< 0.05	< 0.05	< 0.05	<0.05	0.07
Arsenic	0.1	NA	NA	NA	mg/L	0.001	0.001	0.001	< 0.001	0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.001
Barium	2	NA	NA	NA	mg/L	0.001	-	0.08	0.02	0.09	0.11	0.06	0.07	0.07	0.1
Beryllium	0.6	NA	NA	NA	mg/L	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Cadmium	0.002	NA	NA	NA	mg/L	0.0002	< 0.0002	< 0.0002	0.0004	< 0.0002	< 0.0002	< 0.0002	< 0.0002	<0.0002	< 0.0002
Chromium	0.5	NA	NA	NA	mg/L	0.001	-	< 0.001	0.002	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Cobalt	-	NA	NA	NA	mg/L	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.001
Copper	20	NA	NA	NA	mg/L	0.001	< 0.001	0.001	0.01	< 0.001	< 0.001	0.001	0.002	0.003	0.001
Iron	3	NA	NA	NA	mg/L	0.05	-	0.54	0.6	0.15	0.15	0.25	0.29	0.46	1.5
Lead	0.1	NA	NA	NA	mg/L	0.001	< 0.001	< 0.001	0.002	0.001	< 0.001	< 0.001	< 0.001	<0.001	< 0.001
Manganese	5	NA	NA	NA	mg/L	0.005	0.19	0.33	0.041	0.03	0.24	0.044	0.033	0.084	0.96
Mercury	0.01	NA	NA	INA NA	mg/L	0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.001	< 0.0001	< 0.0001	< 0.0001	<0.0001	< 0.0001
Nickel	0.2	NA	NA	NA	mg/L	0.001	0.002	0.002	0.002	0.001	0.001	0.002	0.002	0.001	0.002
ZINC	30	NA	NA	NA	mg/L	0.005	0.009	0.015	0.16	0.008	0.008	0.014	0.038	0.042	0.013
Dissolved Metals		0.055			1 0	0.05				0.05	0.05	0.05		0.05	
	NA	0.055	20	5	mg/L	0.05	-	-	0.35	< 0.05	< 0.05	< 0.05	< 0.05	<0.05	< 0.05
Dissolved Arsenic	NA	0.024	2	0.5-5	mg/L	0.001	< 0.001	-	< 0.001	< 0.001	0.003	< 0.001	< 0.001	< 0.001	< 0.001
Dissolved Barium	NA	-	-	-	mg/L	0.001	-	-	0.02	0.09	0.12	0.06	0.06	0.06	0.08
Dissolved Beryllium	NA	-	0.5	-	mg/L	0.001	< 0.001	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	<0.001	< 0.001
Dissolved Cadmium	NA	0.00054	0.05	0.01	mg/L	0.0002	< 0.0002	-	0.0004	< 0.0002	< 0.0002	< 0.0002	< 0.0002	<0.0002	< 0.0002
	NA NA	0.0025			rrig/L	0.001	-	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	<0.001	< 0.001
Dissolved Coppor	NA NA	0.0014	0.1	1	mg/L	0.001	< 0.001	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.001
Dissolved Iron	NA NA	0.0014	10	not sufficiently toxic	ma/l	0.001		-	0.000	< 0.001	< 0.004	0.001	0.002	0.003	0.001
Dissolved Lead	NΔ	0.0034	5		ma/l	0.001	< 0.001	-	< 0.01	< 0.03	< 0.03	< 0.12	< 0.001	<0.20	< 0.05
Dissolved Manganese	ΝA	1 9	10	not sufficiently toxic	mg/L	0.001	0.012	-	0.036	0.023	0.17	0.001	0.03	0.078	0.85
Dissolved Marguny	NA	0.00006	0.002		mg/L	0.0001	< 0.0012	_	< 0.0001	< 0.0001	< 0.001	< 0.001	< 0.0001	<0.0001	< 0.001
	NA NA	0.00000	0.002	0.002	mg/L	0.0001	< 0.0001	_	0.0001	0.001	0.001	0.0001	0.001	0.001	0.0001
Dissolved Nickel	NA NA	0.0275	5	20	mg/L	0.001	< 0.001		0.002	< 0.001	0.001	0.002	0.001	0.001	0.002
	INA.	0.02	, ,	20	IIIg/L	0.005	< 0.005		0.14	< 0.005	0.000	0.01	0.054	0.050	0.007
Total Deseverable Hydrosarbons 2013 NED	M Exactions														
Nanhthalana		16				10	<10			1	I	1			
	- 1/	- 10	-	-	µq/L	10	<10	-	-	-	-	-	-	-	-
					µg/L	50	<50	-	-	-	-	-	-	_	
	-	-	-	-	µg/L	30	< 50	-	-	-	-	-		-	-
IKT 2010-040 (1000)"	-		-	-	µg/L	100	<100	-	-		-			-	
	-		-	-	µg/L	100	<100	-	-					-	
	-		-	-	µg/L	100	<100	-	-					-	
TRH C6-C10 less BTFY (F1)		-	-	-	µg/L	20	~20	-	-	-		-		-	+ <u>-</u>
	-	-	-	-	µy/L	20	~20	-	-	-	-	-	-	-	-
											1		I		
BTEX															
Benzene	10	950	-	-	µa/L	1	< 1	-	-	-	-	-	-	-	-
Ethylbenzene	3000	80	-	-	μg/L	1	< 1	-	-	-	-	-	-	-	-
m&p-Xylenes	-	-	-	-	μg/L	2	< 2	-	-	-	-	-	-	-	-
o-Xylene	-	-	-	-	µg/L	1	< 1	-	-	-	-	-	-	-	-
Toluene	8000	180	-	-	µg/L	1	< 1	-	-	-	-	-	-	-	
Xylenes - Total	6000	200	-	-	µg/L	3	< 3	-	-	-	-	-	-	-	-
		1													1

- indicates no criterion available LOR = Limit of Reporting Concentrations below the LOR noted as <value NOC = No observed contamination Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG 2018) Australia and New Zealand Environment and Conservation Council (2000) Australian and New Zealand Guidelines for Fresh and Marine Water Quality. ANZECC, NEPM and NHMRC guidelines for mercury are based on total mercury. ^{Arg} Field (2020) Addition are include to human bucht and the province the province of Chart and Arghenergy Hongenergy.

ANZECC, NEPM and NHMRC guidelines for mercury are based on total mercury. ^aEnRiskS (2020) Advice on risks to human health and the environment: Boyd Street and publicly accessible areas, Tarago NSW ^bRecreational criteria adopted are 10 x Australian Drinking Water Gudielines ADWG (2011) ^cANZG (2018) Australian and New Zealand Guidelines for Fresh and Marine Water Quality. ^dThe recreational criteria for aluminium is based on aesthtic issues post flocculation and is not indicative of risks to human health. Concentrations in blue font exceed human health recreational screening criteria Concentrations in **bold** exceed ecological screening criteria Concentrations in **bold** exceed irrigation screening criteria Concentrations in *italics* exceed stockwatering screening criteria

RAMBOLL

					Sample Typ	e:	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
					Lab ID		S20-Oc25153	S21-Ja34966	S21-Ap22340	N21-JI30460	S22-Se00368	N22-De0031043
					Sample date	e:	13-Oct-20	28-Jan-21	14-Apr-21	13-Jul-21	13-Sep-22	12-Dec-22
					Sample ID:		SW10	SW10	SW10	SW10	SW10	SW10
					Droject Non		Tarago SW	Tarago SW	Tarago SW	Tarago SW	Tarago SW	Tarago SW
					Project Nan	ne:	Monitoring	Monitoring	Monitoring	Monitoring	Monitoring	Monitoring
					Project No:		318000780	318000780	318000780	318000780	318001376	318001376-001
	Health-based	Ecological			Sample Loc	ation	Tarago Rail Loop	Tarago Rail Loop	Tarago Rail Loop	Tarago Rail Loop	Tarago Rail Corridor	Tarago Rail Corridor
	Screening Criteria (Recreational	(ANZG 95%) Protection) Fresh	Water Guidelines -	ANZECC Fresh Water Guidelines - Stock Water ^E	Sampling M	ethod:	Grab Sample	Grab Sample	Grab Sample	Grab Sample	Grab Sample	Grab Sample
Guidelines	Waters) ^B	Water ^c	Ingaton	Stock water	Sample Des	scription:	Water flowing, clear/brown, slightly turbid, no odour.	Clear, low turbidity, no observable contamination	Clear, no odour	Clear to slighty turbid, colourless, no odour. Flowing.	very minor suspended solids, no odour. Flowing, minor vegetation and moss on the banks of the stream and within the	Clear, colourless, no odour. Flowing. Reeds and grasses growing on river bank
Analista successiva (Analista					Unite	100						
Analyte grouping/Analyte					Units	LOR						
Total Metals												
Aluminium	2 ^d	NΔ	NA	NA	ma/l	0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.09	0.42
Δrsenic	0.1	NA	NA	NA	mg/L	0.001	0.001	< 0.00	< 0.05	< 0.05	<0.001	< 0.001
Barium	2	NA	NA	NA	mg/L	0.001	0.001	0.001	0.06	0.001	0.07	0.001
Bervllium	0.6	NA	NA	NA	mg/L	0.001	< 0.001	< 0.001	< 0.001	< 0.001	<0.001	< 0.001
Cadmium	0.002	NA	NA	NA	mg/L	0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	<0.0002	< 0.0002
Chromium	0.5	NA	NA	NA	ma/L	0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.002	< 0.001
Cobalt	-	NA	NA	NA	ma/L	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Copper	20	NA	NA	NA	mg/L	0.001	< 0.001	< 0.001	0.001	0.002	0.003	0.003
Iron	3	NA	NA	NA	mg/L	0.05	0.55	0.79	0.24	0.29	0.53	0.79
Lead	0.1	NA	NA	NA	mg/L	0.001	0.002	< 0.001	< 0.001	< 0.001	< 0.001	0.002
Manganese	5	NA	NA	NA	mg/L	0.005	0.089	0.31	0.036	0.066	0.13	0.41
Mercury	0.01	NA	NA	NA	mg/L	0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Nickel	0.2	NA	NA	NA	mg/L	0.001	0.001	< 0.001	0.002	0.002	0.002	0.002
Zinc	30	NA	NA	NA	mg/L	0.005	0.013	< 0.005	0.013	0.032	0.031	0.023
Dissolved Metals										•	•	•
Aluminium (filtered)	NA	0.055	20	5	mg/L	0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Arsenic (filtered)	NA	0.024	2	0.5-5	mg/L	0.001	< 0.001	0.002	< 0.001	< 0.001	< 0.001	< 0.001
Barium (filtered)	NA	-	-	-	mg/L	0.001	0.11	0.11	0.06	0.06	0.07	0.08
Beryllium (filtered)	NA	-	0.5	-	mg/L	0.001	< 0.001	< 0.001	< 0.001	< 0.001	<0.001	< 0.001
Cadmium (filtered)	NA	0.00054	0.05	0.01	mg/L	0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	<0.0002	< 0.0002
Chromium (filtered)	NA	0.0025	1	1	mg/L	0.001	< 0.001	< 0.001	< 0.001	< 0.001	<0.001	< 0.001
Cobalt (filtered)	NA	0.0014	0.1	1	mg/L	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Copper (filtered)	NA	0.0014	5	0.4-5	mg/L	0.001	< 0.001	0.003	< 0.001	0.002	0.003	0.002
Iron (filtered)	NA	-	10	not sufficiently toxic	mg/L	0.05	0.11	0.8	0.08	0.18	0.24	0.08
Lead (filtered)	NA	0.0034	5	0.1	mg/L	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Manganese (filtered)	NA	1.9	10	not sufficiently toxic	mg/L	0.005	0.089	0.33	0.023	0.057	0.12	0.35
Mercury (filtered)	NA	0.00006	0.002	0.002	mg/L	0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	<0.0001	< 0.0001
Nickel (filtered)	NA	0.0275	2	1	mg/L	0.001	< 0.001	< 0.001	0.001	0.001	0.001	0.002
Zinc (filtered)	NA	0.02	5	20	mg/L	0.005	0.006	< 0.005	0.008	0.025	0.025	0.007

- indicates no criterion available

LOR = Limit of Reporting

Concentrations below the LOR noted as <value

NOC = No observed contamination

Australia and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG 2018) Australia and New Zealand Environment and Conservation Council (2000) Australian and New Zealand Guidelines for Fresh and Marine Water Quality.

ANZECC, NEPM and NHMRC guidelines for mercury are based on total mercury.

^aEnRiskS (2020) Advice on risks to human health and the environment: Boyd Street and publicly accessible areas, Tarago NSW

^bRecreational criteria adopted are 10 x Australian Drinking Water Gudielines ADWG (2011)

^cANZG (2018) Australian and New Zealand Guidelines for Fresh and Marine Water Quality.

^dThe recreational criteria for aluminium is based on aesthtic issues post flocculation and is not indicative of risks to human health.

Concentrations in blue font exceed human health recreational screening criteria

Concentrations in grey box exceed ecological screening criteria

Concentrations in **bold** exceed irrigation screening criteria

Concentrations in *italics* exceed stockwatering screening criteria



	1		1			1		
	Sample Type	e:	Surface Water	Surface Water		Surface Water	Surface Water	
	Dunlinste To	-	Intra Laborat	on: Duplicate		Inter Laborat	on Duplicate	
	Duplicate Ty	pe:	IIIU a-Laborat			IIItel-Laborat		
	Lab ID		N22-De0031035	N22-De0031044		N22-De0031035	ES2245721001	
	Sample date		13-Dec-23	13-Dec-23		13-Dec-23	13-Dec-23	
	Sample date	•	15 Dec 25	15 Dec 25		15 Dec 25	15 Dec 25	
	Sample ID:		SW1	D01		SW1	T01	
			-	-		-	-	
	Project Nam	e:	Tarago SW Monitoring	Tarago SW Monitoring		Tarago SW Monitoring	Tarago SW Monitoring	
					RPD %			RPD %
	Project No:		318001376-001	318001376-001	KFD /0	318001376-001	318001376-001	KFD /0
	.		To a Dail Consider	The second second		To a Dail Consider	The second second	
	Sample Loca	ition	Tarago Rail Corridor	Tarago Rail Corridor		Tarago Rail Corridor	Tarago Rail Corridor	
	Sampling Me	ethod:	Grab Sample	Grab Sample		Grab Sample	Grab Sample	
				•		•	•	
Analyte grouping / Analyte	Unite							
inalite grouping/ inalite	onito	LOK	1					
Inorganics								
Ammonia (ac N)	ug/l	10	_	_	_	_	_	-
	µy/L	10	-	-		-	-	-
Ammonium Ion (as N)	µg/L	10	-	-	-	-	-	-
Conductivity (at 25@°C)	uS/cm	1	_	_	_	_	_	-
	µ3/cm	1						
Nitrate & Nitrite (as N)	µg/L	50	-	-	-	-	-	-
Nitrate (as N)	un/l	20	-	_	-	_	_	-
	µ9/⊏	20						
Nitrite (as N)	µg/L	20	-	-	-	-	-	-
pH (at 25@°C)	pH units	0.1	-	-	-	-	-	-
Phoenhata total (as D)		50						
	µg/L	50	-	-	-	-	-	-
Total Dissolved Solids Dried at 180°C ± 2°C	mg/L	10	-	-		-	-	- 7
Total Kieldahl Nitrogen (as N)	10/	200	_	_	_	_	_	_
	µg/L	200	-	-	-	-	-	-
Iotal Nitrogen (as N)	µg/L	200	-	-	-	-	-	
Total Suspended Solids Dried at 105°C	ma/l	5	-	_	-	-	_	-
		5	1					
ו ערטועוגא	NTU	1	-	-	-	-	-	-
Total Matala						•		
i otal metals								
Aluminium	ma/L	0.05	< 0.05	< 0.05	-	< 0.05	0.02	-
Arconic		0.001	< 0.001	< 0.001		< 0.001	<0.001	
Arsenic	mg/L	0.001	< 0.001	< 0.001	-	< 0.001	<0.001	-
Barium	mg/L	0.001	0.07	0.06	15.4	0.07	0.052	29.5
Bervllium		0.001	< 0.001	< 0.001	-	< 0.001	<0.001	
Derymun	IIIg/L	0.001	< 0.001	< 0.001	-	< 0.001	<0.001	-
Cadmium	mg/L	0.0002	< 0.0002	< 0.0002	-	< 0.0002	<0.0001	-
Chromium	ma/l	0.001	< 0.001	< 0.001	-	< 0.001	< 0.001	-
	iiig/L	0.001	< 0.001	< 0.001		< 0.001	<0.001	
Cobalt	mg/L	0.001	< 0.001	< 0.001	-	< 0.001	< 0.001	-
Copper	ma/l	0.001	0.00	0.00	0.0	0.00	< 0.001	-
tooppe.	1119/ L	0.001	0.00	0.00	0.0	0.00	0.001	
Iron	mg/L	0.05	0.23	0.23	0.0	0.23	0.14	48.6
Lead	ma/L	0.001	< 0.001	< 0.001	-	< 0.001	< 0.001	-
 Meneeree		0.005	0.02	0.02	74	0.02	0.02	26.4
Manganese	mg/L	0.005	0.03	0.03	7.4	0.03	0.02	30.4
Mercury	mg/L	0.0001	< 0.0001	< 0.0001	-	< 0.0001	< 0.0001	-
Nickol	ma/l	0.001	0.00	< 0.001		0.001	<0.001	
Nickel	III9/L	0.001	0.00	< 0.001		0.001	<0.001	-
Zinc	mg/L	0.005	0.02	0.02	5.4	0.019	0.008	81.5
D's set of Matala								
Dissolved Metals								
Aluminium (filtered)	ma/L	0.05	< 0.05	< 0.05	-	< 0.05	< 0.01	-
Arconic (filtered)		0.001	10.001	+ 0.001		1.0.001	10.001	
Arsenic (nitered)	mg/L	0.001	< 0.001	< 0.001	-	< 0.001	<0.001	-
Barium (filtered)	mg/L	0.001	0.06	0.06	0.0	0.060	0.052	14.3
Beryllium (filtered)	ma/l	0.001	< 0.001	< 0.001	-	< 0.001	< 0.001	-
	IIIg/L	0.001	< 0.001	< 0.001		< 0.001	<0.001	-
Cadmium (filtered)	mg/L	0.0002	< 0.0002	< 0.0002	-	< 0.0002	<0.0001	-
Chromium (filtered)	ma/l	0.001	< 0.001	< 0.001	-	< 0.001	< 0.001	-
	iiig/L	0.001	< 0.001	< 0.001		< 0.001	<0.001	
Cobalt (filtered)	mg/L	0.001	< 0.001	< 0.001	-	< 0.001	< 0.001	-
Conner (filtered)	ma/l	0.001	< 0.001	< 0.001	-	< 0.001	< 0.001	-
Tron (filtered)		0.001	0.10	0.001	10.5	0.10	0.14	22.2
Iron (filtered)	mg/L	0.05	0.10	0.09	10.5	0.10	0.14	33.3
Lead (filtered)	mg/L	0.001	< 0.001	< 0.001		< 0.001	< 0.001	- 7
Manganaga (filtared)		0.005	0.02	0.02	4.2	0.024	0.015	46.2
manyanese (IIItereu)	mg/L	0.005	0.02	0.02	4.3	0.024	0.015	40.2
Mercury (filtered)	mg/L	0.0001	< 0.0001	< 0.0001	-	< 0.0001	< 0.0001	-
Nickel (filtered)	ma/l	0.001	< 0.001	< 0.001	-	< 0.001	<0.001	-
	IIIg/L	0.001	< 0.001	< 0.001		< 0.001	<0.001	_
LINC (TIITERED)	mg/L	0.005	0.02	0.02	0.0	0.016	0.007	78.3
Total Deservership Underservising 1000 NEDM Frestians								
Total Recoverable Hydrocarbons - 1999 NEPM Fractions								
TRH C10-C14	µq/L	50	-	-	-	-	-	-
TRH C10-C36 (Total)	10/	100	_			-		-
	µy/L	100	-	-	-	-	-	-
IRH C15-C28	μg/L	100	-	-	-	-	-	-
TRH C29-C36	10/1	100	-	_	-	_	_	-
TPU 66 60	P9/L	100	1			l		
1KH CO-CY	µg/L	20	-	-	-	-	-	-
Total Deseverable Hydrosarbons 2013 NEDM Erections								
I GLAI RECOVERABLE HYDROCARDONS - 2013 NEPM FRACTIONS								
Naphthalene	µg/L	10	-	-		-	-	- 7
TPH >C10_C16	uc/l	50	1			i		
	µg/L	50	-	-	-	-	-	-
TRH >C10-C16 less Naphthalene (F2)	µg/L	50	-	-		-	-	- 7
TBH >C10-C40 (total)*	1.0/L	100	_	_	_	_	_	_
	µg/L	100	-	-	-	-	-	-
TRH >C16-C34	µg/L	100	-	-	-	-	-	-
TRH >C34-C40	ug/I	100	_	_	-	-	_	-
	μy/L	100	-	=	-	-	=	-
TRH C6-C10	µg/L	20	-	-	-	-	-	-
TRH C6-C10 less BTEX (F1)	μα/Ι	20	-	-	-	-	-	-
	µ9/∟	20	1			1		L
						l		
BTEX								
Bonzono		1						
benzene	µg/L	T	-	-	-	-	-	-
Ethylbenzene	µq/L	1	-	-		-	-	- 7
m&n-Yylenec	1.5/-	n	1			1		
map-sylenes	µg/L	۷	-	-	-	-	-	-
o-Xylene	µq/L	1	-	-	-	-	-	-
Toluene	1. g/ =	1	1					
	µg/L	1	-	-	-	-	-	-
Xylenes - Total	µg/L	3	-	-	-	-	-	-

LOR = Limit of Reporting ND = not calculated as one or more results are below the LOR. Bold and Shaded cells exceed RPD >30% Bold indicates when above the acceptance criteria for Trip Spikes/Blanks and Rinsates Blank Cell indicates not analysed



Ramboll - Tarago, NSW

APPENDIX 4 LABORATORY REPORTS

Z:\Projects\Transport for NSW\318001376 - Tarago Rail Corridor\7. Reports\T3 - SW Monitoring\202212 December\318001376-T3-SW Monitoring Report (December 2022).docx

	curonina crivironmenti resting, ABN 5	50 005 085 521		+61 2 9900	8400 E	EnviroSampl	leNSW@euro	ofins.com		+61 7 390	2 4600 Ei	viroSampleQLI	O@eurofins.com		+61 8 6253 4	ia Road, we 1444 Eisvin	oSample	VA 6106 VA@euro	ofins.com				+61 3 8	arey Road 3564 5000	EnviroSample	ath VIC 3175 Vic@eurofins.co	m
Company	Ramboll Australia		Proje	ect №	31	8001376		_			Project	Manager	Stephen N	axwell					Sample	r(s)		S. Bucl	kley /	J. Cow	burn		
Address	50 Glebe Road, The Junction,	, NSW 2291	Project	t Name	31	8001376					EDD ESdat, i	Format EQuIS etc	Esdat, EQ	JIS, PDF, Exe	cel			Hai	nded o	/er by		S. Bucl	kley				
			Filtered".	Ni, Zn)	, Hg, Ni,							1						Em	ail for I	voice		smaxw	ell@r	amboll.	.com		
Contact Name	Sam Buckley		Total or UITE prici	Mn, Hg	Pb, Mn								Π.					Em	ail for R	esults	:	smaxw	ell@r	amboll.	.com / sbuck	iey@rambol	l.com
Phone №	0481 384 112		ses se specify b attract S	Fe, Pb,	Cu, Fe,													¢	Change co	Co ontainer	tainers type & siz	s ze if necer	ssary.		Required Tu Default wil	u rmaround Ti I be 5 days if not	me (TA ticked.
pecial Directions			Analys s are requested, pleas 5 code must be used (r	e, Cd, Cr, Co, Cu,	a, Be, Cd, Cr, Co, Zn)													U		lase	-	ottle	(Total)	(peolved)] Overnight	+Surcharg (reporting by	e will app 9am)♦ 1ay ♦
Quote ID N2			Where metal	; (AI, As, Ba, B	etals (AI, As, B													500mL Plasti	250mL Plast	Oml. Amher G	40mL VOA vi	0mL PFAS Bo	Plastic Bottle	Plastic Bottle (Di	☐ 2 days●] 5 days (Ste] Other(∟ 3 c andard)	ays♦
	Client Sample ID	Sampled Date/Time dd/mm/yy hh.mm	Matrix Solid (S) Water (W)	Total Metals	Dissolved M					-										20		20	60mL	90mL1	Samp Dangerous G	ole Commen Goods Hazar	ts d Warn
	SW1_UP	13/12/22	w	×	X	1.5											_						1	1			
	SW1	13/12/22	w	×	X																		1	1			
	SW2	13/12/22	w	X	X																		1	1			
	SW3	13/12/22	w	X	X								P										1	1			_
	SW4	13/12/22	w	X	X															1		3	1	1			
	SW6	13/12/22	w	X	X																		1	1			
	SW7	13/12/22	w	X	X				F														1	1			
	SW8	12/12/22	w	X	X															-			1	1			
	SW9	12/12/22	w	X	X																		1	1			
	SW10	12/12/22	w	×	X																			4			
		Total C	ounts	10	10													-				4	0	10			
Method or Shipment	Courier (#) 🔽 (Hand Delivered		D Po	stal	Na	me		Sam Bi	rckley		Signature						Date			44905	<u> </u>	×	Time		
	Received By	den slow	-910-e	SYD BM	VE MEL	PER	ADL I	I DRW	Signa	ture	h		1	Date	1	4/m	150		Time		0	. 00	a de		Temperature	1	0

Eurofins Environment Testing Australia Pty Ltd EnviroSales@eurofins.com

Submission of samples to the laboratory will be deemed as acceptance of Eurolins | Environment Teeting Standard Terms and Conditions unless agreed otherwise. A copy is available on request.

1/2

C State	HAIN OF CUSTOL Eurofins Environment Testing AB	DY RECORD 3N 50 005 085 521		Sydney Leboratory 179 Megowar Road, Giraween, NSW 2145 +61 2 9500 8400 EnviroSampleNSW@eurofins.com					V Brisbane Laboratory Perth Laboratory Jimaween, NSW 2145 Unit 1/21 Smallwood Place, Muranle, QLD 4172 46-48 Banksia Road, Welshpool, WA 61 nviroSampleNSW@eurofins.com +61 7 3902 4600 EnviroSampleQLD@eurofins.com +61 8 6253 4444 EnviroSampleQLD@eurofins.com											ofins.com		Melbourne Laboratory 6 Monterey Road Dandenong South VIC 3175 461 3 8554 5000 EnviroSammle/Vic@teurofine.com					
Company	Ramboll Australia		Proje	ect №	31	8001376					Project Mar	ager	Stepho	en Maxv	vell					Sample	r(s)		S. Buc	:kley /	/ J. Co	wburn	
Address	50 Glebe Road, The Junction	on, NSW 2291	Project	t Name	31	8001376					EDD Forr ESdal, EQuit	n <mark>at</mark> Sietc	Esdat,	EQuIS,	PDF, Exc	el		Handed over by					S. Buckley				
			"Filtered".	I, Ni, Zn)	n, Hg, Ni,														Em	ail for li	ivoice		smaxw	vell@i	rambo	xII.com	
Contact Name	Sam Buckley		Total or SUITE price	, Mn, Hg	, Pb, Mr														Em	ail for R	esults		SITIAXW	/ell@r	rambo	ill.com / sbuckley	/@ramboli.com
Phone №	481384112		rses se specify to attract 8	I, Fe, Pb	o, Cu, Fe															Change co	Con ontainer t	i <mark>tainer</mark> ype & si	S ze if nece	assary,		Required Turn Default will be	around Time (TA = 5 days if not ticked.
Special Directions			Analy e requested, plea	cd, Cr, Co, Cl	3e, Cd, Cr, Cr Zn)													-			60			otal)	(bev)	Overnight (re	♦Surcharge will apply porting by 9am)♦ 1 day ●
Purchase Order Quote ID №			Where metals an SUITE coo	, As, Ba, Be, C	s (Al, As, Ba, E											3			ImL, Plastic	ImL Plastic	Amber Glass	nL VOA vial	- PFAS Bottle	stic Bottle (To	ic Bottle (Disso	□ 2 days♦ ☑ 5 days (Stand	☐ 3 days♦ dard)
Ne	Client Sample ID	Sampled Date/Time dd/mm/yy hhumm	Matrix Solid (S) Water (W)	Total Metals (Al	Dissolved Metal														200	25(200ml	40n	500ml	60mL Pla	60mL Plast	Sample / Dangerous Goo	Comments ods Hazard Warni
	D01	13/12/22	w	X	×																			1	1		
	T01	13/12/22	w	X	X																			1	1	Please forwar	d to ALS
																										8.7.3	
										Ξ.				- 14													
					3																	E					
					1																			-			
																								+			
																								-			
i.																		_		-							
		Total C	Counts	2	2																			2	2		
Method of Shipment	Courier (#) 🖸	Hand Delivered		D Po	stał	Nam	e	5	Sam Buo	:kley		Signature) 6	for Fresh					Date		1	14/12/2	022		Time	
Laboratory Use On	Received By Jac	idyn Slo	ingon	SYD B	NE MEL	PER A		DRW	Signatu	ire	12	a	/	*	Date	(4/12/	22		Time		9:	001	4M	L	Temperature	8
	Received By			SYD B	NE MEL	PER A	DL NTL	DRW	Signatu	re					Date					Time						Report №	95004

Eurofins Environment Testing Australia Pty Ltd EnviroSales@eurofins.com

Submission of samples to the laboratory will be deemed as acceptance of Eurofins | Environment Testing Standard Terms and Conditions unless agreed otherwise. A copy is available on request.

2/2



Eurofins Environment Testing Australia Pty Ltd

ABN: 50 005 085 521			
Melbourne	Geelong	Sydney	Ca
6 Monterey Road	19/8 Lewalan Street	179 Magowar Road	Uni
Dandenong South	Grovedale	Girraween	Mite
VIC 3175	VIC 3216	NSW 2145	AC.
Tel: +61 3 8564 5000	Tel: +61 3 8564 5000	Tel: +61 2 9900 8400	Tel
NATA# 1261 Site# 1254	NATA# 1261 Site# 1254	NATA# 1261 Site# 18217	

nberra Brisbane 1.2 Dacre Street 1/21 Smallwood Place chell Murarrie T 2911 QLD 4172 +61 2 6113 8091 Tel: +61 7 3902 4600

Newcastle 4/52 Industrial Drive Mayfield East NSW 2304 PO Box 60 Wickham 2293 Tel: +61 2 4968 8448 NATA# 1261 Site# 20794 NATA# 1261 Site# 25079

www.eurofins.com.au

Eurofins ARL Pty Ltd Eurofins Environment Testing NZ Ltd ABN: 91 05 0159 898 Perth 46-48 Banksia Road Welshpool

Tel: +61 8 6253 4444

NATA# 2377 Site# 2370

WA 6106

NZBN: 9429046024954 Auckland 35 O'Rorke Road Penrose, Auckland 1061 Tel: +64 9 526 45 51 IANZ# 1327

EnviroSales@eurofins.com

Christchurch 43 Detroit Drive Rolleston, Christchurch 7675 Tel: 0800 856 450 IANZ# 1290

Sample Receipt Advice

Company name:	Ramboll Australia Pty Ltd
Contact name:	Stephen Maxwell
Project name:	318001376
Project ID:	318001376
Turnaround time:	5 Day
Date/Time received	Dec 14, 2022 9:00 AM
Eurofins reference	950047

Sample Information

- A detailed list of analytes logged into our LIMS, is included in the attached summary table. 1
- All samples have been received as described on the above COC.
- COC has been completed correctly.
- Attempt to chill was evident.
- Appropriately preserved sample containers have been used.
- All samples were received in good condition.
- Samples have been provided with adequate time to commence analysis in accordance with the relevant holding times.
- Appropriate sample containers have been used.
- Sample containers for volatile analysis received with zero headspace.
- 1 Split sample sent to requested external lab.
- X Some samples have been subcontracted.
- N/A Custody Seals intact (if used).

Notes

T01 sent to ALS.

Contact

If you have any questions with respect to these samples, please contact your Analytical Services Manager:

Andrew Black on phone : (+61) 2 9900 8490 or by email: AndrewBlack@eurofins.com

Results will be delivered electronically via email to Stephen Maxwell - smaxwell@ramboll.com.

Note: A copy of these results will also be delivered to the general Ramboll Australia Pty Ltd email address.

Global Leader - Results you can trust

•	Eurofins Environment Testing Australia Pty Lto							1 I														Eurofins Environment Testing NZ Ltd NZBN: 9429046024954		
web: www.eurofins.com.au email: EnviroSales@eurofins.com		.com	Melbourne Geelong Sydney 6 Monterey Road 19/8 Lewalan Street 179 Magov Dandenong South Grovedale Giraween VIC 3175 VIC 3216 NSW 2145 Tel: +61 3 8564 5000 Tel: +61 3 8564 5000 Tel: +61 2 NATA# 1261 Site# 1254 NATA# 1261 Site# 1254 NATA# 1261			owar Ro 5 2 9900 8 261 Site	oad 3400 9# 1821	Canb Unit 1 Mitch ACT : Tel: +	erra I,2 Dacr ell 2911 -61 2 61	re Stree 13 809	t 1, N C 1 T N	risban /21 Sma lurarrie LD 41 el: +61 ATA# 1	e allwood 72 7 3902 - 261 Site	Place 4600 e# 2079	Newo 4/52 Mayfi PO B Tel: + 4 NATA	castle Industria eld Eas ox 60 W 61 2 49 A# 1261	al Drive t NSW 2 /ickham 68 844 Site# 2	2304 1 2293 8 5079	Perth 46-48 Welsh WA 61 Tel: +6 NATA	Banksia Road pool 06 51 8 6253 4444 # 2377 Site# 2370	Auckland 35 O'Rorke Road Penrose, Auckland 1061 Tel: +64 9 526 45 51 IANZ# 1327	Christchurch 43 Detroit Drive Rolleston, Christchurch 7675 Tel: 0800 856 450 IANZ# 1290		
Co Ad	ompany Name: Idress:	Ramboll Au Level 3/100 North Sydne NSW 2060	amboll Australia Pty Ltd evel 3/100 Pacific Highway orth Sydney SW 2060					O Re Pi Fa	rder N eport hone: ax:	No.: #:	9 ((95004)2 99!)2 99!	7 54 81 54 81	18 50						Receiv Due: Priorit Conta	ved: y: ct Name:	Dec 14, 2022 9:00 Dec 21, 2022 5 Day Stephen Maxwell	AM	
Pro Pro	oject Name: oject ID:	318001376 318001376																	Eu	rofins	Analytical Ser	vices Manager : Ar	ndrew Black	
Sample Detail							Aluminium	Aluminium (filtered)	Barium	Barium (filtered)	Beryllium	Beryllium (filtered)	Cobalt	Cobalt (filtered)	Iron	Iron (filtered)	Manganese	Manganese (filtered)	Metals M8	Metals M8 filtered				
Melk	oourne Laborato	ory - NATA # 12	261 Site # 12	54															Х	х				
Syd	ney Laboratory ·	- NATA # 1261	Site # 18217	,			Х	X	Х	X	X	X	X	X	х	X	Х	Х	X	х				
Exte	ernal Laboratory		1	1																				
No	Sample ID	Sample Date	Sampling Time	Matrix		ID																		
1	SW1_UP	Dec 13, 2022		Water	N22-De00	31034	х	х	Х	Х	х	х	X	х	Х	Х	х	х	X	х				
2	SW1	Dec 13, 2022		Water	N22-De00	31035	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х	X	Х				
3	SW2	Dec 13, 2022		Water	N22-De00	31036	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х	X	Х				
4	SW3	Dec 13, 2022		Water	N22-De00	31037	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х	X	Х				
5	SW4	Dec 13, 2022		Water	N22-De00	31038	х	х	Х	Х	Х	х	х	Х	х	Х	Х	Х	X	х				
6	SW6	Dec 13, 2022		Water	N22-De00	31039	Х	Х	Х	Х	Х	х	Х	Х	Х	X	Х	Х	X	х				
7	SW7	Dec 13, 2022		Water	N22-De00	31040	Х	Х	Х	Х	Х	х	X	Х	Х	X	Х	Х	X	х				
8	SW8	Dec 13, 2022		Water	N22-De00	31041	Х	Х	Х	Х	Х	Х	X	Х	Х	Х	Х	Х	X	х				
9	SW9	Dec 13, 2022		Water	N22-De00	31042	Х	Х	Х	Х	Х	Х	X	Х	Х	Х	Х	Х	X	X				
10	SW10	Dec 13, 2022		Water	N22-De00	31043	Х	Х	Х	Х	Х	Х	X	Х	Х	X	Х	Х	X	Х				
11	D01	Dec 13, 2022		Water	N22-De00	31044	Х	Х	Х	Х	Х	Х	X	Х	Х	Х	Х	Х	X	Х				
Test	Counts						11	11	11	11	11	11	11	11	11	11	11	11	11	11				

Ramboll Australia Pty Ltd Level 3/100 Pacific Highway North Sydney NSW 2060

Attention:

Stephen Maxwell

Report	
Project name	
Project ID	
Received Date	

950047-W
318001376
318001376
Dec 14, 2022

Client Sample ID			SW1_UP	SW1	SW2	SW3
Sample Matrix			Water	Water	Water	Water
Eurofins Sample No.			N22- De0031034	N22- De0031035	N22- De0031036	N22- De0031037
Date Sampled			Dec 13, 2022	Dec 13, 2022	Dec 13, 2022	Dec 13, 2022
Test/Reference	LOR	Unit				
Heavy Metals	Lon	Onit				
Aluminium	0.05	mg/L	< 0.05	< 0.05	< 0.05	0.25
Aluminium (filtered)	0.05	mg/L	< 0.05	< 0.05	< 0.05	0.08
Arsenic	0.001	mg/L	< 0.001	< 0.001	< 0.001	0.001
Arsenic (filtered)	0.001	mg/L	< 0.001	< 0.001	< 0.001	0.001
Barium	0.02	mg/L	0.06	0.07	0.06	0.08
Barium (filtered)	0.02	mg/L	0.07	0.06	0.06	0.07
Beryllium	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Beryllium (filtered)	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Cadmium	0.0002	mg/L	< 0.0002	< 0.0002	< 0.0002	0.0045
Cadmium (filtered)	0.0002	mg/L	< 0.0002	< 0.0002	< 0.0002	0.0038
Chromium	0.001	mg/L	< 0.001	< 0.001	0.001	0.002
Chromium (filtered)	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Cobalt	0.001	mg/L	< 0.001	< 0.001	< 0.001	0.003
Cobalt (filtered)	0.001	mg/L	< 0.001	< 0.001	< 0.001	0.003
Copper	0.001	mg/L	0.001	0.001	0.001	0.046
Copper (filtered)	0.001	mg/L	< 0.001	< 0.001	< 0.001	0.038
Iron	0.05	mg/L	0.12	0.23	0.24	0.67
Iron (filtered)	0.05	mg/L	0.07	0.10	0.06	0.31
Lead	0.001	mg/L	< 0.001	< 0.001	0.001	0.015
Lead (filtered)	0.001	mg/L	< 0.001	< 0.001	< 0.001	0.006
Manganese	0.005	mg/L	0.024	0.026	0.036	0.30
Manganese (filtered)	0.005	mg/L	0.027	0.024	0.034	0.27
Mercury	0.0001	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Mercury (filtered)	0.0001	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Nickel	0.001	mg/L	0.001	0.001	0.002	0.008
Nickel (filtered)	0.001	mg/L	< 0.001	< 0.001	< 0.001	0.007
Zinc	0.005	mg/L	< 0.005	0.019	0.008	0.97
Zinc (filtered)	0.005	mg/L	< 0.005	0.016	< 0.005	0.87





NATA

Accredited for compliance with ISO/IEC 17025 – Testing NATA is a signatory to the ILAC Mutual Recognition Arrangement for the mutual recognition of the equivalence of testing, medical testing, calibration, inspection, proficiency testing scheme providers and reference materials producers reports and certificates.



Client Sample ID			SW4	SW6	SW7	SW8
Sample Matrix			Water	Water	Water	Water
			N22-	N22-	N22-	N22-
Eurofins Sample No.			De0031038	De0031039	De0031040	De0031041
Date Sampled			Dec 13, 2022	Dec 13, 2022	Dec 13, 2022	Dec 13, 2022
Test/Reference	LOR	Unit				
Heavy Metals						
Aluminium	0.05	mg/L	0.66	4.0	0.22	0.26
Aluminium (filtered)	0.05	mg/L	0.19	0.34	< 0.05	< 0.05
Arsenic	0.001	mg/L	0.002	0.003	0.003	< 0.001
Arsenic (filtered)	0.001	mg/L	< 0.001	0.001	0.002	< 0.001
Barium	0.02	mg/L	0.07	0.08	0.03	0.08
Barium (filtered)	0.02	mg/L	0.06	0.05	0.03	0.07
Beryllium	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Beryllium (filtered)	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Cadmium	0.0002	mg/L	0.0035	0.0037	< 0.0002	< 0.0002
Cadmium (filtered)	0.0002	mg/L	0.0030	0.0025	< 0.0002	< 0.0002
Chromium	0.001	mg/L	0.002	0.004	0.001	< 0.001
Chromium (filtered)	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Cobalt	0.001	mg/L	0.001	0.002	< 0.001	0.001
Cobalt (filtered)	0.001	mg/L	0.001	0.001	< 0.001	< 0.001
Copper	0.001	mg/L	0.059	0.069	0.004	0.003
Copper (filtered)	0.001	mg/L	0.049	0.043	0.004	0.002
Iron	0.05	mg/L	0.88	4.5	5.0	0.66
Iron (filtered)	0.05	mg/L	0.43	0.82	2.6	0.09
Lead	0.001	mg/L	0.033	0.052	0.004	0.002
Lead (filtered)	0.001	mg/L	0.010	0.016	0.002	< 0.001
Manganese	0.005	mg/L	0.13	0.17	0.16	0.40
Manganese (filtered)	0.005	mg/L	0.11	0.12	0.15	0.33
Mercury	0.0001	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Mercury (filtered)	0.0001	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Nickel	0.001	mg/L	0.009	0.012	0.002	0.002
Nickel (filtered)	0.001	mg/L	0.008	0.008	0.001	0.001
Zinc	0.005	mg/L	0.63	1.2	0.026	0.023
Zinc (filtered)	0.005	mg/L	0.58	0.79	0.018	0.011

Client Sample ID			SW9	SW10	D01
Sample Matrix			Water	Water	Water
Eurofins Sample No.			N22- De0031042	N22- De0031043	N22- De0031044
Date Sampled			Dec 13, 2022	Dec 13, 2022	Dec 13, 2022
Test/Reference	LOR	Unit			
Heavy Metals					
Aluminium	0.05	mg/L	0.07	0.42	< 0.05
Aluminium (filtered)	0.05	mg/L	< 0.05	< 0.05	< 0.05
Arsenic	0.001	mg/L	0.001	< 0.001	< 0.001
Arsenic (filtered)	0.001	mg/L	< 0.001	< 0.001	< 0.001
Barium	0.02	mg/L	0.10	0.09	0.06
Barium (filtered)	0.02	mg/L	0.08	0.08	0.06
Beryllium	0.001	mg/L	< 0.001	< 0.001	< 0.001
Beryllium (filtered)	0.001	mg/L	< 0.001	< 0.001	< 0.001
Cadmium	0.0002	mg/L	< 0.0002	< 0.0002	< 0.0002
Cadmium (filtered)	0.0002	mg/L	< 0.0002	< 0.0002	< 0.0002
Chromium	0.001	mg/L	< 0.001	< 0.001	< 0.001
Chromium (filtered)	0.001	mg/L	< 0.001	< 0.001	< 0.001



Client Sample ID Sample Matrix Eurofins Sample No.			SW9 Water N22- De0031042	SW10 Water N22- De0031043	D01 Water N22- De0031044
Date Sampled			Dec 13, 2022	Dec 13, 2022	Dec 13, 2022
Test/Reference	LOR	Unit			
Heavy Metals		-			
Cobalt	0.001	mg/L	0.001	< 0.001	< 0.001
Cobalt (filtered)	0.001	mg/L	0.001	< 0.001	< 0.001
Copper	0.001	mg/L	0.001	0.003	0.001
Copper (filtered)	0.001	mg/L	0.001	0.002	< 0.001
Iron	0.05	mg/L	1.5	0.79	0.23
Iron (filtered)	0.05	mg/L	0.69	0.08	0.09
Lead	0.001	mg/L	< 0.001	0.002	< 0.001
Lead (filtered)	0.001	mg/L	< 0.001	< 0.001	< 0.001
Manganese	0.005	mg/L	0.96	0.41	0.028
Manganese (filtered)	0.005	mg/L	0.85	0.35	0.023
Mercury	0.0001	mg/L	< 0.0001	< 0.0001	< 0.0001
Mercury (filtered)	0.0001	mg/L	< 0.0001	< 0.0001	< 0.0001
Nickel	0.001	mg/L	0.002	0.002	< 0.001
Nickel (filtered)	0.001	mg/L	0.002	0.002	< 0.001
Zinc	0.005	mg/L	0.013	0.023	0.018
Zinc (filtered)	0.005	mg/L	0.007	0.007	0.016



Sample History

Where samples are submitted/analysed over several days, the last date of extraction is reported.

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Heavy Metals	Sydney	Dec 16, 2022	28 Days
- Method: LTM-MET-3040 Metals in Waters, Soils & Sediments by ICP-MS			
Heavy Metals (filtered)	Sydney	Dec 16, 2022	180 Days
- Method: LTM-MET-3040 Metals in Waters, Soils & Sediments by ICP-MS			
Metals M8	Sydney	Dec 16, 2022	28 Days
- Method: LTM-MET-3040 Metals in Waters, Soils & Sediments by ICP-MS			
Metals M8 filtered	Sydney	Dec 16, 2022	28 Days
- Method: LTM-MET-3040 Metals in Waters, Soils & Sediments by ICP-MS			

Date Reported: Dec 20, 2022

Eurofins Environment Testing Australia Pty Ltd																				Euro	fins ARL Pty Ltd 91 05 0159 898	Eurofins Environment Testing NZ Ltd NZBN: 9429046024954		
web: w email:	WW.eurofins.com.au	.com	Melbourne Geelong Sydney 6 Monterey Road 19/8 Lewalan Street 179 Magoo Dandenong South Grovedale Girraween VIC 3175 VIC 3216 NSW 2145 Tel: +61 3 8564 5000 Tel: +61 3 8564 5000 Tel: +61 2 NATA# 1261 Site# 1254 NATA# 1261 Site# 1254 NATA# 1261				ar Roa 900 84 I Site#	ad 400 # 1821]	Canb Unit 1 Mitche ACT 2 Tel: +	erra ,2 Dacı ell 2911 61 2 61	e Stree 13 809 [.]	t 1, M Q 1 T N	risband (21 Sma lurarrie LD 41 el: +61 ATA# 1	e allwood 72 7 3902 - 261 Site	Place 4600 e# 2079	Newo 4/52 Mayfi PO B Tel: + 14 NATA	castle Industria eld East ox 60 W 61 2 49 A# 1261	al Drive t NSW 2 /ickham 68 8448 Site# 2	2304 1 2293 8 5079	Perth 46-48 Welsh WA 6 ⁷ Tel: +I NATA	Banksia Road pool I06 ô1 8 6253 4444 # 2377 Site# 2370	Auckland 35 O'Rorke Road Penrose, Auckland 1061 Tel: +64 9 526 45 51 IANZ# 1327	Christchurch 43 Detroit Drive Rolleston, Christchurch 7675 Tel: 0800 856 450 IANZ# 1290	
Co Ad	ompany Name: Idress:	Ramboll Aus Level 3/100 North Sydne NSW 2060	stralia Pty Ltd Pacific Highway ∌y					Or Re Pr Fa	der Neport none: 1x:	lo.: #:	9 () ())5004)2 99()2 99(7 54 81 54 81	18 50						Recei [,] Due: Priorit Conta	ved: (y: ct Name:	Dec 14, 2022 9:00 Dec 21, 2022 5 Day Stephen Maxwell	АМ	
Pre Pre	oject Name: oject ID:	318001376 318001376																	Eu	rofins	Analytical Ser	vices Manager : Aı	ndrew Black	
Sample Detail								Aluminium (filtered)	Barium	Barium (filtered)	Beryllium	Beryllium (filtered)	Cobalt	Cobalt (filtered)	Iron	Iron (filtered)	Manganese	Manganese (filtered)	Metals M8	Metals M8 filtered				
Mell	oourne Laborato	ory - NATA # 12	261 Site # 12	54															X	Х	l			
Syd	ney Laboratory	- NATA # 1261	Site # 18217	•			Х	Х	Х	X	X	Х	X	X	Х	X	Х	х	X	Х	l			
Exte	ernal Laboratory																							
NO	Sample ID	Sample Date	Time	Matrix																	l			
1	SW1_UP	Dec 13, 2022		Water	N22-De00310)34	Х	Х	х	Х	Х	х	х	Х	Х	х	х	х	X	х	l			
2	SW1	Dec 13, 2022		Water	N22-De00310)35	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х	X	Х	ł			
3	SW2	Dec 13, 2022		Water	N22-De00310	036	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х	X	Х	1			
4	SW3	Dec 13, 2022		Water	N22-De00310)37	Х	Х	Х	Х	Х	Х	X	Х	Х	X	Х	Х	X	Х	l			
5	SW4	Dec 13, 2022		Water	N22-De00310)38	Х	Х	Х	Х	Х	Х	X	Х	Х	X	Х	Х	X	Х	1			
6	SW6	Dec 13, 2022		Water	N22-De00310)39	Х	Х	Х	Х	Х	Х	X	Х	Х	X	Х	Х	X	Х	l			
7	SW7	Dec 13, 2022		Water	N22-De00310	040	Х	Х	Х	Х	Х	Х	X	Х	Х	X	Х	Х	X	Х	l			
8	SW8	Dec 13, 2022		Water	N22-De00310)41	Х	Х	Х	X	Х	Х	X	Х	Х	X	Х	Х	X	Х	l			
9	SW9	Dec 13, 2022		Water	N22-De00310)42	Х	Х	Х	Х	Х	Х	X	Х	Х	X	Х	Х	X	Х	l			
10	SW10	Dec 13, 2022		Water	N22-De00310)43	Х	Х	Х	X	Х	Х	X	Х	Х	X	Х	Х	X	Х	l			
11	D01	Dec 13, 2022		Water	N22-De00310)44	Х	Х	Х	Х	Х	Х	Х	Х	Х	X	Х	Х	X	Х	l			
Test	t Counts						11	11	11	11	11	11	11	11	11	11	11	11	11	11	I			



Internal Quality Control Review and Glossary

General

- 1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples follows guidelines delineated in the National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended May 2013 and are included in this QC report where applicable. Additional QC data may be available on request.
- 2. All soil/sediment/solid results are reported on a dry basis, unless otherwise stated.
- 3. All biota/food results are reported on a wet weight basis on the edible portion, unless otherwise stated.
- 4. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
- 5. Results are uncorrected for matrix spikes or surrogate recoveries except for PFAS compounds
- 6. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
- 7. Samples were analysed on an 'as received' basis.
- 8. Information identified on this report with blue colour, indicates data provided by customer that may have an impact on the results.
- 9. This report replaces any interim results previously issued.

Holding Times

Please refer to 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours prior to sample receipt deadlines as stated on the SRA. If the Laboratory did not receive the information in the required timeframe, and regardless of any other integrity issues, suitably qualified results may still be reported. Holding times apply from the date of sampling, therefore compliance to these may be outside the laboratory's control.

For VOCs containing vinyl chloride, styrene and 2-chloroethyl vinyl ether the holding time is 7 days however for all other VOCs such as BTEX or C6-10 TRH then the holding time is 14 days.

Units

mg/kg: milligrams per kilogram	mg/L: milligrams per litre	μg/L: micrograms per litre
ppm: parts per million	ppb: parts per billion	%: Percentage
org/100 mL: Organisms per 100 millilitres	NTU: Nephelometric Turbidity Units	MPN/100 mL: Most Probable Number of organisms per 100 millilitres
CFU: Colony forming unit		

Terms

АРНА	American Public Health Association
сос	Chain of Custody
СР	Client Parent - QC was performed on samples pertaining to this report
CRM	Certified Reference Material (ISO17034) - reported as percent recovery.
Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
LOR	Limit of Reporting.
LCS	Laboratory Control Sample - reported as percent recovery.
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands and in the case of water samples these are performed on de-ionised water.
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
SRA	Sample Receipt Advice
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
ТВТО	Tributyltin oxide (bis-tributyltin oxide) - individual tributyltin compounds cannot be identified separately in the environment however free tributyltin was measured and its values were converted stoichiometrically into tributyltin oxide for comparison with regulatory limits.
TCLP	Toxicity Characteristic Leaching Procedure
TEQ	Toxic Equivalency Quotient or Total Equivalence
QSM	US Department of Defense Quality Systems Manual Version 5.4
US EPA	United States Environmental Protection Agency
WA DWER	Sum of PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC - Acceptance Criteria

The acceptance criteria should be used as a guide only and may be different when site specific Sampling Analysis and Quality Plan (SAQP) have been implemented

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is 30% however the following acceptance guidelines are equally applicable:

Results <10 times the LOR: No Limit

Results between 10-20 times the LOR: RPD must lie between 0-50%

Results >20 times the LOR : RPD must lie between 0-30%

NOTE: pH duplicates are reported as a range not as RPD

Surrogate Recoveries: Recoveries must lie between 20-130% for Speciated Phenols & 50-150% for PFAS

PFAS field samples that contain surrogate recoveries in excess of the QC limit designated in QSM 5.4 where no positive PFAS results have been reported have been reviewed and no data was affected.

QC Data General Comments

- 1. Where a result is reported as a less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
- 2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
- 3. pH and Free Chlorine analysed in the laboratory Analysis on this test must begin within 30 minutes of sampling. Therefore, laboratory analysis is unlikely to be completed within holding time. Analysis will begin as soon as possible after sample receipt.
- 4. Recovery Data (Spikes & Surrogates) where chromatographic interference does not allow the determination of recovery the term "INT" appears against that analyte.
- 5. For Matrix Spikes and LCS results a dash "-" in the report means that the specific analyte was not added to the QC sample.
- 6. Duplicate RPDs are calculated from raw analytical data thus it is possible to have two sets of data.



Quality Control Results

Test	Units	Result 1		Acceptance Limits	Pass Limits	Qualifying Code
Method Blank						
Heavy Metals						
Aluminium	mg/L	< 0.05		0.05	Pass	
Aluminium (filtered)	mg/L	< 0.05		0.05	Pass	
Arsenic	mg/L	< 0.001		0.001	Pass	
Arsenic (filtered)	mg/L	< 0.001		0.001	Pass	
Barium	mg/L	< 0.02		0.02	Pass	
Barium (filtered)	mg/L	< 0.02		0.02	Pass	
Beryllium	mg/L	< 0.001		0.001	Pass	
Cadmium	mg/L	< 0.0002		0.0002	Pass	
Cadmium (filtered)	mg/L	< 0.0002		0.0002	Pass	
Chromium	mg/L	< 0.001		0.001	Pass	
Chromium (filtered)	mg/L	< 0.001		0.001	Pass	
Cobalt	mg/L	< 0.001		0.001	Pass	
Cobalt (filtered)	mg/L	< 0.001		0.001	Pass	
Copper	mg/L	< 0.001		0.001	Pass	
Copper (filtered)	mg/L	< 0.001		0.001	Pass	
Iron	mg/L	< 0.05		0.05	Pass	
Iron (filtered)	mg/L	< 0.05		0.05	Pass	
Lead	mg/L	< 0.001		0.001	Pass	
Lead (filtered)	mg/L	< 0.001		0.001	Pass	
Manganese	mg/L	< 0.005		0.005	Pass	
Manganese (filtered)	mg/L	< 0.005		0.005	Pass	
Mercury	mg/L	< 0.0001		0.0001	Pass	
Mercury (filtered)	mg/L	< 0.0001		0.0001	Pass	
Nickel	mg/L	< 0.001		0.001	Pass	
Nickel (filtered)	mg/L	< 0.001		0.001	Pass	
Zinc	mg/L	< 0.005		0.005	Pass	
Zinc (filtered)	mg/L	< 0.005		0.005	Pass	
LCS - % Recovery						
Heavy Metals						
Aluminium	%	113		80-120	Pass	
Aluminium (filtered)	%	103		80-120	Pass	
Arsenic	%	104		80-120	Pass	
Arsenic (filtered)	%	99		80-120	Pass	
Barium	%	106		80-120	Pass	
Barium (filtered)	%	101		80-120	Pass	
Beryllium	%	118		80-120	Pass	
Cadmium	%	105		80-120	Pass	
Cadmium (filtered)	%	100		80-120	Pass	
Chromium	%	107		80-120	Pass	
Chromium (filtered)	%	107		80-120	Pass	
Cobalt	%	100		80-120	Pass	
Cobalt (filtered)	%	105		80-120	Pass	
Copper	%	96		80-120	Pass	
Copper (filtered)	%	104		80-120	Pass	
Iron	%	103		80-120	Pass	
Iron (filtered)	%	104		80-120	Pass	
Lead	%	103		80-120	Pass	
Lead (filtered)	%	102		80-120	Pass	
Manganese	%	103		80-120	Pass	
Manganese (filtered)	%	103		80-120	Pass	



Test			Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Mercury			%	108			80-120	Pass	
Mercury (filtered)			%	103			80-120	Pass	
Nickel			%	112			80-120	Pass	
Nickel (filtered)			%	106			80-120	Pass	
Zinc			%	104			80-120	Pass	
Zinc (filtered)	r		%	104			80-120	Pass	
Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery							-		
Heavy Metals				Result 1					
Aluminium (filtered)	S22-De0035827	NCP	%	106			75-125	Pass	
Arsenic (filtered)	S22-De0035827	NCP	%	100			75-125	Pass	
Barium (filtered)	S22-De0035827	NCP	%	91			75-125	Pass	
Beryllium (filtered)	S22-De0035827	NCP	%	106			75-125	Pass	
Cadmium (filtered)	S22-De0035827	NCP	%	95			75-125	Pass	
Chromium (filtered)	S22-De0035827	NCP	%	95			75-125	Pass	
Cobalt (filtered)	S22-De0035827	NCP	%	94			75-125	Pass	
Copper (filtered)	S22-De0035827	NCP	%	91			75-125	Pass	
Iron (filtered)	S22-De0035827	NCP	%	95			75-125	Pass	
Lead (filtered)	S22-De0035827	NCP	%	95			75-125	Pass	
Manganese (filtered)	S22-De0035827	NCP	%	93			75-125	Pass	
Mercury (filtered)	S22-De0035827	NCP	%	100			75-125	Pass	
Nickel (filtered)	S22-De0035827	NCP	%	91			75-125	Pass	
Zinc (filtered)	S22-De0035827	NCP	%	89			75-125	Pass	
Spike - % Recovery							-	-	
Heavy Metals				Result 1					
Aluminium	N22-De0031044	CP	%	105			75-125	Pass	
Arsenic	N22-De0031044	CP	%	102			75-125	Pass	
Barium	N22-De0031044	CP	%	103			75-125	Pass	
Beryllium	N22-De0031044	CP	%	113			75-125	Pass	
Cadmium	N22-De0031044	CP	%	100			75-125	Pass	
Chromium	N22-De0031044	CP	%	99			75-125	Pass	
Cobalt	N22-De0031044	CP	%	97			75-125	Pass	
Copper	N22-De0031044	CP	%	95			75-125	Pass	
Iron	N22-De0031044	CP	%	99			75-125	Pass	
Lead	N22-De0031044	CP	%	100			75-125	Pass	
Manganese	N22-De0031044	CP	%	99			75-125	Pass	
Mercury	N22-De0031044	CP	%	107			75-125	Pass	
Nickel	N22-De0031044	CP	%	94			75-125	Pass	
Zinc	N22-De0031044	CP	%	95			75-125	Pass	
Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Duplicate				1					
Heavy Metals	I			Result 1	Result 2	RPD			
Chromium (filtered)	S22-De0034651	NCP	mg/L	0.017	0.018	4.2	30%	Pass	
Mercury	S22-De0028860	NCP	mg/L	< 0.0001	< 0.0001	<1	30%	Pass	
Mercury (filtered)	S22-De0034307	NCP	mg/L	< 0.0001	< 0.0001	<1	30%	Pass	
Duplicate									
Heavy Metals	[Result 1	Result 2	RPD			
Aluminium	N22-De0031035	CP	mg/L	< 0.05	< 0.05	<1	30%	Pass	
Arsenic	N22-De0031035	CP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Barium	N22-De0031035	CP	mg/L	0.07	0.07	<1	30%	Pass	
Beryllium	N22-De0031035	CP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Cadmium	N22-De0031035	CP	mg/L	< 0.0002	< 0.0002	<1	30%	Pass	
Chromium	N22-De0031035	CP	mg/L	< 0.001	< 0.001	<1	30%	Pass	



Duplicate									
Heavy Metals				Result 1	Result 2	RPD			
Cobalt	N22-De0031035	CP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Copper	N22-De0031035	CP	mg/L	0.001	0.001	9.9	30%	Pass	
Iron	N22-De0031035	CP	mg/L	0.23	0.23	2.7	30%	Pass	
Lead	N22-De0031035	CP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Manganese	N22-De0031035	CP	mg/L	0.026	0.025	4.5	30%	Pass	
Nickel	N22-De0031035	CP	mg/L	0.001	< 0.001	39	30%	Fail	Q15
Zinc	N22-De0031035	CP	mg/L	0.019	0.018	3.4	30%	Pass	
Duplicate									
Heavy Metals				Result 1	Result 2	RPD			
Aluminium (filtered)	N22-De0031039	CP	mg/L	0.34	0.32	6.5	30%	Pass	
Arsenic (filtered)	N22-De0031039	CP	mg/L	0.001	< 0.001	5.3	30%	Pass	
Barium (filtered)	N22-De0031039	CP	mg/L	0.05	0.05	1.2	30%	Pass	
Beryllium (filtered)	N22-De0031039	CP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Cadmium (filtered)	N22-De0031039	CP	mg/L	0.0025	0.0025	2.8	30%	Pass	
Cobalt (filtered)	N22-De0031039	CP	mg/L	0.001	0.001	2.6	30%	Pass	
Copper (filtered)	N22-De0031039	CP	mg/L	0.043	0.042	1.7	30%	Pass	
Iron (filtered)	N22-De0031039	CP	mg/L	0.82	0.82	<1	30%	Pass	
Lead (filtered)	N22-De0031039	CP	mg/L	0.016	0.016	<1	30%	Pass	
Manganese (filtered)	N22-De0031039	CP	mg/L	0.12	0.12	1.1	30%	Pass	
Nickel (filtered)	N22-De0031039	CP	mg/L	0.008	0.008	1.6	30%	Pass	
Zinc (filtered)	N22-De0031039	CP	mg/L	0.79	0.80	<1	30%	Pass	

Eurofine Environment Testing Australia Pty Ltd EnviroSales@eurofins.com $(q_{i}) \in (k, q_{i})$ Laboratory Use Only CHAIN OF CUSTODY RECORD 481384112 50 Glebe Road, The Junction, NSW 2291 Ramboll Australia Sam Buckley Courier (# Eurotins [Environment Texting ABM 50 005 085 521 Received By Received By <u>B</u>1 101 NAR N 13/12/22 13/12/22 deves 3 Hand Delivered のためというない ¥ Ş SYD [BME] WEL ! PER ! ADL] WIT I DRW SVD | BNF | MEL | PER | ADL (MO) I DRW No Sydney Laboratory × Total Metals (Al, As, Ba, Be, Cd, Cr, Co, Cu, Fe, Pb, Mn, Hg, Ni, Zn) +612 9909 8400 EnviroSamoleNSW@eurofins.com 179 Magowar Roed, Ginaween, NSW 2145 X N Dissolved Metals (Al, As, Ba, Be, Cd, Cr, Co, Cu, Fe, Pb, Mn, Hg, Ni, Zn) X × Postal 318001376 318001376 Susmission of samples to the leboratory will be deemed as acceptance of Eurotins | Environment Testing Staffs Name Signature Signature Brisbane Laboratory Sam Buckley Unit 1/21 Smallwood Place, Murarne, OLD 4172 +617 3902 4600 EnviroSampleQLD@eurofins.com **Environmental Division** Sydney Telephone: + 61-2-8784 8555 and the second Work Order Reference ES2245721 Signature Esdat, EQuIS, PDF, Excel Stephen Maxwell Bay French Date Date Perth Laboratory 48-48 Banksia Road, Welshpool, WA 6106 +618 6253 4444 EnviroSampleWA@exirofins.com rd Terms and Constitions unless agreed otherwise. A copy is available on request 4 P 500mL Plastic allowing in the light denoien overde Seminary a 250mL Plastic Time Date autr 125mL Plastic 200mL Amber Glass 5 40mL VOA vial WA WU 14/12/2022 S. Buckley / J. Cowburn smaxwell@ramboll.com / sbucktey@ramboll.com S. Buckley smaxwell@ramboll.com 500mL PFAS Bottle Melbourne Laboratory N ----60mL Plastic Bottle (Total) 6 Monterey Read Dandsmong South VIC 3175 +61 38564 5050 EnviroSampleVio@eurofins.com N -60mL Plastic Bottle (Dissolved) □ Same day ◆ □ □ 2 days ◆ □ ☑ 5 days (Standard) □ Other(Report No. lemperature Please forward to ALS Overnight (reporting by 9am)+ Time 400 VP ☐ 1 day∳ 3 days∳ Surcharge will opply

16/12/12 12:57

LC :

けんで

1



SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order	: ES2245721

Client Contact Address	E RAMBOLL AUSTRALIA PTY LTD E S BUCKLEY EASTPOINT COMPLEX SUITE 19B, LEVEL 2 50 GLEBE ROAD THE JUNCTION NSW 2291	Laboratory Contact Address	 Environmental Division Sydney Cez Bautista 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail Telephone Facsimile	: sbuckley@ramboll.com : :	E-mail Telephone Facsimile	: cez.bautista@alsglobal.com : +61-2-8784 8555 : +61-2-8784 8500
Project Order number C-O-C number Site Sampler	: 318001376 : : : JILLIAN COWBURN, S BUCKLEY	Page Quote number QC Level	: 1 of 2 : EB2017ENVIAUS0001 (EN/222) : NEPM 2013 B3 & ALS QC Standard
Dates Date Samples Receive Client Requested Due	ed : 16-Dec-2022 12:50 : 28-Dec-2022	Issue Date Scheduled Reporting I	: 16-Dec-2022 Date : 28-Dec-2022

D,	- t	~	

Delivery Details

Delivery Details			
Mode of Delivery	: Carrier	Security Seal	: Intact.
No. of coolers/boxes	: 1	Temperature	: 10.1'C - Ice Bricks present
Receipt Detail	:	No. of samples received / analysed	: 1/1

General Comments

- This report contains the following information:
 - Sample Container(s)/Preservation Non-Compliances
 - Summary of Sample(s) and Requested Analysis
 - Proactive Holding Time Report
 - Requested Deliverables
- Please refer to the Proactive Holding Time Report table below which summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory. The laboratory will process these samples unless instructions are received from you indicating you do not wish to proceed. The absence of this summary table indicates that all samples have been received within the recommended holding times for the analysis requested.
- Please direct any queries you have regarding this work order to the above ALS laboratory contact.
- Analytical work for this work order will be conducted at ALS Sydney.
- Sample Disposal Aqueous (3 weeks), Solid (2 months ± 1 week) from receipt of samples.
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.



Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

• No sample container / preservation non-compliance exists.

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.

Matrix: WATER

as the determina tasks, that are inclu If no sampling default 00:00 on is provided, the laboratory and	ation of moisture uded in the package. time is provided, the date of samplin sampling date wi displayed in bra	content and preparation the sampling time will g. If no sampling date II be assumed by the ckets without a time	ICP/MS	MS (including digestion)		
Component Matrix: WATER Laboratory sample	Sampling date /	Sample ID	/ATER - EG020F issolved Metals by	/ATER - EG020T otal Metals by ICP/	/ATER - W-02 Metals	/ATER - W-02T metals (Total)
ES2245721-001	13-Dec-2022 00:00	T01	✓	✓	> ∞	<u>> ∞</u>

Proactive Holding Time Report

Sample(s) have been received within the recommended holding times for the requested analysis.

Requested Deliverables

ACCOUNTS PAYABLE

- A4 - AU Tax Invoice (INV)	Email	AsiaPac-Accounts@Ramboll.com
S BUCKLEY		
 *AU Certificate of Analysis - NATA (COA) 	Email	sbuckley@ramboll.com
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	sbuckley@ramboll.com
 *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC) 	Email	sbuckley@ramboll.com
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	sbuckley@ramboll.com
- Chain of Custody (CoC) (COC)	Email	sbuckley@ramboll.com
 EDI Format - EQUIS_ENVIRON (EQUIS_ENVIRON) 	Email	sbuckley@ramboll.com
- EDI Format - XTab (XTAB)	Email	sbuckley@ramboll.com
STEPHEN MAXWELL		
 *AU Certificate of Analysis - NATA (COA) 	Email	smaxwell@ramboll.com
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	smaxwell@ramboll.com
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	smaxwell@ramboll.com
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	smaxwell@ramboll.com
- A4 - AU Tax Invoice (INV)	Email	smaxwell@ramboll.com
- Chain of Custody (CoC) (COC)	Email	smaxwell@ramboll.com
 EDI Format - EQUIS_ENVIRON (EQUIS_ENVIRON) 	Email	smaxwell@ramboll.com
- EDI Format - XTab (XTAB)	Email	smaxwell@ramboll.com



CERTIFICATE OF ANALYSIS

Work Order	ES2245721	Page	: 1 of 3
Client	RAMBOLL AUSTRALIA PTY LTD	Laboratory	Environmental Division Sydney
Contact	: S BUCKLEY	Contact	: Cez Bautista
Address	EASTPOINT COMPLEX SUITE 19B, LEVEL 2 50 GLEBE ROAD	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
	THE JUNCTION NSW 2291		
Telephone	:	Telephone	: +61-2-8784 8555
Project	: 318001376	Date Samples Received	: 16-Dec-2022 12:50
Order number	:	Date Analysis Commenced	: 21-Dec-2022
C-O-C number	:	Issue Date	28-Dec-2022 16:30
Sampler	: JILLIAN COWBURN, S BUCKLEY		HALA NALA
Site	:		
Quote number	: EN/222		Accorditation No. 925
No. of samples received	: 1		Accredited for compliance with
No. of samples analysed	:1		ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	Position	Accreditation Category
Wisam Marassa	Inorganics Coordinator	Sydney Inorganics, Smithfield, NSW



General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contract for details.

Key: CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.

LOR = Limit of reporting

* = This result is computed from individual analyte detections at or above the level of reporting

ø = ALS is not NATA accredited for these tests.

~ = Indicates an estimated value.

• EG020: It is recognised that total concentration is less than dissolved for some metal analytes. However, the difference is within experimental variation of the methods.

Page : 3 of 3 Work Order : ES2245721 Client : RAMBOLL AUSTRALIA PTY LTD Project : 318001376



Analytical Results

Sub-Matrix: WATER			Sample ID	T01	 	
		Sampli	ng date / time	13-Dec-2022 00:00	 	
Compound	CAS Number	LOR	Unit	ES2245721-001	 	
				Result	 	
EG020F: Dissolved Metals by ICP-MS						
Aluminium	7429-90-5	10	µg/L	<10	 	
Arsenic	7440-38-2	1	µg/L	<1	 	
Beryllium	7440-41-7	1	µg/L	<1	 	
Barium	7440-39-3	1	µg/L	55	 	
Cadmium	7440-43-9	0.1	µg/L	<0.1	 	
Chromium	7440-47-3	1	µg/L	<1	 	
Copper	7440-50-8	1	µg/L	<1	 	
Cobalt	7440-48-4	1	µg/L	<1	 	
Nickel	7440-02-0	1	µg/L	<1	 	
Lead	7439-92-1	1	µg/L	<1	 	
Zinc	7440-66-6	5	µg/L	8	 	
Manganese	7439-96-5	1	µg/L	15	 	
Iron	7439-89-6	50	µg/L	50	 	
EG020T: Total Metals by ICP-MS						
Aluminium	7429-90-5	10	µg/L	20	 	
Arsenic	7440-38-2	1	µg/L	<1	 	
Beryllium	7440-41-7	1	µg/L	<1	 	
Barium	7440-39-3	1	µg/L	52	 	
Cadmium	7440-43-9	0.1	µg/L	<0.1	 	
Chromium	7440-47-3	1	µg/L	<1	 	
Copper	7440-50-8	1	µg/L	<1	 	
Cobalt	7440-48-4	1	µg/L	<1	 	
Nickel	7440-02-0	1	µg/L	<1	 	
Lead	7439-92-1	1	µg/L	<1	 	
Zinc	7440-66-6	5	µg/L	7	 	
Manganese	7439-96-5	1	µg/L	18	 	
Iron	7439-89-6	50	µg/L	140	 	
EG035F: Dissolved Mercury by FIMS						
Mercury	7439-97-6	0.1	µg/L	<0.1	 	
EG035T: Total Recoverable Mercury by F	IMS					
Mercury	7439-97-6	0.1	µg/L	<0.1	 	



QUALITY CONTROL REPORT

Work Order	ES2245721	Page	: 1 of 5
Client	RAMBOLL AUSTRALIA PTY LTD	Laboratory	: Environmental Division Sydney
Contact	: S BUCKLEY	Contact	: Cez Bautista
Address	EASTPOINT COMPLEX SUITE 19B, LEVEL 2 50 GLEBE ROAD THE JUNCTION NSW 2291	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	:	Telephone	: +61-2-8784 8555
Project	: 318001376	Date Samples Received	: 16-Dec-2022
Order number	:	Date Analysis Commenced	: 21-Dec-2022
C-O-C number	:	Issue Date	28-Dec-2022
Sampler	: JILLIAN COWBURN, S BUCKLEY		Hac-MRA NATA
Site	:		
Quote number	: EN/222		Accreditation No. 825
No. of samples received	: 1		Accredited for compliance with
No. of samples analysed	: 1		ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories

Wisam Marassa

Inorganics Coordinator

Position

Accreditation Category

Sydney Inorganics, Smithfield, NSW



General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot

CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.

LOR = Limit of reporting

RPD = Relative Percentage Difference

= Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: WATER			Laboratory Duplicate (DUP) Report						
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EG020F: Dissolved	Metals by ICP-MS (QC L	₋ot: 4786235)							
ES2245740-002 Anonymous	Anonymous	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Barium	7440-39-3	0.001	mg/L	0.141	0.142	1.1	0% - 20%
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Manganese	7439-96-5	0.001	mg/L	0.155	0.156	0.0	0% - 20%
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	0.0	No Limit
		EG020A-F: Aluminium	7429-90-5	0.01	mg/L	0.05	0.05	0.0	No Limit
		EG020A-F: Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	0.0	No Limit
ES2244433-003	Anonymous	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	0.002	<0.001	0.0	No Limit
		EG020A-F: Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Barium	7440-39-3	0.001	mg/L	0.057	0.057	0.0	0% - 20%
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Manganese	7439-96-5	0.001	mg/L	0.039	0.040	0.0	0% - 20%
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	0.055	0.053	3.9	0% - 50%

Page	: 3 of 5
Work Order	: ES2245721
Client	: RAMBOLL AUSTRALIA PTY LTD
Project	: 318001376



Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EG020F: Dissolved M	etals by ICP-MS (QC Lot: 4	786235) - continued							
ES2244433-003	Anonymous	EG020A-F: Aluminium	7429-90-5	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-F: Iron	7439-89-6	0.05	mg/L	0.83	0.82	0.0	0% - 50%
EG020T: Total Metals	by ICP-MS (QC Lot: 47832	95)							
ES2245675-001	Anonymous	EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
		EG020A-T: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Barium	7440-39-3	0.001	mg/L	0.010	0.010	0.0	No Limit
		EG020A-T: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Copper	7440-50-8	0.001	mg/L	0.357	0.335	6.3	0% - 20%
		EG020A-T: Lead	7439-92-1	0.001	mg/L	0.009	0.009	0.0	No Limit
		EG020A-T: Manganese	7439-96-5	0.001	mg/L	0.001	<0.001	0.0	No Limit
		EG020A-T: Nickel	7440-02-0	0.001	mg/L	<0.001	0.001	0.0	No Limit
		EG020A-T: Zinc	7440-66-6	0.005	mg/L	0.040	0.032	23.1	No Limit
		EG020A-T: Aluminium	7429-90-5	0.01	mg/L	0.01	0.01	0.0	No Limit
		EG020A-T: Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	0.0	No Limit
ES2245761-002	Anonymous	EG020A-T: Barium	7440-39-3	0.001	mg/L	0.020	0.020	0.0	0% - 50%
ES2245761-002	Anonymous	EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
		EG020A-T: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Cobalt	7440-48-4	0.001	mg/L	0.002	0.001	0.0	No Limit
		EG020A-T: Copper	7440-50-8	0.001	mg/L	0.007	0.007	0.0	No Limit
		EG020A-T: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Manganese	7439-96-5	0.001	mg/L	0.010	0.011	0.0	0% - 50%
		EG020A-T: Nickel	7440-02-0	0.001	mg/L	0.008	0.007	0.0	No Limit
		EG020A-T: Zinc	7440-66-6	0.005	mg/L	0.017	0.017	0.0	No Limit
		EG020A-T: Aluminium	7429-90-5	0.01	mg/L	0.06	0.06	0.0	No Limit
		EG020A-T: Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	0.0	No Limit
EG035F: Dissolved M	ercury by FIMS (QC Lot: 47	86234)							
ES2244433-002	Anonymous	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
ES2245760-004	Anonymous	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
EG035T: Total Recov	erable Mercury by FIMS(Q	C Lot: 4786342)							
ES2245141-016	Anonymous	EG035T: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
ES2245729-002	Anonymous	EG035T: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit



Method Blank (MB) and Laboratory Control Sample (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: WATER				Method Blank (MB)	Laboratory Control Spike (LCS) Report				
				Report	Spike	Spike Recovery (%)	Acceptable	Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High	
EG020F: Dissolved Metals by ICP-MS (QCLot: 4786235)									
EG020A-F: Aluminium	7429-90-5	0.01	mg/L	<0.01	0.5 mg/L	94.9	80.0	116	
EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	96.2	85.0	114	
EG020A-F: Beryllium	7440-41-7	0.001	mg/L	<0.001	0.1 mg/L	99.6	85.0	115	
EG020A-F: Barium	7440-39-3	0.001	mg/L	<0.001	0.1 mg/L	95.1	82.0	110	
EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	96.0	84.0	110	
EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	100	85.0	111	
EG020A-F: Cobalt	7440-48-4	0.001	mg/L	<0.001	0.1 mg/L	94.7	82.0	112	
EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	94.6	81.0	111	
EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	93.1	83.0	111	
EG020A-F: Manganese	7439-96-5	0.001	mg/L	<0.001	0.1 mg/L	98.7	82.0	110	
EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	95.4	82.0	112	
EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	96.4	81.0	117	
EG020A-F: Iron	7439-89-6	0.05	mg/L	<0.05	0.5 mg/L	94.2	82.0	112	
EG020T: Total Metals by ICP-MS (QCLot: 4783295)									
EG020A-T: Aluminium	7429-90-5	0.01	mg/L	<0.01	0.5 mg/L	86.7	82.0	120	
EG020A-T: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	96.6	82.0	114	
EG020A-T: Beryllium	7440-41-7	0.001	mg/L	<0.001	0.1 mg/L	91.2	79.0	119	
EG020A-T: Barium	7440-39-3	0.001	mg/L	<0.001	0.1 mg/L	94.5	84.0	116	
EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	96.2	84.0	112	
EG020A-T: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	95.1	86.0	116	
EG020A-T: Cobalt	7440-48-4	0.001	mg/L	<0.001	0.1 mg/L	94.5	84.0	116	
EG020A-T: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	93.9	83.0	118	
EG020A-T: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	92.0	85.0	115	
EG020A-T: Manganese	7439-96-5	0.001	mg/L	<0.001	0.1 mg/L	94.6	85.0	113	
EG020A-T: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	89.0	84.0	116	
EG020A-T: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	90.3	79.0	117	
EG020A-T: Iron	7439-89-6	0.05	mg/L	<0.05	0.5 mg/L	91.8	85.0	117	
EG035F: Dissolved Mercury by FIMS (QCLot: 4786234)									
EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.01 mg/L	84.8	83.0	105	
EG035T: Total Recoverable Mercury by FIMS (QCLot: 4786	342)								
EG035T: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.01 mg/L	84.5	77.0	111	

Matrix Spike (MS) Report

Page	: 5 of 5
Work Order	: ES2245721
Client	: RAMBOLL AUSTRALIA PTY LTD
Project	: 318001376



The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: WATER				Matrix Spike (MS) Report				
				Spike	SpikeRecovery(%)	Acceptable L	.imits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High	
EG020F: Dissolved	I Metals by ICP-MS (QCLot: 4786235)							
ES2244433-004	Anonymous	EG020A-F: Arsenic	7440-38-2	2 mg/L	71.4	70.0	130	
		EG020A-F: Beryllium	7440-41-7	2 mg/L	77.1	70.0	130	
		EG020A-F: Barium	7440-39-3	2 mg/L	70.4	70.0	130	
		EG020A-F: Cadmium	7440-43-9	0.5 mg/L	72.3	70.0	130	
		EG020A-F: Chromium	7440-47-3	2 mg/L	73.5	70.0	130	
		EG020A-F: Cobalt	7440-48-4	2 mg/L	70.6	70.0	130	
		EG020A-F: Copper	7440-50-8	2 mg/L	70.9	70.0	130	
		EG020A-F: Lead	7439-92-1	2 mg/L	71.1	70.0	130	
		EG020A-F: Manganese	7439-96-5	2 mg/L	73.1	70.0	130	
		EG020A-F: Nickel	7440-02-0	2 mg/L	70.7	70.0	130	
		EG020A-F: Zinc	7440-66-6	2 mg/L	71.0	70.0	130	
EG020T: Total Met	als by ICP-MS (QCLot: 4783295)							
ES2245675-002	Anonymous	EG020A-T: Arsenic	7440-38-2	1 mg/L	94.6	70.0	130	
		EG020A-T: Beryllium	7440-41-7	1 mg/L	87.5	70.0	130	
		EG020A-T: Barium	7440-39-3	1 mg/L	92.1	70.0	130	
		EG020A-T: Cadmium	7440-43-9	0.25 mg/L	96.1	70.0	130	
		EG020A-T: Chromium	7440-47-3	1 mg/L	98.2	70.0	130	
		EG020A-T: Cobalt	7440-48-4	1 mg/L	94.5	70.0	130	
		EG020A-T: Copper	7440-50-8	1 mg/L	96.0	70.0	130	
		EG020A-T: Lead	7439-92-1	1 mg/L	97.1	70.0	130	
		EG020A-T: Manganese	7439-96-5	1 mg/L	101	70.0	130	
		EG020A-T: Nickel	7440-02-0	1 mg/L	91.8	70.0	130	
		EG020A-T: Zinc	7440-66-6	1 mg/L	90.5	70.0	130	
EG035F: Dissolved	Mercury by FIMS (QCLot: 4786234)							
ES2244433-001	Anonymous	EG035F: Mercury	7439-97-6	0.01 mg/L	91.8	70.0	130	
EG035T: Total Re	coverable Mercury by FIMS (QCLot: 4786342)							
ES2245398-067	Anonymous	EG035T: Mercury	7439-97-6	0.01 mg/L	76.8	70.0	130	


Environment Testing

Comments

Sample Integrity	
Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Qualifier Codes/Comments

Code Description

Q15 The RPD reported passes Eurofins Environment Testing's QC - Acceptance Criteria as defined in the Internal Quality Control Review and Glossary page of this report.

Authorised by:

Andrew Black Mickael Ros

Analytical Services Manager Senior Analyst-Metal

Glenn Jackson General Manager

Final Report – this report replaces any previously issued Report

- Indicates Not Requested
- * Indicates NATA accreditation does not cover the performance of this service
- Measurement uncertainty of test data is available on request or please click here.

Eurofins shall not be liable for loss, cost, damages or expenses incurred by the client, or any other person or company, resulting from the use of any information or interpretation given in this report. In no case shall Eurofins be liable for consequential damages including, but not limited to, lost profits, damages for failure to meet deadlines and lost production arising from this report. This document shall not be reproduced except in full and relates only to the items tested. Unless indicated otherwise, the tests were performed on the samples as received.



QA/QC Compliance Assessme	nt to assist with	h Quality Review
ES2245721	Page	: 1 of 4
	Laboratory	Environmental Division Sydney

Client	RAMBOLL AUSTRALIA PTY LTD	Laboratory	: Environmental Division Sydney
Contact	: S BUCKLEY	Telephone	: +61-2-8784 8555
Project	: 318001376	Date Samples Received	: 16-Dec-2022
Site		Issue Date	: 28-Dec-2022
Sampler	: JILLIAN COWBURN, S BUCKLEY	No. of samples received	: 1
Order number	:	No. of samples analysed	: 1

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Work Order

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- <u>NO</u> Method Blank value outliers occur.
- <u>NO</u> Duplicate outliers occur.
- <u>NO</u> Laboratory Control outliers occur.
- <u>NO</u> Matrix Spike outliers occur.
- For all regular sample matrices, <u>NO</u> surrogate recovery outliers occur.

Outliers : Analysis Holding Time Compliance

• NO Analysis Holding Time Outliers exist.

Outliers : Frequency of Quality Control Samples

• <u>NO</u> Quality Control Sample Frequency Outliers exist.



Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for VOC in soils vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Evaluation:	x =	Holding	time	hreach	ι.	<pre>< =</pre>	Within	holding	time
	~ -	TIOIUIIIG	une	Dieacii		_		noiunig	ume.

Matrix: WATER				Evaluation	: × = Holding time	breach ; 🗸 = Withi	n holding time.
Method	Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EG020F: Dissolved Metals by ICP-MS							
Clear Plastic Bottle - Nitric Acid; Filtered (EG020A-F) T01	13-Dec-2022				23-Dec-2022	11-Jun-2023	~
EG020T: Total Metals by ICP-MS							
Clear Plastic Bottle - Nitric Acid; Unfiltered (EG020A-T) T01	13-Dec-2022	21-Dec-2022	11-Jun-2023	4	21-Dec-2022	11-Jun-2023	~
EG035F: Dissolved Mercury by FIMS							
Clear Plastic Bottle - Nitric Acid; Filtered (EG035F) T01	13-Dec-2022				22-Dec-2022	10-Jan-2023	✓
EG035T: Total Recoverable Mercury by FIMS							
Clear Plastic Bottle - Nitric Acid; Unfiltered (EG035T) T01	13-Dec-2022				28-Dec-2022	10-Jan-2023	~



Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: WATER				Evaluation	n: 🗴 = Quality Co	ntrol frequency	not within specification ; \checkmark = Quality Control frequency within specification.
Quality Control Sample Type		Count			Rate (%)		Quality Control Specification
Analytical Methods	Method	00	Reaular	Actual	Expected	Evaluation	
Laboratory Duplicates (DUP)							
Dissolved Mercury by FIMS	EG035F	2	19	10.53	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	3	20	15.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Dissolved Mercury by FIMS	EG035F	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Dissolved Mercury by FIMS	EG035F	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Dissolved Mercury by FIMS	EG035F	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	20	5.00	5.00	~	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard



Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
Dissolved Metals by ICP-MS - Suite A	EG020A-F	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. Samples are 0.45µm filtered prior to analysis. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Total Metals by ICP-MS - Suite A	EG020A-T	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Dissolved Mercury by FIMS	EG035F	WATER	In house: Referenced to APHA 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) Samples are 0.45µm filtered prior to analysis. FIM-AAS is an automated flameless atomic absorption technique. A bromate/bromide reagent is used to oxidise any organic mercury compounds in the filtered sample. The ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM Schedule B(3).
Total Mercury by FIMS	EG035T	WATER	In house: Referenced to APHA 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. A bromate/bromide reagent is used to oxidise any organic mercury compounds in the unfiltered sample. The ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM Schedule B(3).
Preparation Methods	Method	Matrix	Method Descriptions
Digestion for Total Recoverable Metals	EN25	WATER	In house: Referenced to USEPA SW846-3005. Method 3005 is a Nitric/Hydrochloric acid digestion procedure used to prepare surface and ground water samples for analysis by ICPAES or ICPMS. This method is compliant with NEPM Schedule B(3)

Ramboll - Tarago, NSW

APPENDIX 5 SITE PHOTOGRAPHS

Z:\Projects\Transport for NSW\318001376 - Tarago Rail Corridor\7. Reports\T3 - SW Monitoring\202212 December\318001376-T3-SW Monitoring Report (December 2022).docx



Photo 1: Image of embankment adjacent to monitoring location SW1. Signs of erosion from recent heavy rain events.



Photo 2: Image of culvert adjacent to monitoring location SW1 facing east.

Title:	Tarago SWM	Approved:	Project-Nr.: 318001376-001	Date: 09/01/2023
Site:	Tarago Rail Corridor and Mulwaree River			
Client:	Transport for New South Wales			RAMBOLL



Photo 3: Image of monitoring location SW1_UP facing west.



Photo 4: Image of bank opposite monitoring location SW1_UP showing signs of erosion from recent heavy rainfall events.

Title:	Tarago SWM	Approved:	Project-Nr.: 318001376-001	Date: 09/01/2023
Site:	Tarago Rail Corridor and Mulwaree River			
Client:	Transport for New South Wales			RAMBOLL



Photo 5: Image of culvert adjacent to monitoring location SW4 facing west.



Photo 6: Image facing east of monitoring location SW4. Water appears to pool at this location.

Title:	Tarago SWM	Approved:	Project-Nr.: 318001376-001	Date: 09/01/2023
Site:	Tarago Rail Corridor and Mulwaree River			
Client:	Transport for New South Wales			RAMBOLL



Photo 7: Metal tubing and concrete waste adjacent to monitoring location SW4



Photo 8: Image of monitoring location SW5. Both culverts and surrounding ballast were dry.

Title:	Tarago SWM	Approved:	Project-Nr.: 318001376-001	Date: 09/01/2023
Site:	Tarago Rail Corridor and Mulwaree River			
Client:	Transport for New South Wales			RAMBOLL



Photo 9: Image of right-side culvert of monitoring location SW5. Image shows staining and sediment build up from times of flowing water.



Photo 10: Image of culvert adjacent to monitoring location SW6. Water pools at this location and contains sediment colloids.

Title:	Tarago SWM	Approved:	Project-Nr.: 318001376-001	Date: 09/01/2023
Site:	Tarago Rail Corridor and Mulwaree River			
Client:	Transport for New South Wales			RAMBOLL



Photo 11: Image of monitoring location SW7 facing north. Location is a small dam containing reeds, and vegetative debris.



Photo 12: Image of monitoring location SW7 facing west towards the rail line. Image shows fencing debris and chicken wire mid image.

Title:	Tarago SWM	Approved:	Project-Nr.: 318001376-001	Date: 09/01/2023
Site:	Tarago Rail Corridor and Mulwaree River			
Client:	Transport for New South Wales			RAMBOLL