



Environmental Forensics Report of Analysis

Project 20230144

Report #:

1648

Date Issued:

25-May-2023

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Client Project Reference: Menindee Fish Kill - 15 (1 May 2023

Customer: Department of Planning & Environment

Attention:

[Redacted]

EF Project Contact:

[Redacted]

[Redacted]

[Redacted]

Report Date: 25 May 2023

Project Received: 02 May 2023

The following samples were analysed:

Sample ID	Client ID	Sample Type	Client Sampled Date/Time	Aliquot
232864	E6	Liquid	01/05/2023 1:25PM	
232871	E6	Liquid	01/05/2023 1:25PM	Field Aliquot
232878	E6	Liquid	01/05/2023 1:25PM	Field Aliquot
232885	E6	Liquid	01/05/2023 1:25PM	Field Aliquot
232892	E6	Liquid	01/05/2023 1:25PM	Laboratory Aliquot
232865	E6.5	Liquid	01/05/2023 2:45PM	
232872	E6.5	Liquid	01/05/2023 2:45PM	Field Aliquot
232879	E6.5	Liquid	01/05/2023 2:45PM	Field Aliquot
232886	E6.5	Liquid	01/05/2023 2:45PM	Field Aliquot
232893	E6.5	Liquid	01/05/2023 2:45PM	Laboratory Aliquot
232866	E7	Liquid	01/05/2023 3:10PM	
232873	E7	Liquid	01/05/2023 3:10PM	Field Aliquot
232880	E7	Liquid	01/05/2023 3:10PM	Field Aliquot
232887	E7	Liquid	01/05/2023 3:10PM	Field Aliquot
232894	E7	Liquid	01/05/2023 3:10PM	Laboratory Aliquot
232867	E8	Liquid	01/05/2023 9:50AM	
232874	E8	Liquid	01/05/2023 9:50AM	Field Aliquot
232881	E8	Liquid	01/05/2023 9:50AM	Field Aliquot
232888	E8	Liquid	01/05/2023 9:50AM	Field Aliquot
232895	E8	Liquid	01/05/2023 9:50AM	Laboratory Aliquot
232868	E9	Liquid	01/05/2023 10:40AM	
232875	E9	Liquid	01/05/2023 10:40AM	Field Aliquot
232882	E9	Liquid	01/05/2023 10:40AM	Field Aliquot
232889	E9	Liquid	01/05/2023 10:40AM	Field Aliquot
232896	E9	Liquid	01/05/2023 10:40AM	Laboratory Aliquot
232869	E10	Liquid	01/05/2023 11:40AM	
232876	E10	Liquid	01/05/2023 11:40AM	Field Aliquot
232883	E10	Liquid	01/05/2023 11:40AM	Field Aliquot
232890	E10	Liquid	01/05/2023 11:40AM	Field Aliquot

Tests not covered by NATA accreditation 3040 are denoted with \*

Codes: SN = Sample Note

RC = Project Comment



Sample ID	Matrix	Sample Type	Date	Time	Notes
232897	E10	Liquid	01/05/2023	11:40AM	Laboratory Aliquot
232870	B4	Liquid	01/05/2023	2:00PM	
232877	B4	Liquid	01/05/2023	2:00PM	Field Aliquot
232884	B4	Liquid	01/05/2023	2:00PM	Field Aliquot
232891	B4	Liquid	01/05/2023	2:00PM	Field Aliquot
232898	B4	Liquid	01/05/2023	2:00PM	Laboratory Aliquot
233048	E6.5 MFK-Z-16_202304	Liquid	01/05/2023		
233049	E10 MFK-Z-10_202304	Liquid	01/05/2023		
233055	E6 MFK-Z-6_20230501	Liquid	01/05/2023		
233056	E7 MFK-Z-7_20230501	Liquid	01/05/2023		
233057	E8 MFK-Z-8_20230501	Liquid	01/05/2023		
233058	E9 MFK-Z-9_20230501	Liquid	01/05/2023		
233059	B4 MFK-Z-20_20230501	Liquid	01/05/2023		

**Report Notes**

- This document has been authorised by the person whose name appears in this report.
- This report shall not be reproduced except in full. Samples analysed as received from the client.
- Results reported as 'less than' (<) indicates a result below the practical quantitation limit for the sample matrix and method used.
- Solid samples are reported on a dry weight basis and biota samples are reported on an as received basis unless specified otherwise.

### Project Comments

- Samples 232864, 232865, 232866, 232867, 232868, 232869, 232870 were sent to ALS Environmental Laboratory (NATA Accreditation no: 825) for the analysis of EK055G: Ammonia as N by Discrete Analyser, EK057G: Nitrite as N by Discrete Analyser, EK058G: Nitrate as N by Discrete Analyser, EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser, EK061G: Total Kjeldahl Nitrogen By Discrete Analyser, EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser, EK067G: Total Phosphorus as P by Discrete Analyser, EK071G: Reactive Phosphorus as P by discrete analyser, EP202A: Phenoxyacetic Acid Herbicides by LCMS, EP202S: Phenoxyacetic Acid Herbicide Surrogate, EP204: Glyphosate and AMPA. This report summarises data from the attached external report: ES2314518, dated 11-May-2023.
- Samples 232878 to 232884 were sent to Sydney Water Laboratory Services (NATA Accreditation no: 63 and 610) for the analysis of Blue-Green Algal ID and Enumeration. Please see detailed results in the attached Phytoplankton Analysis Report No: 284809 dated 19 May 2023.
- Samples 232892 to 232898 were sent to Sydney Water Laboratory Services (NATA Accreditation no: 63 and 610) for the analysis of Algal Toxins. Please see the attached Analytical Report No: 284809 dated 19 May 2023, which gives Algal Toxins analysis results and the Blue-Green Algal ID and Enumeration summary results.
- Samples 233048, 233049, 233055 to 233059 were analysed outside the method holding time for TSS analysis. Samples 233048 and 233059 contained very fine particulates, a fraction of which passed through the filter used for analysing total, fixed and volatile suspended solids.



**Analysis Results - External Methods\***

**Area - EXTERNAL**

Analyte	Sample ID	Start Date	Client ID	232864 3/05/2023 E6	232865 3/05/2023 E6.5	232866 3/05/2023 E7	232867 3/05/2023 E8	232868 3/05/2023 E9	232869 3/05/2023 E10	232870 3/05/2023 B4
2,4,5-T				<10	<10	<10	<10	<10	<10	<10
2,4,6-T				<10	<10	<10	<10	<10	<10	<10
2,4-D				<10	<10	<10	<10	<10	<10	<10
2,4-DB				<10	<10	<10	<10	<10	<10	<10
2,4-DP				<10	<10	<10	<10	<10	<10	<10
2,6-D				<10	<10	<10	<10	<10	<10	<10
4-Chlorophenoxy acetic acid				<10	<10	<10	<10	<10	<10	<10
Ammonia as N				<0.01	0.03	0.05	0.06	0.05	0.06	<0.01
AMPA				<10	<10	<10	<10	<10	<10	<10
Clopyralid				<10	<10	<10	<10	<10	<10	<10
Dicamba				<10	<10	<10	<10	<10	<10	<10
Fluroxypyr				<10	<10	<10	<10	<10	<10	<10
Glyphosate				<10	<10	<10	<10	<10	<10	<10
MCPA				<10	<10	<10	<10	<10	<10	<10
MCPB				<10	<10	<10	<10	<10	<10	<10
Mecoprop				<10	<10	<10	<10	<10	<10	<10
Nitrate as N				<0.01	0.02	<0.01	0.04	0.04	0.07	<0.01
Nitrite as N				<0.01	<0.01	<0.01	<0.01	0.01	0.02	<0.01
Nitrite+Nitrate as N				<0.01	0.02	<0.01	0.04	0.05	0.09	<0.01
Picloram				<10	<10	<10	<10	<10	<10	<10
Reactive Phosphorus as P				<0.01	0.23	0.15	0.13	0.12	0.10	0.24
Silvex (2,4,5-TP/Fenoprop)				<10	<10	<10	<10	<10	<10	<10
Total Kjeldahl Nitrogen as N				4.7	0.9	1.6	1.2	1.4	1.7	0.7
Total Nitrogen as N				4.7	0.9	1.6	1.2	1.4	1.8	0.7
Total Phosphorus as P				0.54	0.38	0.38	0.27	0.29	0.32	0.33
Triclopyr				<10	<10	<10	<10	<10	<10	<10

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**Analysis Results - ICPMS**  
**Area - INORGANIC**

Analyte	Sample ID Start Date Client ID	232885 3/05/2023 E6	232886 3/05/2023 E6.5	232887 3/05/2023 E7	232888 3/05/2023 E8	232889 3/05/2023 E9	232890 3/05/2023 E10	232891 3/05/2023 B4
Antimony (Lab. filtered)	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Arsenic (Lab. filtered)	mg/L	0.005	0.006	0.007	0.004	0.004	0.004	0.006
Beryllium (Lab. filtered)	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Cadmium (Lab. filtered)	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium (Lab. filtered)	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Cobalt (Lab. filtered)	mg/L	0.0013	0.001	0.002	0.002	0.002	0.003	<0.0001
Copper (Lab. filtered)	mg/L	0.0010	0.0023	0.0017	0.0019	0.0019	0.0020	0.0024
Lead (Lab. filtered)	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Lithium (Lab. filtered)	mg/L	0.0022	0.0020	0.0022	0.0017	0.0018	0.0019	0.0020
Manganese (Lab. filtered)	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Molybdenum (Lab. filtered)	mg/L	0.0022	0.0014	0.0014	0.0013	0.0013	0.0013	0.0014
Nickel (Lab. filtered)	mg/L	0.0025	0.0022	0.0021	0.0026	0.0030	0.0031	0.0021
Selenium (Lab. filtered)	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Silver (Lab. filtered)	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Thallium (Lab. filtered)	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Tin (Lab. filtered)	mg/L	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Vanadium (Lab. filtered)	mg/L	0.012	0.019	0.022	0.011	0.012	0.012	0.019
Zinc (Lab. filtered)	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

Tests not covered by NATA accreditation 3040 are denoted with \*  
**Codes:** SN = Sample Note  
**RN** = Result Note  
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**Analysis Results - ICPAES**  
**Area - INORGANIC**

Analyte	Sample ID	Start Date	Client ID	232885	232886	232887	232888	232889	232890	232891
		3/05/2023		3/05/2023	3/05/2023	3/05/2023	3/05/2023	3/05/2023	3/05/2023	3/05/2023
		E6	E6.5	E7	E8	E9	E8	E9	E10	B4
Aluminium (acid extractable)		0.73	4.8	4.6	6.0	6.2	6.0	6.2	6.4	3.6
Barium (acid extractable)		0.11	0.12	0.13	0.15	0.15	0.15	0.15	0.15	0.11
Boron (acid extractable)		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Calcium (acid extractable)		21	35	32	36	36	36	36	35	34
Iron (acid extractable)		0.7	3.8	3.9	5.2	5.4	5.2	5.4	5.8	2.8
Magnesium (acid extractable)		15	14	15	17	17	17	17	18	14
Manganese (acid extractable)		0.18	0.04	0.11	0.11	0.13	0.11	0.13	0.17	0.03
Potassium (acid extractable)		16	14	15	14	14	14	14	15	13
Sodium (acid extractable)		59	40	46	45	47	45	47	49	40
Strontium (acid extractable)		0.33	0.35	0.36	0.39	0.39	0.39	0.39	0.40	0.34
Sulfur (acid extractable)		3.4	4.2	4.3	3.8	3.7	3.8	3.7	3.4	4.1
Titanium (acid extractable)		<0.01	0.10	0.05	0.11	0.11	0.11	0.11	0.08	0.07

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**Analysis Results - ICPMS**  
**Area - INORGANIC**

Analyte	Sample ID Start Date Client / ID	232885 3/05/2023 E6	232886 3/05/2023 E6.5	232887 3/05/2023 E7	232888 3/05/2023 E8	232889 3/05/2023 E9	232890 3/05/2023 E10	232891 3/05/2023 B4
Antimony (acid extractable)	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Arsenic (acid extractable)	mg/L	0.005	0.007	0.007	0.005	0.005	0.005	0.007
Beryllium (acid extractable)	mg/L	<0.0001	0.0001	0.0001	0.0002	0.0002	0.0002	<0.0001
Cadmium (acid extractable)	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium (acid extractable)	mg/L	<0.001	0.004	0.005	0.006	0.006	0.006	0.003
Cobalt (acid extractable)	mg/L	0.0025	0.0012	0.0018	0.0019	0.0021	0.0027	0.0008
Copper (acid extractable)	mg/L	0.0021	0.0049	0.0045	0.0048	0.0050	0.0056	0.0048
Lead (acid extractable)	mg/L	0.0007	0.0009	0.0013	0.0015	0.0015	0.0017	0.0006
Lithium (acid extractable)	mg/L	0.0025	0.0035	0.0038	0.0035	0.0035	0.0039	0.0032
Molybdenum (acid extractable)	mg/L	0.0022	0.0014	0.0014	0.0013	0.0013	0.0013	0.0014
Nickel (acid extractable)	mg/L	0.0044	0.0050	0.0053	0.0063	0.0067	0.0076	0.0044
Selenium (acid extractable)	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Silver (acid extractable)	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Thallium (acid extractable)	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Tin (acid extractable)	mg/L	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Vanadium (acid extractable)	mg/L	0.016	0.027	0.031	0.021	0.022	0.023	0.025
Zinc (acid extractable)	mg/L	0.004	0.007	0.008	0.009	0.009	0.010	0.005

**Analysis Results - IGR TSS**  
**Area - INORGANIC**

Analyte	Sample ID Start Date Client / ID	233048 11/05/2023 E6.5 MFK-Z- 16_202304	233049 11/05/2023 E10 MFK-Z- 10_202304	233055 12/05/2023 E6 MFK-Z- _20230501	233056 12/05/2023 E7 MFK-Z-7 _20230501	233057 12/05/2023 E8 MFK-Z-8 _20230501	233058 12/05/2023 E9 MFK-Z-9 _20230501	233059 12/05/2023 B4 MFK-Z-2 0_20230501
Fixed Suspended Solids	mg/L	27	71	14	46	27	48	7
Total Suspended Solids	mg/L	35	87	59	60	36	59	11
Volatile Suspended Solids	mg/L	8	16	45	14	8	11	<5

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**Analysis Results - QQQPEST**  
**Area - ORGANIC**

Analyte	Sample ID Start Date Client ID	232871 4/05/2023 E6	232872 4/05/2023 E6.5	232873 4/05/2023 E7	232874 4/05/2023 E8	232875 4/05/2023 E9	232876 4/05/2023 E10	232877 4/05/2023 B4
Fenvalerate	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Gamma-Chlordane	µg/L	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
gamma-HCH	µg/L	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
Heptachlor Epoxide	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Heptachlor	µg/L	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
Hexachlorobenzene	µg/L	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Hexazinone	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
L-cyhalothrin	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Malathion	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Methidathion	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Methyl Azinphos	µg/L	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
Methyl Chlorpyrifos	µg/L	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
Methyl Parathion	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Mevinphos	µg/L	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
Oxyfluorfen	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Parathion	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Phorate	µg/L	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
Profenofos	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Prometon	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Promethyn	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Propagite	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Propazine	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Propelamphos	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Simazine	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Simethyn	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Sulprofos	µg/L	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
Tebuconazole	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Tebuthiuron	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Terbutylazine	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Terbutyn	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Tetrachlorvinphos	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Trans-permethrin	µg/L	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7

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**RN = Result Note**  
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**Area - ORGANIC**

Sample ID	Client ID	Method	Start Date	Result
232871	E6	OLSCAN* - LC/MS Scan	08/05/2023	LC/MS scan for approximately 600 pesticides was negative. A list of analysed compounds can be provided on request. Note the list doesn't include glyphosate and quaternary ammonium herbicides (e.g. Paraquat and Diquat).
232872	E6.5	OLSCAN* - LC/MS Scan	08/05/2023	LC/MS scan for approximately 600 pesticides was negative. A list of analysed compounds can be provided on request. Note the list doesn't include glyphosate and quaternary ammonium herbicides (e.g. Paraquat and Diquat).
232873	E7	OLSCAN* - LC/MS Scan	08/05/2023	LC/MS scan for approximately 600 pesticides was negative. A list of analysed compounds can be provided on request. Note the list doesn't include glyphosate and quaternary ammonium herbicides (e.g. Paraquat and Diquat).
232874	E8	OLSCAN* - LC/MS Scan	08/05/2023	LC/MS scan for approximately 600 pesticides was negative. A list of analysed compounds can be provided on request. Note the list doesn't include glyphosate and quaternary ammonium herbicides (e.g. Paraquat and Diquat).
232875	E9	OLSCAN* - LC/MS Scan	08/05/2023	LC/MS scan for approximately 600 pesticides was negative. A list of analysed compounds can be provided on request. Note the list doesn't include glyphosate and quaternary ammonium herbicides (e.g. Paraquat and Diquat).
232876	E10	OLSCAN* - LC/MS Scan	08/05/2023	LC/MS scan for approximately 600 pesticides was negative. A list of analysed compounds can be provided on request. Note the list doesn't include glyphosate and quaternary ammonium herbicides (e.g. Paraquat and Diquat).
232877	B4	OLSCAN* - LC/MS Scan	08/05/2023	LC/MS scan for approximately 600 pesticides was negative. A list of analysed compounds can be provided on request. Note the list doesn't include glyphosate and quaternary ammonium herbicides (e.g. Paraquat and Diquat).

**The sample(s) referred to in this report were analysed by the following method(s):**

Method code	Method description	Area
External Methods*	External Methods - Analysis completed externally	EXTERNAL
External Methods*	External Methods - Analysis completed externally	EXTERNAL
ICVAASW	Mercury by Cold Vapour Atomic Absorption Spectroscopy	INORGANIC
ICPAES	Dissolved element analysis by Inductively Coupled Plasma-Atomic Emission Spectrometry (ICPAES)	INORGANIC
ICPMS	Dissolved Metals by Inductively Coupled Plasma Mass Spectrometry (ICP-MS)	INORGANIC
ICPAES	Acid extractable element analysis by Inductively Coupled Plasma-Atomic Emission Spectrometry (ICPAES)	INORGANIC
ICPMS	Acid extractable Metals by Inductively Coupled Plasma Mass Spectrometry (ICP-MS)	INORGANIC
IGRTSS	Total Suspended Solids (TSS) (includes Volatile and Fixed Suspended Solids)	INORGANIC
QQQPEST	Determination of Multiresidue Pesticides by GCMSMS	ORGANIC
OLSCAN*	Qualitative LC/MS scan	ORGANIC

**The results in this report were authorised by:**

Name	Title	Area
	Senior Scientist	EXTERNAL
	Scientist	INORGANIC
	Scientist	ORGANIC

Tests not covered by NATA accreditation 3040 are denoted with \*  
**Codes:** SN = Sample Note  
 RN = Result Note  
 RC = Project Comment