



## CERTIFICATE OF ANALYSIS 267791

### Client Details

<b>Client</b>	Douglas Partners Pty Ltd (Port Macquarie)
<b>Attention</b>	Joel Cowan
<b>Address</b>	PO Box 5463, Port Macquarie, NSW, 2444

### Sample Details

<b>Your Reference</b>	<b>89781.00, Kempsey Landfill Water &amp; Gas Monitoring</b>
<b>Number of Samples</b>	7 Water
<b>Date samples received</b>	28/04/2021
<b>Date completed instructions received</b>	28/04/2021

### Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.  
Samples were analysed as received from the client. Results relate specifically to the samples as received.  
Results are reported on a dry weight basis for solids and on an as received basis for other matrices.  
**Please refer to the last page of this report for any comments relating to the results.**

### Report Details

<b>Date results requested by</b>	05/05/2021
<b>Date of Issue</b>	05/05/2021

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#### **Results Approved By**

Diego Bigolin, Team Leader, Inorganics  
Hannah Nguyen, Senior Chemist  
Priya Samarawickrama, Senior Chemist

#### **Authorised By**

Nancy Zhang, Laboratory Manager

Total Phenolics in Water			
Our Reference		267791-6	267791-7
Your Reference	UNITS	S5	S6
Date Sampled		27/04/2021	27/04/2021
Type of sample		Water	Water
Date extracted	-	29/04/2021	29/04/2021
Date analysed	-	29/04/2021	29/04/2021
Total Phenolics (as Phenol)	mg/L	<0.05	<0.05

Miscellaneous Inorganics						
Our Reference		267791-1	267791-2	267791-3	267791-4	267791-5
Your Reference	UNITS	BH01-2	BH1	BH2	BH3	BH4
Date Sampled		27/04/2021	27/04/2021	27/04/2021	27/04/2021	27/04/2021
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	29/04/2021	29/04/2021	29/04/2021	29/04/2021	29/04/2021
Date analysed	-	29/04/2021	29/04/2021	29/04/2021	29/04/2021	29/04/2021
Ammonia as N in water	mg/L	0.031	1.3	0.096	0.085	0.11
Nitrate as N in water	mg/L	0.15	<0.005	<0.005	<0.005	0.006

Miscellaneous Inorganics			
Our Reference		267791-6	267791-7
Your Reference	UNITS	S5	S6
Date Sampled		27/04/2021	27/04/2021
Type of sample		Water	Water
Date prepared	-	29/04/2021	29/04/2021
Date analysed	-	29/04/2021	29/04/2021
Ammonia as N in water	mg/L	6.7	0.67
Nitrate as N in water	mg/L	0.04	0.03
Fluoride, F	mg/L	<0.1	<0.1
Total Organic Carbon	mg/L	29	24
Total Suspended Solids	mg/L	16	6

Ion Balance						
Our Reference		267791-1	267791-2	267791-3	267791-4	267791-5
Your Reference	UNITS	BH01-2	BH1	BH2	BH3	BH4
Date Sampled		27/04/2021	27/04/2021	27/04/2021	27/04/2021	27/04/2021
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	28/04/2021	28/04/2021	28/04/2021	28/04/2021	28/04/2021
Date analysed	-	28/04/2021	28/04/2021	28/04/2021	28/04/2021	28/04/2021
Magnesium - Dissolved	mg/L	10	<0.5	17	30	36

Ion Balance			
Our Reference		267791-6	267791-7
Your Reference	UNITS	S5	S6
Date Sampled		27/04/2021	27/04/2021
Type of sample		Water	Water
Date prepared	-	28/04/2021	28/04/2021
Date analysed	-	28/04/2021	28/04/2021
Calcium - Dissolved	mg/L	20	7.0
Potassium - Dissolved	mg/L	10	5.4
Sodium - Dissolved	mg/L	50	36
Magnesium - Dissolved	mg/L	7.3	5.2
Hydroxide Alkalinity (OH <sup>-</sup> ) as CaCO <sub>3</sub>	mg/L	<5	<5
Bicarbonate Alkalinity as CaCO <sub>3</sub>	mg/L	110	49
Carbonate Alkalinity as CaCO <sub>3</sub>	mg/L	<5	<5
Total Alkalinity as CaCO <sub>3</sub>	mg/L	110	49
Sulphate, SO <sub>4</sub>	mg/L	10	2
Chloride, Cl	mg/L	62	43
Ionic Balance	%	-2.0	5.0

HM in water - dissolved			
Our Reference		267791-6	267791-7
Your Reference	UNITS	S5	S6
Date Sampled		27/04/2021	27/04/2021
Type of sample		Water	Water
Date prepared	-	30/04/2021	30/04/2021
Date analysed	-	30/04/2021	30/04/2021
Iron-Dissolved	µg/L	1,200	1,400
Manganese-Dissolved	µg/L	60	160

HM in water - total			
Our Reference		267791-6	267791-7
Your Reference	UNITS	S5	S6
Date Sampled		27/04/2021	27/04/2021
Type of sample		Water	Water
Date prepared	-	05/05/2021	05/05/2021
Date analysed	-	05/05/2021	05/05/2021
Iron-Total	µg/L	3,300	2,300
Manganese-Total	µg/L	210	170

**Client Reference: 89781.00, Kempsey Landfill Water & Gas Monitoring**

<b>Method ID</b>	<b>Methodology Summary</b>
<b>Inorg-006</b>	Alkalinity - determined titrimetrically in accordance with APHA latest edition, 2320-B.
<b>Inorg-019</b>	Suspended Solids - determined gravimetrically by filtration of the sample. The samples are dried at 104+/-5°C.
<b>Inorg-026</b>	Fluoride determined by ion selective electrode (ISE) in accordance with APHA latest edition, 4500-F-C.
<b>Inorg-031</b>	Total Phenolics by segmented flow analyser (in line distillation with colourimetric finish). Solids are extracted in a caustic media prior to analysis.
<b>Inorg-040</b>	The concentrations of the major ions (mg/L) are converted to milliequivalents and summed. The ionic balance should be within +/- 10% ie total anions = total cations +/-10%.
<b>Inorg-055</b>	Nitrate - determined colourimetrically. Waters samples are filtered on receipt prior to analysis. Soils are analysed following a water extraction.
<b>Inorg-057</b>	Ammonia - determined colourimetrically, based on APHA latest edition 4500-NH3 F. Waters samples are filtered on receipt prior to analysis. Soils are analysed following a KCl extraction.
<b>Inorg-079</b>	TOC determined using a TOC analyser using the combustion method. Dissolved requires filtering prior to determination. Analysis using APHA latest edition 5310B.
<b>Inorg-081</b>	Anions - a range of Anions are determined by Ion Chromatography, in accordance with APHA latest edition, 4110-B. Waters samples are filtered on receipt prior to analysis. Alternatively determined by colourimetry/turbidity using Discrete Analyser.
<b>Metals-020</b>	Determination of various metals by ICP-AES.
<b>Metals-022</b>	Determination of various metals by ICP-MS.

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QUALITY CONTROL: Total Phenolics in Water					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date extracted	-			29/04/2021	[NT]	[NT]	[NT]	[NT]	29/04/2021	[NT]
Date analysed	-			29/04/2021	[NT]	[NT]	[NT]	[NT]	29/04/2021	[NT]
Total Phenolics (as Phenol)	mg/L	0.05	Inorg-031	<0.05	[NT]	[NT]	[NT]	[NT]	102	[NT]



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QUALITY CONTROL: Miscellaneous Inorganics				Duplicate				Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	267791-2
Date prepared	-			29/04/2021	7	29/04/2021	29/04/2021		29/04/2021	29/04/2021
Date analysed	-			29/04/2021	7	29/04/2021	29/04/2021		29/04/2021	29/04/2021
Ammonia as N in water	mg/L	0.005	Inorg-057	<0.005	7	0.67	0.64	5	102	[NT]
Nitrate as N in water	mg/L	0.005	Inorg-055	<0.005	7	0.03	0.03	0	97	[NT]
Fluoride, F	mg/L	0.1	Inorg-026	<0.1	7	<0.1	[NT]		99	[NT]
Total Organic Carbon	mg/L	1	Inorg-079	<1	7	24	[NT]		104	98
Total Suspended Solids	mg/L	5	Inorg-019	<5	7	6	[NT]		94	[NT]

QUALITY CONTROL: Miscellaneous Inorganics				Duplicate				Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	267791-6
Date prepared	-			[NT]	[NT]	[NT]	[NT]	[NT]	[NT]	29/04/2021
Date analysed	-			[NT]	[NT]	[NT]	[NT]	[NT]	[NT]	29/04/2021
Ammonia as N in water	mg/L	0.005	Inorg-057	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]	79
Nitrate as N in water	mg/L	0.005	Inorg-055	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]	94

Client Reference: 89781.00, Kempsey Landfill Water & Gas Monitoring

QUALITY CONTROL: Ion Balance				Duplicate				Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date prepared	-			28/04/2021	1	28/04/2021	28/04/2021		28/04/2021	[NT]
Date analysed	-			28/04/2021	1	28/04/2021	28/04/2021		28/04/2021	[NT]
Calcium - Dissolved	mg/L	0.5	Metals-020	<0.5	[NT]	[NT]	[NT]	[NT]	92	[NT]
Potassium - Dissolved	mg/L	0.5	Metals-020	<0.5	[NT]	[NT]	[NT]	[NT]	90	[NT]
Sodium - Dissolved	mg/L	0.5	Metals-020	<0.5	[NT]	[NT]	[NT]	[NT]	96	[NT]
Magnesium - Dissolved	mg/L	0.5	Metals-020	<0.5	1	10	10	0	97	[NT]
Hydroxide Alkalinity (OH <sup>-</sup> ) as CaCO <sub>3</sub>	mg/L	5	Inorg-006	<5	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Bicarbonate Alkalinity as CaCO <sub>3</sub>	mg/L	5	Inorg-006	<5	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Carbonate Alkalinity as CaCO <sub>3</sub>	mg/L	5	Inorg-006	<5	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Total Alkalinity as CaCO <sub>3</sub>	mg/L	5	Inorg-006	<5	[NT]	[NT]	[NT]	[NT]	115	[NT]
Sulphate, SO <sub>4</sub>	mg/L	1	Inorg-081	<1	[NT]	[NT]	[NT]	[NT]	92	[NT]
Chloride, Cl	mg/L	1	Inorg-081	<1	[NT]	[NT]	[NT]	[NT]	98	[NT]

**Client Reference: 89781.00, Kempsey Landfill Water & Gas Monitoring**

QUALITY CONTROL: HM in water - dissolved					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date prepared	-			30/04/2021	[NT]	[NT]	[NT]	[NT]	30/04/2021	[NT]
Date analysed	-			30/04/2021	[NT]	[NT]	[NT]	[NT]	30/04/2021	[NT]
Iron-Dissolved	µg/L	10	Metals-022	<10	[NT]	[NT]	[NT]	[NT]	100	[NT]
Manganese-Dissolved	µg/L	5	Metals-022	<5	[NT]	[NT]	[NT]	[NT]	98	[NT]

**Client Reference: 89781.00, Kempsey Landfill Water & Gas Monitoring**

QUALITY CONTROL: HM in water - total				Duplicate				Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date prepared	-			05/05/2021	[NT]	[NT]	[NT]	[NT]	05/05/2021	[NT]
Date analysed	-			05/05/2021	[NT]	[NT]	[NT]	[NT]	05/05/2021	[NT]
Iron-Total	µg/L	10	Metals-022	<10	[NT]	[NT]	[NT]	[NT]	102	[NT]
Manganese-Total	µg/L	5	Metals-022	<5	[NT]	[NT]	[NT]	[NT]	102	[NT]

## Result Definitions

<b>NT</b>	Not tested
<b>NA</b>	Test not required
<b>INS</b>	Insufficient sample for this test
<b>PQL</b>	Practical Quantitation Limit
<b>&lt;</b>	Less than
<b>&gt;</b>	Greater than
<b>RPD</b>	Relative Percent Difference
<b>LCS</b>	Laboratory Control Sample
<b>NS</b>	Not specified
<b>NEPM</b>	National Environmental Protection Measure
<b>NR</b>	Not Reported

## Quality Control Definitions

<b>Blank</b>	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
<b>Duplicate</b>	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
<b>Matrix Spike</b>	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
<b>LCS (Laboratory Control Sample)</b>	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
<b>Surrogate Spike</b>	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.
Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.	
The recommended maximums for analytes in urine are taken from "2018 TLVs and BEIs", as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.	
Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2	

## Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Samples for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.

## Report Comments

Dissolved Metals: no filtered, preserved sample was received for #6,7, therefore the unpreserved sample was filtered through 0.45µm filter at the lab.

Note: there is a possibility some elements may be underestimated.

Dissolved Metals: The preserved samples provided for 267791-6 and 7 were not identified as either total or dissolved, therefore the unpreserved sample was filtered through 0.45µm filter at the lab.

Note: there is a possibility some elements may be underestimated.

Total Metals: The preserved samples provided for 267791-6 and 7 were not identified as either total or dissolved, therefore the analysis was conducted from the unpreserved sample.

Note: there is a possibility some elements may be underestimated