

EPL20350 WATER MONITORING RESULTS 2016/2017 - QUARTER 4

LICENCE HOLDER	Santos NSW (Eastern) Pty Ltd
PREMISES	Narrabri Gas Field X Line Road, NARRABRI NSW 2390
LICENCE NUMBER	Environment Protection Licence 20350
EPL LINK (EPA SITE)	http://www.epa.nsw.gov.au/prpoeoapp/ViewPOEOLicence.aspx?DOCID=33816&SYSUID=1&LICID=20350
SCHEDULED ACTIVITY	Coal seam gas exploration, assessment and production
REPORTING PERIOD	2016-17, Quarter 4 - February / April 2017
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MONITORING BY	Santos
ANALYSIS BY	ALS Laboratory, Smithfield

TABLE 1: EPL20350 WATER MONITORING LOCATIONS

Spatial reference: GDA94 MGA Zone 55

EPA Identification No.	Monitoring type	Location	Easting	Northing
7	Groundwater quality monitoring	BWD27PRORA01	755429.176	6604670.682
8	Groundwater quality monitoring	BWD27PRUPS02	755433.048	6604684.807
9	Groundwater quality monitoring	BWD26PRUPS01	749372.750	6609376.690
10	Groundwater quality monitoring	BWD26PRLPS02	749364.450	6609363.350
11	Groundwater quality monitoring	DWH14PRUPS01	764703.313	6617145.443
12	Groundwater quality monitoring	DWH14PRLPS02	764689.147	6617119.109
13	Groundwater quality monitoring	DWH14PRPUR03	764696.211	6617132.298
14	Groundwater quality monitoring	DWH3PRUPS01	762239.680	6605589.320
15	Groundwater quality monitoring	DWH3PRLPS02	762251.050	6605598.980
16	Groundwater quality monitoring	NYOPRORA01	736293.460	6643110.400
17	Groundwater quality monitoring	NYOPRUPS02	736308.800	6643107.840
18	Groundwater quality monitoring	BWD27PRLPS03	755436.361	6604699.035
20	Groundwater quality monitoring	BHN14PRORA01	747158.130	6626109.120
21	Groundwater quality monitoring	BHN14PRUPS02	747152.710	6626123.910
22	Groundwater quality monitoring	TULPRNAP01	774464.070	6612048.130
23	Groundwater quality monitoring	TULPRDGY02	774466.480	6612032.980
24	Groundwater quality monitoring	BWDMW13D	753863.300	6608108.510
25	Groundwater quality monitoring	BWDMW13S	753864.820	6608109.300
26	Groundwater quality monitoring	BWDMW12S	753830.650	6608202.740
27	Groundwater quality monitoring	BWDMW12D	753831.910	6608203.710
28	Groundwater quality monitoring	BWDMW12I	753832.680	6608202.250
29	Groundwater quality monitoring	BWDMW2	753912.830	6608241.350
30	Groundwater quality monitoring	BWDMW3	753935.870	6608254.020
31	Groundwater quality monitoring	BWDMW4D	753980.810	6608285.740
32	Groundwater quality monitoring	BWDMW4	753984.140	6608288.040
33	Groundwater quality monitoring	BWDMW15S	753868.090	6608258.340
34	Groundwater quality monitoring	BWDMW15D	753867.100	6608256.750
35	Groundwater quality monitoring	BWDMW16S	753858.950	6608316.490
36	Groundwater quality monitoring	BWDMW16D	753856.980	6608315.570
37	Groundwater quality monitoring	LWDMW1D	751387.930	6623862.960
38	Groundwater quality monitoring	LWDMW1S	751388.920	6623862.460
39	Groundwater quality monitoring	LWDMW1I	751390.640	6623861.850
40	Groundwater quality monitoring	LWDMW2S	751102.840	6622293.020
41	Groundwater quality monitoring	LWDMW2D	751101.810	6622293.150
42	Groundwater quality monitoring	LWDMW3D	751876.160	6622163.760
43	Groundwater quality monitoring	LWDMW3S	751876.470	6622164.930
44	Groundwater level monitoring	DWH8AGMB1	765546.740	6616987.990
45	Groundwater level monitoring	DWH8AGMB2	765546.740	6616987.990

EPA Identification No.	Monitoring type	Location	Easting	Northing
46	Groundwater level monitoring	DWH8AGMB3	765546.740	6616987.990
47	Groundwater level monitoring	BWD28QGUPS01	752949.898	6604219.732
48	Groundwater level monitoring	BWD28QGLPS01	752949.898	6604219.732
49	Groundwater level monitoring	BWD28QGPUR01	752949.898	6604219.732
50	Groundwater quality monitoring	WPKMW01	755684.140	6638105.310
51	Groundwater quality monitoring	WPKMW01D	755689.750	6638097.350
52	Groundwater quality monitoring	WPKMW02	755671.200	6638034.290
53	Groundwater quality monitoring	WPKMW04	755632.500	6637993.070
54	Groundwater quality monitoring	WPKMW07	755501.160	6638207.530
55	Groundwater quality monitoring	WPKMW08	755634.110	6638166.870
56	Groundwater quality monitoring	WPKMW09D	755663.980	6637988.200
57	Groundwater quality monitoring	WPKMW09S	755664.400	6637990.540
58	Groundwater quality monitoring	WPKMW12S	755456.180	6638228.910
59	Groundwater quality monitoring	WPKMW13I	755552.650	6638189.560
60	Groundwater quality monitoring	WPKMW13S	755554.880	6638189.050
61	Groundwater quality monitoring	WPKMW14D	755364.510	6638049.060
62	Groundwater quality monitoring	WPKMW14S	755364.770	6638048.260
63	Groundwater quality monitoring	WPKMW15D	755365.480	6638233.360
64	Groundwater quality monitoring	WPKMW15S	755365.500	6638230.740
65	Groundwater quality monitoring	WPKMW16D	755051.030	6637988.500
66	Groundwater quality monitoring	WPKMW16S	755050.530	6637986.640
67	Groundwater quality monitoring	WPKMW17D	756151.060	6638128.320
68	Groundwater quality monitoring	WPKMW17S	756149.540	6638128.050
69	Produced water storage dam	BWDPD2	753875.870	6607995.060
70	Produced water storage dam	BWDPD3	753992.170	6608125.970
71	Produced water storage dam	LWDPD1CELL4	751473.349	6623513.252
72	Produced water storage dam	LWDPD1CELL3	751460.723	6623323.850
73	Produced water storage dam	LWDPD1CELL2	751428.103	6623124.978
74	Produced water storage dam	LWDPD1CELL1	751390.223	6622935.575
75	Produced water storage dam	TFDPD1	755611.600	6638072.850
76	Produced water storage dam	TFDPD2	755480.110	6638099.040
78	Groundwater quality monitoring	WPKMW18S	755944.010	6638100.840
79	Groundwater quality monitoring	WPKMW18I	755945.070	6638105.040

TABLE 2: ANALYTES MONITORED, FREQUENCY AND SAMPLING METHOD

Analyte	Units of measure	Frequency	Sampling method
Aluminium	milligrams per litre	Every 6 months	Grab sample
Ammonia	milligrams per litre	Every 6 months	Grab sample
Arsenic	milligrams per litre	Every 6 months	Grab sample
Barium	milligrams per litre	Every 6 months	Grab sample
Beryllium	milligrams per litre	Every 6 months	Grab sample
Bicarbonate	milligrams per litre	Every 6 months	Grab sample
Boron	milligrams per litre	Every 6 months	Grab sample
Bromide	milligrams per litre	Every 6 months	Grab sample
Cadmium	milligrams per litre	Every 6 months	Grab sample
Calcium	milligrams per litre	Every 6 months	Grab sample
Carbonate	milligrams per litre	Every 6 months	Grab sample
Chloride	milligrams per litre	Every 6 months	Grab sample
Chromium	milligrams per litre	Every 6 months	Grab sample
Cobalt	milligrams per litre	Every 6 months	Grab sample
Copper	milligrams per litre	Every 6 months	Grab sample
Dissolved Oxygen	milligrams per litre	Quarterly	In situ
Electrical Conductivity	microsiemens per centimetre	Quarterly	In situ
Fluoride	milligrams per litre	Every 6 months	Grab sample
Iron	milligrams per litre	Every 6 months	Grab sample
Lead	milligrams per litre	Every 6 months	Grab sample
Magnesium	milligrams per litre	Every 6 months	Grab sample
Manganese	milligrams per litre	Every 6 months	Grab sample
Mercury	milligrams per litre	Every 6 months	Grab sample
Methane	milligrams per litre	Every 6 months	Grab sample
Molybdenum	milligrams per litre	Every 6 months	Grab sample
Nickel	milligrams per litre	Every 6 months	Grab sample
Nitrate	milligrams per litre	Every 6 months	Grab sample
Nitrite	milligrams per litre	Every 6 months	Grab sample
pH	pH Unit	Quarterly	In situ
Potassium	milligrams per litre	Every 6 months	Grab sample
Reactive Phosphorus	milligrams per litre	Every 6 months	Grab sample
Redox Potential	millivolts	Quarterly	In situ
Selenium	milligrams per litre	Every 6 months	Grab sample
Sodium	milligrams per litre	Every 6 months	Grab sample
Sodium Adsorption Ratio	-	Every 6 months	Grab sample
Standing Water Level	metres below top of casing	Quarterly	In situ
Strontium	milligrams per litre	Every 6 months	Grab sample
Sulfate	milligrams per litre	Every 6 months	Grab sample
Total Dissolved Solids	milligrams per litre	Every 6 months	Grab sample
Total Organic Carbon	milligrams per litre	Every 6 months	Grab sample
Total Phosphorus	milligrams per litre	Every 6 months	Grab sample
Uranium	milligrams per litre	Every 6 months	Grab sample
Vanadium	milligrams per litre	Every 6 months	Grab sample
Zinc	milligrams per litre	Every 6 months	Grab sample

Table 3: Water Monitoring Results 4th Quarter – February 2017 / April 2017

	Units	EPA Identification No Location Date Sampled Sample obtained Sample Method	7	8	9	10	11	12	13	14
			BWD27PRORA01 26/04/2017 No* DRY WELL RESULT	BWD27PRUPS02 26/04/2017 Yes In situ RESULT	BWD26PRUPS01 26/04/2017 Yes In situ RESULT	BWD26PRLPS02 26/04/2017 Yes In situ RESULT	DWH14PRUPS01 23/04/2017 Yes In situ RESULT	DWH14PRLPS02 23/04/2017 Yes In situ RESULT	DWH14PRPUR03 12/04/2017 Yes In situ RESULT	DWH3PRUPS01 18/04/2017 Yes In situ RESULT
Aluminium	mg/L	0.01								
Ammonia	mg/L	0.01								
Arsenic	mg/L	0.001								
Barium	mg/L	0.001								
Beryllium	mg/L	0.001								
Bicarbonate	mg/L	1								
Boron	mg/L	0.05								
Bromide	mg/L	0.01								
Cadmium	mg/L	0.0001								
Calcium	mg/L	1								
Carbonate	mg/L	1								
Chloride	mg/L	1								
Chromium	mg/L	0.001								
Cobalt	mg/L	0.001								
Copper	mg/L	0.001								
Dissolved Oxygen	mg/L	-		2.4	0.2	0.05	0.54	0.46	0.35	1.83
Electrical Conductivity	µS/cm	-		136	70	135	199	194	700	121
Fluoride	mg/L	0.1								
Iron	mg/L	0.05								
Lead	mg/L	0.001								
Magnesium	mg/L	1								
Manganese	mg/L	0.001								
Mercury	mg/L	0.0001								
Methane	mg/L	10								
Molybdenum	mg/L	0.001								
Nickel	mg/L	0.001								
Nitrate	mg/L	0.01								
Nitrite	mg/L	0.01								
pH	pH Unit	-		5.54	5.87	6.11	5.77	5.6	9.88	5.37
Potassium	mg/L	1								
Reactive Phosphorus	mg/L	0.01								
Redox Potential	mV	-		216	79	-30	-76	197	-244.7	210
Selenium	mg/L	0.01								
Sodium	mg/L	1								
Sodium Adsorption Ratio (Storages)	-	0.01								
Standing Water Level	mTOC	-		38.69	27.73	28.76	54.1	53.3	53.91	67.4
Strontium	mg/L	0.001								
Sulfate	mg/L	1								
Total Dissolved Solids	mg/L	10								
Total Organic Carbon (Storages)	mg/L	1								
Total Phosphorus (Storages)	mg/L	0.01								
Uranium	mg/L	0.001								
Vanadium	mg/L	0.01								
Zinc	mg/L	0.005								

*Monitoring event was completed but no water was available for sampling in BWD27PRORA01

	Units	EPA Identification No Location Date Sampled Sample obtained Sample Method	15	16	17	18	20	21	22	23
			DWH3PRLPS02 18/04/2017 Yes DRY WELL RESULT	NYOPRORA01 28/04/2017 Yes In situ RESULT	NYOPRUPS02 28/04/2017 Yes In situ RESULT	BWD27PRLPS03 26/04/2017 Yes In situ RESULT	BHN14PRORA01 28/04/2017 Yes In situ RESULT	BHN14PRUPS02 28/04/2017 Yes In situ RESULT	TULPRNAP01 27/04/2017 Yes In situ RESULT	TULPRDGY02 27/04/2017 Yes In situ RESULT
Aluminium	mg/L	LOR								
Ammonia	mg/L	0.01								
Arsenic	mg/L	0.001								
Barium	mg/L	0.001								
Beryllium	mg/L	0.001								
Bicarbonate	mg/L	1								
Boron	mg/L	0.05								
Bromide	mg/L	0.01								
Cadmium	mg/L	0.0001								
Calcium	mg/L	1								
Carbonate	mg/L	1								
Chloride	mg/L	1								
Chromium	mg/L	0.001								
Cobalt	mg/L	0.001								
Copper	mg/L	0.001								
Dissolved Oxygen	mg/L	-	0.66	0	0.38	0.1	0.33	0.93	0.59	0.8
Electrical Conductivity	µS/cm	-	135	1281	1255	200	493	460	6883	7831
Fluoride	mg/L	0.1								
Iron	mg/L	0.05								
Lead	mg/L	0.001								
Magnesium	mg/L	1								
Manganese	mg/L	0.001								
Mercury	mg/L	0.0001								
Methane	mg/L	10								
Molybdenum	mg/L	0.001								
Nickel	mg/L	0.001								
Nitrate	mg/L	0.01								
Nitrite	mg/L	0.01								
pH	pH Unit	-	5.51	8.31	8.39	5.81	7.29	7.23	6.9	6.79
Potassium	mg/L	1								
Reactive Phosphorus	mg/L	0.01								
Redox Potential	mV	-	224	-229	-166	111	-97	-91	-137	-213
Selenium	mg/L	0.01								
Sodium	mg/L	1								
Sodium Adsorption Ratio (Storages)	-	0.01								
Standing Water Level	mTOC	-	67.51	0	0	38.21	27.46	15.7	94.16	73.62
Strontium	mg/L	0.001								
Sulfate	mg/L	1								
Total Dissolved Solids	mg/L	10								
Total Organic Carbon (Storages)	mg/L	1								
Total Phosphorus (Storages)	mg/L	0.01								
Uranium	mg/L	0.001								
Vanadium	mg/L	0.01								
Zinc	mg/L	0.005								

	Units	EPA Identification No Location Date Sampled Sample obtained Sample Method	24	25	26	27	28	29	30	31
			BWDMW13D	BWDMW13S	BWDMW12S	BWDMW12D	BWDMW12I	BWDMW2	BWDMW3	BWDMW4D
			21/03/2017	21/03/2017	21/03/2017	21/03/2017	21/03/2017	21/03/2017	21/03/2017	21/03/2017
		Yes	No*	No*	Yes	Yes	No*	Yes	Yes	
		Grab sample	DRY WELL	DRY WELL	Grab sample	Grab sample	DRY WELL	Grab sample	Grab sample	
		RESULT	RESULT	RESULT	RESULT	RESULT	RESULT	RESULT	RESULT	
Aluminium	mg/L	0.01	<0.01			<0.01	<0.01		<0.01	<0.01
Ammonia	mg/L	0.01	0.02			0.02	<0.01		1.11	0.01
Arsenic	mg/L	0.001	<0.001			<0.001	0.001		0.008	<0.001
Barium	mg/L	0.001	0.503			1.67	9.21		0.144	0.054
Beryllium	mg/L	0.001	<0.001			<0.001	<0.001		<0.001	<0.001
Bicarbonate	mg/L	1	47			5090	8130		90	37
Boron	mg/L	0.05	<0.05			<0.05	<0.05		<0.05	<0.05
Bromide	mg/L	0.01	1.1			7.25	8.6		0.638	0.131
Cadmium	mg/L	0.0001	0.0002			<0.0001	<0.0001		<0.0001	<0.0001
Calcium	mg/L	1	14			1	5		7	1
Carbonate	mg/L	1	<1			<1	<1		<1	<1
Chloride	mg/L	1	409			1200	1510		187	36
Chromium	mg/L	0.001	<0.001			<0.001	0.002		<0.001	<0.001
Cobalt	mg/L	0.001	0.005			<0.001	0.013		0.007	<0.001
Copper	mg/L	0.001	0.001			<0.001	0.018		<0.001	<0.001
Dissolved Oxygen	mg/L	-	2.28			2.63	2.58		0.84	2.58
Electrical Conductivity	µS/cm	-	1280			10611	16364		845	267
Fluoride	mg/L	0.1	<0.1			1.2	1		<0.1	<0.1
Iron	mg/L	0.05	<0.05			<0.05	<0.05		11.6	0.21
Lead	mg/L	0.001	<0.001			<0.001	<0.001		<0.001	<0.001
Magnesium	mg/L	1	35			340	808		14	3
Manganese	mg/L	0.001	0.04			0.002	0.015		1.38	0.007
Mercury	mg/L	0.0001	<0.0001			<0.0001	<0.0001		<0.0001	<0.0001
Methane	mg/L	10	<10			<10	<10		654	<10
Molybdenum	mg/L	0.001	<0.001			0.001	0.004		<0.001	<0.001
Nickel	mg/L	0.001	0.005			<0.001	0.006		0.004	0.002
Nitrate	mg/L	0.01	0.1			0.11	0.31		<0.01	0.22
Nitrite	mg/L	0.01	<0.01			<0.01	<0.01		<0.01	<0.01
pH	pH Unit	-	5.93**			7.2	7.09		5.52	5.16
Potassium	mg/L	1	18			2	59		10	6
Reactive Phosphorus	mg/L	0.01	<0.01			<0.01	0.04		<0.01	<0.01
Redox Potential	mV	-	396.2			109.5	94.4		-64.2	107.5
Selenium	mg/L	0.01	<0.01			<0.01	<0.01		<0.01	<0.01
Sodium	mg/L	1	156			1900	3670		115	39
Sodium Adsorption Ratio (Storages)	-	0.01	-			-	-		-	-
Standing Water Level	mTOC	-	30.36			30.7	20.59		30.68	30.06
Strontium	mg/L	0.001	0.172			0.454	0.336		0.102	0.01
Sulfate	mg/L	1	7			33	11		22	15
Total Dissolved Solids	mg/L	10	719			6590	11300		419	171
Total Organic Carbon (Storages)	mg/L	1	-			-	-		-	-
Total Phosphorus (Storages)	mg/L	0.01	-			-	-		-	-
Uranium	mg/L	0.001	<0.001			0.085	0.222		<0.001	<0.001
Vanadium	mg/L	0.01	<0.01			<0.01	0.06		<0.01	<0.01
Zinc	mg/L	0.005	0.024			0.006	0.018		0.01	0.008

*Monitoring event was completed but no water was available for sampling in BWDMW13S, BWDMW12S and BWDMW2

**pH laboratory result used due to water quality meter error for pH in situ monitoring.

	Units	EPA Identification No Location Date Sampled Sample obtained Sample Method	32	33	34	35	36	37	38	39
			BWDMW4 21/03/2017 No* DRY WELL RESULT	BWDMW15S 21/03/2017 No* DRY WELL RESULT	BWDMW15D 21/03/2017 Yes Grab sample RESULT	BWDMW16S 21/03/2017 No* DRY WELL RESULT	BWDMW16D 21/03/2017 Yes Grab sample RESULT	LWDMW1D 23/03/2017 Yes Grab sample RESULT	LWDMW1S 23/03/2017 No* DRY WELL RESULT	LWDMW1I 23/03/2017 No* DRY WELL RESULT
Aluminium	mg/L	LOR			<0.01		<0.01	<0.01		
Ammonia	mg/L	0.01			0.01		0.02	0.02		
Arsenic	mg/L	0.001			<0.001		<0.001	<0.001		
Barium	mg/L	0.001			0.044		0.068	0.418		
Beryllium	mg/L	0.001			<0.001		<0.001	<0.001		
Bicarbonate	1	1			22		9	191		
Boron	mg/L	0.05			<0.05		<0.05	0.13		
Bromide	mg/L	0.01			0.225		0.22	1.33		
Cadmium	mg/L	0.0001			<0.0001		<0.0001	<0.0001		
Calcium	mg/L	1			2		<1	7		
Carbonate	mg/L	1			<1		<1	<1		
Chloride	1	1			74		100	595		
Chromium	mg/L	0.001			<0.001		<0.001	<0.001		
Cobalt	mg/L	0.001			<0.001		<0.001	<0.001		
Copper	mg/L	0.001			<0.001		<0.001	<0.001		
Dissolved Oxygen	mg/L	-			3.26		3.2	1.42		
Electrical Conductivity	µS/cm	-			430.6		385.6	2185		
Fluoride	mg/L	0.1			<0.1		0.1	0.3		
Iron	mg/L	0.05			<0.05		<0.05	<0.05		
Lead	mg/L	0.001			<0.001		<0.001	<0.001		
Magnesium	mg/L	1			4		2	12		
Manganese	mg/L	0.001			<0.001		0.005	0.015		
Mercury	mg/L	0.0001			<0.0001		0.0001	<0.0001		
Methane	mg/L	10			<10		10	<10		
Molybdenum	mg/L	0.001			<0.001		<0.001	<0.001		
Nickel	mg/L	0.001			<0.001		0.002	<0.001		
Nitrate	mg/L	0.01			0.23		0.23	0.24		
Nitrite	mg/L	0.01			<0.01		0.01	<0.01		
pH	pH Unit	-			5.35		5.75	6.34		
Potassium	mg/L	1			7		6	12		
Reactive Phosphorus	mg/L	0.01			<0.01		0.01	0.07		
Redox Potential	mV	-			130.6		123.2	139.4		
Selenium	mg/L	0.01			<0.01		<0.01	<0.01		
Sodium	mg/L	1			64		57	423		
Sodium Adsorption Ratio (Storages)	-	0.01			-		-	-		
Standing Water Level	mTOC	-			30.13		29.96	29.94		
Strontium	mg/L	0.001			0.015		0.008	0.124		
Sulfate	mg/L	1			25		2	16		
Total Dissolved Solids	mg/L	10			216		207	1230		
Total Organic Carbon (Storages)	mg/L	1			-		-	-		
Total Phosphorus (Storages)	mg/L	0.01			-		-	-		
Uranium	mg/L	0.001			<0.001		<0.001	<0.001		
Vanadium	mg/L	0.01			<0.01		<0.01	<0.01		
Zinc	mg/L	0.005			0.006		0.01	<0.005		

*Monitoring event was completed but no water was available for sampling in BWDMW4, BWDMW15S, BWDMW16S, LWDMW1S and LWDMW1I

	Units	EPA Identification No Location Date Sampled Sample obtained Sample Method	40	41	42	43	50	51	52	53
			LWDMW2S 23/03/2017 No* DRY WELL RESULT	LWDMW2D 23/03/2017 Yes Grab sample RESULT	LWDMW3D 23/03/2017 Yes Grab sample RESULT	LWDMW3S 23/03/2017 No* DRY WELL RESULT	WPKMW1 22/03/2017 Yes Grab sample RESULT	WPKMW1D 22/03/2017 Yes Grab sample RESULT	WPKMW2 22/03/2017 Yes Grab sample RESULT	WPKMW4 22/03/2017 Yes Grab sample RESULT
Aluminium	mg/L	LOR		<0.01	<0.01		<0.01	<0.01	<0.01	<0.01
Ammonia	mg/L	0.01		0.03	0.06		0.03	0.13	0.05	0.01
Arsenic	mg/L	0.001		0.001	0.002		0.002	0.004	0.004	0.005
Barium	mg/L	0.001		0.385	0.095		0.025	0.105	0.049	0.014
Beryllium	mg/L	0.001		<0.001	<0.001		<0.001	<0.001	<0.001	<0.001
Bicarbonate	mg/L	1		351	117		581	528	1210	867
Boron	mg/L	0.05		0.12	0.09		0.24	0.23	0.28	0.29
Bromide	mg/L	0.01		0.807	0.473		0.304	0.188	1.37	0.652
Cadmium	mg/L	0.0001		<0.0001	<0.0001		<0.0001	<0.0001	<0.0001	<0.0001
Calcium	mg/L	1		16	2		2	7	4	1
Carbonate	mg/L	1		<1	<1		<1	17	18	22
Chloride	mg/L	1		440	247		102	52	435	206
Chromium	mg/L	0.001		<0.001	<0.001		<0.001	<0.001	<0.001	<0.001
Cobalt	mg/L	0.001		0.002	<0.001		<0.001	<0.001	<0.001	<0.001
Copper	mg/L	0.001		<0.001	<0.001		<0.001	<0.001	<0.001	<0.001
Dissolved Oxygen	mg/L	-		1.19	0.87		1.9	1.35	0.95	1.03
Electrical Conductivity	µS/cm	-		1942	967		1406	1198	3289	2149
Fluoride	mg/L	0.1		0.4	0.2		0.7	0.8	0.7	1.1
Iron	mg/L	0.05		0.07	0.73		<0.05	<0.05	<0.05	<0.05
Lead	mg/L	0.001		<0.001	<0.001		<0.001	<0.001	<0.001	<0.001
Magnesium	mg/L	1		21	4		<1	2	2	<1
Manganese	mg/L	0.001		0.09	0.011		0.004	0.097	0.007	<0.001
Mercury	mg/L	0.0001		<0.0001	<0.0001		<0.0001	<0.0001	0.0001	<0.0001
Methane	mg/L	10		<10	<10		<10	58	10	<10
Molybdenum	mg/L	0.001		0.003	<0.001		<0.001	<0.001	0.002	0.002
Nickel	mg/L	0.001		0.002	0.001		<0.001	<0.001	<0.001	<0.001
Nitrate	mg/L	0.01		0.12	0.12		0.12	<0.01	0.02	0.04
Nitrite	mg/L	0.01		<0.01	<0.01		<0.01	<0.01	0.01	<0.01
pH	pH Unit	-		6.82	6.49		7.94	8.08	7.85	7.96
Potassium	mg/L	1		23	9		4	3	8	6
Reactive Phosphorus	mg/L	0.01		0.14	0.14		0.44	0.1	0.63	0.64
Redox Potential	mV	-		-26.8	-151.8		119.6	-21.3	113.1	101.7
Selenium	mg/L	0.01		<0.01	<0.01		<0.01	<0.01	<0.01	<0.01
Sodium	mg/L	1		351	182		336	290	791	503
Sodium Adsorption Ratio (Storages)	-	0.01		-	-		-	-	-	-
Standing Water Level	mTOC	-		25.93	21.05		16.1	15.83	15.18	15.92
Strontium	mg/L	0.001		0.245	0.027		0.031	0.063	0.069	0.026
Sulfate	mg/L	1		25	1		<1	<1	<10**	<1
Total Dissolved Solids	mg/L	10		1100	540		1010	694	2090	1310
Total Organic Carbon (Storages)	mg/L	1		-	-		-	-	-	-
Total Phosphorus (Storages)	mg/L	0.01		-	-		-	-	-	-
Uranium	mg/L	0.001		0.002	<0.001		<0.001	<0.001	0.003	0.001
Vanadium	mg/L	0.01		<0.01	<0.01		<0.01	<0.01	0.01	0.01
Zinc	mg/L	0.005		0.008	<0.005		<0.005	<0.005	<0.005	<0.005

*Monitoring event was completed but no water was available for sampling in LWDMW2S and LWDMW3S

**Limit of Reporting (LOR) on sulfate raised due to sample matrix.

	Units	EPA Identification No Location Date Sampled Sample obtained Sample Method	55	56	57	58	59	60	61	62
			WPKMW8	WPKMW9D	WPKMW9S	WPKMW12S	WPKMW13I	WPKMW13S	WPKMW14D	WPKMW14S
			22/03/2017 Yes Grab sample RESULT	22/03/2017 Yes Grab sample RESULT	22/03/2017 Yes Grab sample RESULT	22/03/2017 No* DRY WELL RESULT	22/03/2017 Yes Grab sample RESULT	22/03/2017 Yes Grab sample RESULT	22/03/2017 Yes Grab sample RESULT	22/03/2017 No* DRY WELL RESULT
Aluminium	mg/L	LOR	<0.01	<0.01	<0.01		<0.01	<0.01	<0.01	
Ammonia	mg/L	0.01	0.04	0.04	0.04		0.03	0.03	0.05	
Arsenic	mg/L	0.001	0.002	0.005	0.003		0.002	0.002	0.003	
Barium	mg/L	0.001	0.03	0.075	0.279		0.039	0.093	0.308	
Beryllium	mg/L	0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	
Bicarbonate	mg/L	1	923	518	1570		584	1180	559	
Boron	mg/L	0.05	0.28	0.22	0.4		0.24	0.34	0.22	
Bromide	mg/L	0.01	0.874	0.188	1.2		0.505	1.23	0.187	
Cadmium	mg/L	0.0001	<0.0001	<0.0001	<0.0001		<0.0001	<0.0001	<0.0001	
Calcium	mg/L	1	3	5	10		3	4	7	
Carbonate	mg/L	1	<1	24	23		8	<1	7	
Chloride	mg/L	1	294	52	413		58	399	51	
Chromium	mg/L	0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	
Cobalt	mg/L	0.001	<0.001	<0.001	0.001		<0.001	<0.001	<0.001	
Copper	mg/L	0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	
Dissolved Oxygen	mg/L	-	2	0.81	0.97		1.36	1.03	0.88	
Electrical Conductivity	µS/cm	-	2406	1218	4374		1269	3078	1167	
Fluoride	mg/L	0.1	0.6	0.8	0.8		0.8	0.6	0.7	
Iron	mg/L	0.05	<0.05	<0.05	<0.05		<0.05	<0.05	<0.05	
Lead	mg/L	0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	
Magnesium	mg/L	1	1	1	3		<1	2	2	
Manganese	mg/L	0.001	0.014	0.07	0.058		0.002	0.014	0.012	
Mercury	mg/L	0.0001	<0.0001	<0.0001	0.0001		0.0001	<0.0001	<0.0001	
Methane	mg/L	10	<10	28	10		10	<10	<10	
Molybdenum	mg/L	0.001	0.001	0.001	0.003		0.001	0.004	0.001	
Nickel	mg/L	0.001	<0.001	0.001	0.001		<0.001	<0.001	0.002	
Nitrate	mg/L	0.01	0.49	<0.01	0.01		0.2	<0.01	0.02	
Nitrite	mg/L	0.01	<0.01	<0.01	0.01		0.01	<0.01	<0.01	
pH	pH Unit	-	7.62	8.16	7.81		8.08	7.39	8.01	
Potassium	mg/L	1	7	4	11		4	10	5	
Reactive Phosphorus	mg/L	0.01	0.38	0.28	0.38		0.26	0.28	0.2	
Redox Potential	mV	-	122.4	27.3	-132.3		92.7	83.4	0.4	
Selenium	mg/L	0.01	<0.01	<0.01	<0.01		<0.01	<0.01	<0.01	
Sodium	mg/L	1	591	281	1090		307	755	275	
Sodium Adsorption Ratio (Storages)	-	0.01	-	-	-		-	-	-	
Standing Water Level	mTOC	-	16.53	15.38	15.6		16.74	16.88	21.03	
Strontium	mg/L	0.001	0.043	0.069	0.141		0.017	0.044	0.045	
Sulfate	mg/L	1	<1	<1	160		2	1	<1	
Total Dissolved Solids	mg/L	10	1690	698	2990		751	1960	728	
Total Organic Carbon (Storages)	mg/L	1	-	-	-		-	-	-	
Total Phosphorus (Storages)	mg/L	0.01	-	-	-		-	-	-	
Uranium	mg/L	0.001	0.001	<0.001	0.008		<0.001	0.002	<0.001	
Vanadium	mg/L	0.01	<0.01	<0.01	<0.01		<0.01	<0.01	0.01	
Zinc	mg/L	0.005	<0.005	<0.005	<0.005		<0.005	<0.005	<0.005	

*Monitoring event was completed but no water was available for sampling in WPKMW12S and WPKMW14S

	Units	EPA Identification No Location Date Sampled Sample obtained Sample Method	63	64	65	66	67	68	78	79
			WPKMW15D 22/03/2017 Yes Grab sample RESULT	WPKMW15S 22/03/2017 Yes Grab sample RESULT	WPKMW16D 22/03/2017 Yes Grab sample RESULT	WPKMW16S 22/03/2017 No* DRY WELL RESULT	WPKMW17D 22/03/2017 Yes Grab sample RESULT	WPKMW17S 22/03/2017 Yes Grab sample RESULT	WPKMW18S 22/03/2017 No* DRY WELL RESULT	WPKMW18I 22/03/2017 Yes Grab sample RESULT
Aluminium	mg/L	LOR	<0.01	<0.01	<0.01		<0.01	<0.01		<0.01
Ammonia	mg/L	0.01	0.18	0.02	<0.01		0.08	0.02		<0.01
Arsenic	mg/L	0.001	0.003	0.004	0.003		0.002	0.003		0.001
Barium	mg/L	0.001	0.236	1.99	0.193		0.13	0.326		0.103
Beryllium	mg/L	0.001	<0.001	<0.001	<0.001		<0.001	<0.001		<0.001
Bicarbonate	mg/L	1	598	3870	579		494	1100		563
Boron	mg/L	0.05	0.19	0.6	0.08		<0.05	0.26		0.22
Bromide	mg/L	0.01	0.203	3.48	0.217		0.194	0.451		0.16
Cadmium	mg/L	0.0001	<0.0001	<0.0001	<0.0001		<0.0001	<0.0001		<0.0001
Calcium	mg/L	1	6	8	6		3	6		1
Carbonate	mg/L	1	<1	<1	9		<1	<1		16
Chloride	mg/L	1	54	937	60		51	134		51
Chromium	mg/L	0.001	<0.001	0.01	<0.001		<0.001	<0.001		<0.001
Cobalt	mg/L	0.001	<0.001	<0.001	<0.001		<0.001	<0.001		<0.001
Copper	mg/L	0.001	<0.001	<0.001	<0.001		<0.001	<0.001		<0.001
Dissolved Oxygen	mg/L	-	1.01	2.44	1.39		0.82	1.22		2.24
Electrical Conductivity	µS/cm	-	1357	8636	1263		1113	2264		1201
Fluoride	mg/L	0.1	0.5	1	0.5		0.8	0.6		0.6
Iron	mg/L	0.05	0.11	<0.05	<0.05		<0.05	<0.05		<0.05
Lead	mg/L	0.001	<0.001	<0.001	<0.001		<0.001	<0.001		<0.001
Magnesium	mg/L	1	2	14	2		1	2		<1
Manganese	mg/L	0.001	0.111	<0.001	0.001		0.035	0.02		<0.001
Mercury	mg/L	0.0001	<0.0001	<0.0001	<0.0001		0.0001	0.0001		<0.0001
Methane	mg/L	10	125	<10	<10		10	10		<10
Molybdenum	mg/L	0.001	0.007	0.007	0.006		0.007	0.006		0.004
Nickel	mg/L	0.001	0.001	0.001	<0.001		<0.001	<0.001		<0.001
Nitrate	mg/L	0.01	<0.01	0.45	0.02		0.01	0.01		3.48
Nitrite	mg/L	0.01	<0.01	0.15	<0.01		0.01	0.01		<0.01
pH	pH Unit	-	8.11	7.77	7.91		7.45	7.57		7.97
Potassium	mg/L	1	7	32	11		6	12		5
Reactive Phosphorus	mg/L	0.01	0.33	0.63	0.28		0.07	0.43		0.31
Redox Potential	mV	-	-227.6	126.6	118.6		114.7	-133.1		90.5
Selenium	mg/L	0.01	<0.01	<0.01	<0.01		<0.01	<0.01		<0.01
Sodium	mg/L	1	306	2240	298		270	547		317
Sodium Adsorption Ratio (Storages)	-	0.01	-	-	-		-	-		-
Standing Water Level	mTOC	-	22.18	22.48	26.56		18.39	21.14		15.99
Strontium	mg/L	0.001	0.092	0.277	0.054		0.02	0.052		0.014
Sulfate	mg/L	1	9	9	13		<1	4		<1
Total Dissolved Solids	mg/L	10	765	5520	820		632	1470		772
Total Organic Carbon (Storages)	mg/L	1	-	-	-		-	-		-
Total Phosphorus (Storages)	mg/L	0.01	-	-	-		-	-		-
Uranium	mg/L	0.001	<0.001	0.018	0.005		0.001	0.003		<0.001
Vanadium	mg/L	0.01	<0.01	0.03	0.04		<0.01	<0.01		0.01
Zinc	mg/L	0.005	<0.005	<0.005	<0.005		<0.005	<0.005		<0.005

*Monitoring event was completed but no water was available for sampling in WPKMW16S and WPKMW18S

	Units	EPA Identification No Location Date Sampled Sample obtained Sample Method	69	70	71	72	73	74	75	76
			BWDPD2	BWDPD3	LWDPD1CELL4	LWDPD1CELL3	LWDPD1CELL2	LWDPD1CELL1	TFDPD1	TFDPD2
			21/03/2017 No*	21/03/2017 No*	28/03/2017 Yes	28/03/2017 Yes	28/03/2017 Yes	28/03/2017 Yes	28/03/2017 Yes	28/03/2017 Yes
		Not operational RESULT	Not operational RESULT	Grab sample RESULT	Grab sample RESULT	Grab sample RESULT	Grab sample RESULT	Grab sample RESULT	Grab sample RESULT	
Aluminium	mg/L	LOR			<0.01	<0.1	<0.1	<0.1	<0.1	<0.1
Ammonia	mg/L	0.01			<0.01	0.82	0.14	<0.1	0.06	<0.1
Arsenic	mg/L	0.001			<0.001	<0.01	<0.01	<0.01	<0.01	<0.01
Barium	mg/L	0.001			3.96	2.42	1.5	6.36	2.42	3.42
Beryllium	mg/L	0.001			<0.001	<0.01	<0.01	<0.001	<0.01	<0.01
Bicarbonate	1				187	8120	8510	14500	3010	3620
Boron	mg/L	0.05			0.16	2.39	2.52	3	0.32	0.69
Bromide	mg/L	0.01			0.177	4.02	3.98	25.6	2.58	7.83
Cadmium	mg/L	0.0001			<0.0001	<0.001	<0.001	0.0002	<0.001	<0.001
Calcium	mg/L	1			13	9	9	22	12	17
Carbonate	mg/L	1			68	9330	8260	28800	4920	12200
Chloride	1				66	1880	1820	5810	1010	2370
Chromium	mg/L	0.001			<0.001	<0.01	<0.01	0.012	<0.01	<0.01
Cobalt	mg/L	0.001			<0.001	<0.01	<0.01	<0.001	<0.01	<0.01
Copper	mg/L	0.001			<0.001	<0.01	<0.01	0.027	<0.01	<0.01
Dissolved Oxygen	mg/L	-			4.33	4.82	4.35	6.47	5.84	10.78
Electrical Conductivity	µS/cm	-			672	26856	26493	54120	14425	26563
Fluoride	mg/L	0.1			0.4	9.3	8.7	21.7	2.8	6.9
Iron	mg/L	0.05			0.16	<0.1	0.1	0.33	<0.1	<0.1
Lead	mg/L	0.001			<0.001	<0.01	<0.01	<0.01	<0.01	<0.01
Magnesium	mg/L	1			5	15	12	18	5	6
Manganese	mg/L	0.001			0.004	<0.01	<0.01	<0.01	<0.01	<0.01
Mercury	mg/L	0.0001			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Methane	mg/L	10			104	16	30	51	32	1160
Molybdenum	mg/L	0.001			<0.001	<0.01	<0.01	0.018	<0.01	<0.01
Nickel	mg/L	0.001			<0.001	<0.01	<0.01	<0.001	<0.01	<0.01
Nitrate	mg/L	0.01			0.03	<0.1	<0.1	<0.1	0.04	<0.1
Nitrite	mg/L	0.01			<0.01	<0.1	<0.01	<0.01	<0.01	<0.01
pH	pH Unit	-			9.29	9.47	9.39	9.69	9.52	9.87
Potassium	mg/L	1			23	95	86	594	30	91
Reactive Phosphorus	mg/L	0.01			-	-	-	-	-	-
Redox Potential	mV	-			37.9	44.2	48	51.5	96.2	77.3
Selenium	mg/L	0.01			<0.01	<0.1	<0.1	<0.01	<0.1	<0.1
Sodium	mg/L	1			138	8670	8670	22500	4580	9060
Sodium Adsorption Ratio (Storages)	-	0.01			10.9	411	445	862	280	481
Standing Water Level	mTOC	-			-	-	-	-	-	-
Strontium	mg/L	0.001			0.581	1.21	1.06	1.89	1.76	2.56
Sulfate	mg/L	1			<1	<10	<10	<50	<1	<10
Total Dissolved Solids	mg/L	10			574	21500	19100	58700	9770	21400
Total Organic Carbon (Storages)	mg/L	1			39	90	50	69	3010	5
Total Phosphorus (Storages)	mg/L	0.01			0.13	0.06	0.04	1.68	0.04	0.34
Uranium	mg/L	0.001			<0.001	<0.01	<0.01	<0.001	<0.01	<0.01
Vanadium	mg/L	0.01			<0.01	<0.1	<0.1	0.03	<0.1	<0.1
Zinc	mg/L	0.005			<0.005	<0.05	<0.05	<0.005	<0.05	<0.05

*Monitoring event was completed but no water was available as ponds are not in operation.

TABLE 4: GROUNDWATER LEVEL RESULTS FOR 4th QUARTER – FEBRUARY 2017 / APRIL 2017

EPA Identification no.	Analyte	Unit	Number of samples required	Number of samples collected	Lowest sample value	Mean of sample	Highest sample value
44	Standing Water Level	Metres	Continuous	Continuous	-36	-35.5711	-35.2
45	Standing Water Level	Metres	Continuous	Continuous	17.2	17.6333	18.1
46	Standing Water Level	Metres	Continuous	Continuous	-57.9	-56.8278	-55.9
47	Standing Water Level	Metres	Continuous	Continuous	11.3	11.7656	11.8
48	Standing Water Level	Metres	Continuous	Continuous	4.5	4.5	4.5
49	Standing Water Level	Metres	Continuous	Continuous	14.7	14.7	14.7