

## CERTIFICATE OF ANALYSIS

**Work Order** : **EW1603015**  
**Client** : **WOLLONGONG CITY COUNCIL**  
**Contact** : MR WAYDE PETERSON  
**Address** : 41 BURELLI STREET  
 WOLLONGONG NSW, AUSTRALIA 2500  
  
**Telephone** : +61 02 4227 7111  
**Project** : Helensburgh Leachate Annual  
**Order number** : 3058354  
**C-O-C number** : ----  
**Sampler** : Craig Wilson  
**Site** : ----  
**Quote number** : ----  
**No. of samples received** : 1  
**No. of samples analysed** : 1

**Page** : 1 of 8  
**Laboratory** : Environmental Division NSW South Coast  
**Contact** : Glenn Davies  
**Address** : 1/19 Ralph Black Dr, North Wollongong 2500  
 4/13 Geary Pl, North Nowra 2541  
 Australia  
**Telephone** : 02 42253125  
**Date Samples Received** : 10-Aug-2016 14:00  
**Date Analysis Commenced** : 10-Aug-2016  
**Issue Date** : 18-Aug-2016 10:28

NATA Accredited Laboratory 825  
 Accredited for compliance with  
 ISO/IEC 17025.



This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

**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.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Ashesh Patel	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjjar	Organic Coordinator	Sydney Organics, Smithfield, NSW
Glenn Davies	Environmental Services Representative	Laboratory - Wollongong
RICHARD TEA	Lab technician	Sydney Inorganics, Smithfield, NSW



## General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by 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 Contact 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

∅ = ALS is not NATA accredited for these tests.

~ = Indicates an estimated value.

- Sampling and sample data supplied by ALS Wollongong.
- Sampling completed as per FWI-EN002 Surface Water Sampling.
- Field tests completed on day of sampling/receipt.
- Benzo(a)pyrene Toxicity Equivalent Quotient (TEQ) is the sum total of the concentration of the eight carcinogenic PAHs multiplied by their Toxicity Equivalence Factor (TEF) relative to Benzo(a)pyrene. TEF values are provided in brackets as follows: Benz(a)anthracene (0.1), Chrysene (0.01), Benzo(b+j) & Benzo(k)fluoranthene (0.1), Benzo(a)pyrene (1.0), Indeno(1.2.3.cd)pyrene (0.1), Dibenz(a,h)anthracene (1.0), Benzo(g,h,i)perylene (0.01). Less than LOR results for 'TEQ Zero' are treated as zero.



## Analytical Results

Sub-Matrix: WATER (Matrix: WATER)		Client sample ID			Leachate	----	----	----	----
		Client sampling date / time			10-Aug-2016 11:40	----	----	----	----
Compound	CAS Number	LOR	Unit	EW1603015-001	-----	-----	-----	-----	-----
				Result	----	----	----	----	----
<b>EA005FD: Field pH</b>									
pH	----	0.1	pH Unit	7.0	----	----	----	----	----
<b>EA010FD: Field Conductivity</b>									
Electrical Conductivity (Non Compensated)	----	1	µS/cm	1380	----	----	----	----	----
<b>EA015: Total Dissolved Solids dried at 180 ± 5 °C</b>									
Total Dissolved Solids @180°C	----	10	mg/L	798	----	----	----	----	----
<b>EA025: Total Suspended Solids dried at 104 ± 2°C</b>									
Suspended Solids (SS)	----	5	mg/L	6	----	----	----	----	----
<b>ED037P: Alkalinity by PC Titrator</b>									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	----	----	----	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	624	----	----	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L	624	----	----	----	----	----
<b>ED041G: Sulfate (Turbidimetric) as SO4 2- by DA</b>									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	24	----	----	----	----	----
<b>ED045G: Chloride by Discrete Analyser</b>									
Chloride	16887-00-6	1	mg/L	58	----	----	----	----	----
<b>ED093T: Total Major Cations</b>									
Calcium	7440-70-2	1	mg/L	118	----	----	----	----	----
Magnesium	7439-95-4	1	mg/L	44	----	----	----	----	----
Sodium	7440-23-5	1	mg/L	102	----	----	----	----	----
Potassium	7440-09-7	1	mg/L	33	----	----	----	----	----
<b>EG020T: Total Metals by ICP-MS</b>									
Aluminium	7429-90-5	0.01	mg/L	0.19	----	----	----	----	----
Arsenic	7440-38-2	0.001	mg/L	<0.001	----	----	----	----	----
Barium	7440-39-3	0.001	mg/L	0.252	----	----	----	----	----
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	----	----	----	----	----
Cobalt	7440-48-4	0.001	mg/L	0.001	----	----	----	----	----
Chromium	7440-47-3	0.001	mg/L	0.001	----	----	----	----	----
Copper	7440-50-8	0.001	mg/L	0.017	----	----	----	----	----
Manganese	7439-96-5	0.001	mg/L	0.112	----	----	----	----	----
Lead	7439-92-1	0.001	mg/L	<0.001	----	----	----	----	----
Zinc	7440-66-6	0.005	mg/L	0.024	----	----	----	----	----
<b>EG035T: Total Recoverable Mercury by FIMS</b>									



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Client sampling date / time				10-Aug-2016 11:40	----	----	----	----	
Compound	CAS Number	LOR	Unit	EW1603015-001	-----	-----	-----	-----	
				Result	----	----	----	----	
<b>EG035T: Total Recoverable Mercury by FIMS - Continued</b>									
Mercury	7439-97-6	0.0001	mg/L	<0.0001	----	----	----	----	
<b>EG050T: Total Hexavalent Chromium</b>									
Hexavalent Chromium	18540-29-9	0.01	mg/L	<0.01	----	----	----	----	
<b>EK040P: Fluoride by PC Titrator</b>									
Fluoride	16984-48-8	0.1	mg/L	0.1	----	----	----	----	
<b>EK055G: Ammonia as N by Discrete Analyser</b>									
Ammonia as N	7664-41-7	0.01	mg/L	19.7	----	----	----	----	
<b>EK057G: Nitrite as N by Discrete Analyser</b>									
Nitrite as N	14797-65-0	0.01	mg/L	0.13	----	----	----	----	
<b>EK058G: Nitrate as N by Discrete Analyser</b>									
Nitrate as N	14797-55-8	0.01	mg/L	3.84	----	----	----	----	
<b>EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser</b>									
Nitrite + Nitrate as N	----	0.01	mg/L	3.97	----	----	----	----	
<b>EK067G: Total Phosphorus as P by Discrete Analyser</b>									
Total Phosphorus as P	----	0.01	mg/L	0.03	----	----	----	----	
<b>EN055: Ionic Balance</b>									
Total Anions	----	0.01	meq/L	14.6	----	----	----	----	
Total Cations	----	0.01	meq/L	15.0	----	----	----	----	
Ionic Balance	----	0.01	%	1.38	----	----	----	----	
<b>EP005: Total Organic Carbon (TOC)</b>									
Total Organic Carbon	----	1	mg/L	19	----	----	----	----	
<b>EP035G: Total Phenol by Discrete Analyser</b>									
Phenols (Total)	----	0.05	mg/L	<0.05	----	----	----	----	
<b>EP068A: Organochlorine Pesticides (OC)</b>									
alpha-BHC	319-84-6	0.5	µg/L	<0.5	----	----	----	----	
Hexachlorobenzene (HCB)	118-74-1	0.5	µg/L	<0.5	----	----	----	----	
beta-BHC	319-85-7	0.5	µg/L	<0.5	----	----	----	----	
gamma-BHC	58-89-9	0.5	µg/L	<0.5	----	----	----	----	
delta-BHC	319-86-8	0.5	µg/L	<0.5	----	----	----	----	
Heptachlor	76-44-8	0.5	µg/L	<0.5	----	----	----	----	
Aldrin	309-00-2	0.5	µg/L	<0.5	----	----	----	----	
Heptachlor epoxide	1024-57-3	0.5	µg/L	<0.5	----	----	----	----	
trans-Chlordane	5103-74-2	0.5	µg/L	<0.5	----	----	----	----	



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Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	Leachate	----	----	----	----
Client sampling date / time				10-Aug-2016 11:40	----	----	----	----	
Compound	CAS Number	LOR	Unit	EW1603015-001	-----	-----	-----	-----	
				Result	----	----	----	----	
<b>EP068A: Organochlorine Pesticides (OC) - Continued</b>									
alpha-Endosulfan	959-98-8	0.5	µg/L	<0.5	----	----	----	----	
cis-Chlordane	5103-71-9	0.5	µg/L	<0.5	----	----	----	----	
Dieldrin	60-57-1	0.5	µg/L	<0.5	----	----	----	----	
4,4'-DDE	72-55-9	0.5	µg/L	<0.5	----	----	----	----	
Endrin	72-20-8	0.5	µg/L	<0.5	----	----	----	----	
beta-Endosulfan	33213-65-9	0.5	µg/L	<0.5	----	----	----	----	
4,4'-DDD	72-54-8	0.5	µg/L	<0.5	----	----	----	----	
Endrin aldehyde	7421-93-4	0.5	µg/L	<0.5	----	----	----	----	
Endosulfan sulfate	1031-07-8	0.5	µg/L	<0.5	----	----	----	----	
4,4'-DDT	50-29-3	2	µg/L	<2.0	----	----	----	----	
Endrin ketone	53494-70-5	0.5	µg/L	<0.5	----	----	----	----	
Methoxychlor	72-43-5	2	µg/L	<2.0	----	----	----	----	
^ Total Chlordane (sum)	----	0.5	µg/L	<0.5	----	----	----	----	
^ Sum of DDD + DDE + DDT	72-54-8/72-55-9/50-2	0.5	µg/L	<0.5	----	----	----	----	
^ Sum of Aldrin + Dieldrin	309-00-2/60-57-1	0.5	µg/L	<0.5	----	----	----	----	
<b>EP068B: Organophosphorus Pesticides (OP)</b>									
Dichlorvos	62-73-7	0.5	µg/L	<0.5	----	----	----	----	
Demeton-S-methyl	919-86-8	0.5	µg/L	<0.5	----	----	----	----	
Monocrotophos	6923-22-4	2	µg/L	<2.0	----	----	----	----	
Dimethoate	60-51-5	0.5	µg/L	<0.5	----	----	----	----	
Diazinon	333-41-5	0.5	µg/L	<0.5	----	----	----	----	
Chlorpyrifos-methyl	5598-13-0	0.5	µg/L	<0.5	----	----	----	----	
Parathion-methyl	298-00-0	2	µg/L	<2.0	----	----	----	----	
Malathion	121-75-5	0.5	µg/L	<0.5	----	----	----	----	
Fenthion	55-38-9	0.5	µg/L	<0.5	----	----	----	----	
Chlorpyrifos	2921-88-2	0.5	µg/L	<0.5	----	----	----	----	
Parathion	56-38-2	2	µg/L	<2.0	----	----	----	----	
Pirimphos-ethyl	23505-41-1	0.5	µg/L	<0.5	----	----	----	----	
Chlorfenvinphos	470-90-6	0.5	µg/L	<0.5	----	----	----	----	
Bromophos-ethyl	4824-78-6	0.5	µg/L	<0.5	----	----	----	----	
Fenamiphos	22224-92-6	0.5	µg/L	<0.5	----	----	----	----	
Prothiofos	34643-46-4	0.5	µg/L	<0.5	----	----	----	----	
Ethion	563-12-2	0.5	µg/L	<0.5	----	----	----	----	
Carbophenothion	786-19-6	0.5	µg/L	<0.5	----	----	----	----	



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Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	Leachate	----	----	----	----
Client sampling date / time				10-Aug-2016 11:40	----	----	----	----	
Compound	CAS Number	LOR	Unit	EW1603015-001	-----	-----	-----	-----	
				Result	----	----	----	----	
<b>EP068B: Organophosphorus Pesticides (OP) - Continued</b>									
Azinphos Methyl	86-50-0	0.5	µg/L	<0.5	----	----	----	----	
<b>EP075(SIM)B: Polynuclear Aromatic Hydrocarbons</b>									
Naphthalene	91-20-3	1	µg/L	<1.0	----	----	----	----	
Acenaphthylene	208-96-8	1	µg/L	<1.0	----	----	----	----	
Acenaphthene	83-32-9	1	µg/L	<1.0	----	----	----	----	
Fluorene	86-73-7	1	µg/L	<1.0	----	----	----	----	
Phenanthrene	85-01-8	1	µg/L	<1.0	----	----	----	----	
Anthracene	120-12-7	1	µg/L	<1.0	----	----	----	----	
Fluoranthene	206-44-0	1	µg/L	<1.0	----	----	----	----	
Pyrene	129-00-0	1	µg/L	<1.0	----	----	----	----	
Benz(a)anthracene	56-55-3	1	µg/L	<1.0	----	----	----	----	
Chrysene	218-01-9	1	µg/L	<1.0	----	----	----	----	
Benzo(b+j)fluoranthene	205-99-2 205-82-3	1	µg/L	<1.0	----	----	----	----	
Benzo(k)fluoranthene	207-08-9	1	µg/L	<1.0	----	----	----	----	
Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	----	----	----	----	
Indeno(1.2.3.cd)pyrene	193-39-5	1	µg/L	<1.0	----	----	----	----	
Dibenz(a.h)anthracene	53-70-3	1	µg/L	<1.0	----	----	----	----	
Benzo(g,h,i)perylene	191-24-2	1	µg/L	<1.0	----	----	----	----	
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	µg/L	<0.5	----	----	----	----	
^ Benzo(a)pyrene TEQ (zero)	----	0.5	µg/L	<0.5	----	----	----	----	
<b>EP080/071: Total Petroleum Hydrocarbons</b>									
C6 - C9 Fraction	----	20	µg/L	<20	----	----	----	----	
C10 - C14 Fraction	----	50	µg/L	<50	----	----	----	----	
C15 - C28 Fraction	----	100	µg/L	120	----	----	----	----	
C29 - C36 Fraction	----	50	µg/L	790	----	----	----	----	
^ C10 - C36 Fraction (sum)	----	50	µg/L	910	----	----	----	----	
<b>EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions</b>									
C6 - C10 Fraction	C6_C10	20	µg/L	<20	----	----	----	----	
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L	<20	----	----	----	----	
>C10 - C16 Fraction	----	100	µg/L	<100	----	----	----	----	
>C16 - C34 Fraction	----	100	µg/L	610	----	----	----	----	
>C34 - C40 Fraction	----	100	µg/L	600	----	----	----	----	
^ >C10 - C40 Fraction (sum)	----	100	µg/L	1210	----	----	----	----	



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Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	Leachate	----	----	----	----
Client sampling date / time				10-Aug-2016 11:40	----	----	----	----	
Compound	CAS Number	LOR	Unit	EW1603015-001	-----	-----	-----	-----	
				Result	----	----	----	----	
<b>EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued</b>									
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L	<100	----	----	----	----	
<b>EP080: BTEXN</b>									
Benzene	71-43-2	1	µg/L	<1	----	----	----	----	
Toluene	108-88-3	2	µg/L	<2	----	----	----	----	
Ethylbenzene	100-41-4	2	µg/L	<2	----	----	----	----	
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	----	----	----	----	
ortho-Xylene	95-47-6	2	µg/L	<2	----	----	----	----	
^ Total Xylenes	1330-20-7	2	µg/L	<2	----	----	----	----	
^ Sum of BTEX	----	1	µg/L	<1	----	----	----	----	
Naphthalene	91-20-3	5	µg/L	<5	----	----	----	----	
<b>EP068S: Organochlorine Pesticide Surrogate</b>									
Dibromo-DDE	21655-73-2	0.5	%	88.2	----	----	----	----	
<b>EP068T: Organophosphorus Pesticide Surrogate</b>									
DEF	78-48-8	0.5	%	90.6	----	----	----	----	
<b>EP075(SIM)S: Phenolic Compound Surrogates</b>									
Phenol-d6	13127-88-3	1	%	28.2	----	----	----	----	
2-Chlorophenol-D4	93951-73-6	1	%	57.3	----	----	----	----	
2,4,6-Tribromophenol	118-79-6	1	%	39.4	----	----	----	----	
<b>EP075(SIM)T: PAH Surrogates</b>									
2-Fluorobiphenyl	321-60-8	1	%	76.2	----	----	----	----	
Anthracene-d10	1719-06-8	1	%	88.4	----	----	----	----	
4-Terphenyl-d14	1718-51-0	1	%	93.3	----	----	----	----	
<b>EP080S: TPH(V)/BTEX Surrogates</b>									
1,2-Dichloroethane-D4	17060-07-0	2	%	127	----	----	----	----	
Toluene-D8	2037-26-5	2	%	124	----	----	----	----	
4-Bromofluorobenzene	460-00-4	2	%	110	----	----	----	----	



## Surrogate Control Limits

Sub-Matrix: WATER		Recovery Limits (%)	
Compound	CAS Number	Low	High
<b>EP068S: Organochlorine Pesticide Surrogate</b>			
Dibromo-DDE	21655-73-2	30	120
<b>EP068T: Organophosphorus Pesticide Surrogate</b>			
DEF	78-48-8	27	129
<b>EP075(SIM)S: Phenolic Compound Surrogates</b>			
Phenol-d6	13127-88-3	10	44
2-Chlorophenol-D4	93951-73-6	14	94
2,4,6-Tribromophenol	118-79-6	17	125
<b>EP075(SIM)T: PAH Surrogates</b>			
2-Fluorobiphenyl	321-60-8	20	104
Anthracene-d10	1719-06-8	27	113
4-Terphenyl-d14	1718-51-0	32	112
<b>EP080S: TPH(V)/BTEX Surrogates</b>			
1,2-Dichloroethane-D4	17060-07-0	71	137
Toluene-D8	2037-26-5	79	131
4-Bromofluorobenzene	460-00-4	70	128