

## ENVIRONMENT PROTECTION LICENCE 20350 MONITORING DATA

<b>Licence Holder:</b>	Santos NSW (Eastern) Pty Ltd
<b>Premises:</b>	Narrabri Gas Field X-Line Road, Narrabri, NSW 2390
<b>Licence No:</b>	20350
<b>EPL LINK:</b>	<a href="https://apps.epa.nsw.gov.au/prpoeoapp/Detail.aspx?instid=20350&amp;id=20350&amp;option=licence&amp;searchrange=licence&amp;range=POEO%20lice">https://apps.epa.nsw.gov.au/prpoeoapp/Detail.aspx?instid=20350&amp;id=20350&amp;option=licence&amp;searchrange=licence&amp;range=POEO%20lice</a> Version 17NOV22
<b>EPL Period:</b>	May 1st 2022 to April 30th 2023
<b>Reporting Period:</b>	<b>Quarter 3 - November 2022 - January 2023</b>
<b>Published Date:</b>	Feb-23
<b>Monitoring Location:</b>	Refer to Table 1
<b>Scheduled Activity:</b>	Coal seam gas exploration, assessment and production
<b>General Notes:</b>	Monitoring Point 80, 81 & 82 - no sample required in accordance with EPL20350 Condition M2.7 . Monitoring Point 77 - no sample required in accordance with EPL20350 Condition M2.7 (Plant not operating). Monitoring Point 69, 70 & 76 - no sample required in accordance with EPL20350 Condition M2.8 and M2.9. Monitoring Point 83, 84, 85 & 86 - no sample required in accordance with EPL20350 Condition M2.6. Monitoring point 18 - The bore is sealed shut and unable to open. Historically dry. Monitoring points visited and reported dry : 26, 28, 38, 39, 40, 43, 62, 66 and 78. Grab samples for monitoring points with "Special Frequency 2" are taken annually in June unless results trigger above baseline values - no sample required for the monitoring period. Monitoring points 47, 48 and 49: no water level results available. Repairs and maintenance being investigated. Monitoring points 87-116 not yet commissioned.

**Table 1: EPL20350 Water Monitoring Locations**

EPA Identification No.	Monitoring type	Location	Easting	Northing
7	Groundwater quality monitoring	BWD27PRUPS02	755433.048	6604684.807
8	Groundwater quality monitoring	BWD27PRLPS03	755436.361	6604699.035
9	Groundwater quality monitoring	BWD26PRUPS01	749372.75	6609376.69
10	Groundwater quality monitoring	BWD26PRLPS02	749364.45	6609363.35
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	762239.68	6605589.32
15	Groundwater quality monitoring	DWH3PRLPS02	762251.05	6605598.98
16	Groundwater quality monitoring	NYOPRORA01	736293.46	6643110.4
17	Groundwater quality monitoring	NYOPRUPS02	736308.8	6643107.84
18	Groundwater quality monitoring	BWD27PRORA01	755429.176	6604670.682
20	Groundwater quality monitoring	BHN14PRORA01	747158.13	6626109.12
21	Groundwater quality monitoring	BHN14PRUPS02	747152.71	6626123.91
22	Groundwater quality monitoring	TULPRNAP01	774464.07	6612048.13
23	Groundwater quality monitoring	TULPRDGY02	774466.48	6612032.98
24	Groundwater quality monitoring	BWDMW13D	753863.3	6608108.51
25	Groundwater quality monitoring	BWDMW13S	753864.82	6608109.3
26	Groundwater quality monitoring	BWDMW12S	753830.65	6608202.74
27	Groundwater quality monitoring	BWDMW12D	753831.91	6608203.71
28	Groundwater quality monitoring	BWDMW12I	753832.68	6608202.25
29	Groundwater quality monitoring	BWDMW2	753912.83	6608241.35
30	Groundwater quality monitoring	BWDMW3	753935.87	6608254.02
31	Groundwater quality monitoring	BWDMW4D	753980.81	6608285.74
32	Groundwater quality monitoring	BWDMW4	753984.14	6608288.04
33	Groundwater quality monitoring	BWDMW15S	753868.09	6608258.34
34	Groundwater quality monitoring	BWDMW15D	753867.1	6608256.75
35	Groundwater quality monitoring	BWDMW16S	753858.95	6608316.49
36	Groundwater quality monitoring	BWDMW16D	753856.98	6608315.57
37	Groundwater quality monitoring	LWDMW1D	751387.93	6623862.96
38	Groundwater quality monitoring	LWDMW1S	751388.92	6623862.46
39	Groundwater quality monitoring	LWDMW1I	751390.64	6623861.85
40	Groundwater quality monitoring	LWDMW2S	751102.84	6622293.02
41	Groundwater quality monitoring	LWDMW2D	751101.81	6622293.15
42	Groundwater quality monitoring	LWDMW3D	751876.16	6622163.76
43	Groundwater quality monitoring	LWDMW3S	751876.47	6622164.93
44	Groundwater level monitoring	DWH8AGMB1	765546.74	6616987.99
45	Groundwater level monitoring	DWH8AGMB2	765546.74	6616987.99
46	Groundwater level monitoring	DWH8AGMB3	765546.74	6616987.99

EPA Identification No.	Monitoring type	Location	Easting	Northing
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	755684.14	6638105.31
51	Groundwater quality monitoring	WPKMW01D	755689.75	6638097.35
52	Groundwater quality monitoring	WPKMW02	755671.2	6638034.29
53	Groundwater quality monitoring	WPKMW04	755632.5	6637993.07
55	Groundwater quality monitoring	WPKMW08	755634.11	6638166.87
56	Groundwater quality monitoring	WPKMW09D	755663.98	6637988.2
57	Groundwater quality monitoring	WPKMW09S	755664.4	6637990.54
58	Groundwater quality monitoring	WPKMW12S	755456.18	6638228.91
59	Groundwater quality monitoring	WPKMW13I	755552.65	6638189.56
60	Groundwater quality monitoring	WPKMW13S	755554.88	6638189.05
61	Groundwater quality monitoring	WPKMW14D	755364.51	6638049.06
62	Groundwater quality monitoring	WPKMW14S	755364.77	6638048.26
63	Groundwater quality monitoring	WPKMW15D	755365.48	6638233.36
64	Groundwater quality monitoring	WPKMW15S	755365.5	6638230.74
65	Groundwater quality monitoring	WPKMW16D	755051.03	6637988.5
66	Groundwater quality monitoring	WPKMW16S	755050.53	6637986.64
67	Groundwater quality monitoring	WPKMW17D	756151.06	6638128.32
68	Groundwater quality monitoring	WPKMW17S	756149.54	6638128.05
69	Produced water storage dam	BWDPD2	753875.87	6607995.06
70	Produced water storage dam	BWDPD3	753992.17	6608125.97
71	Produced water storage dam	LWDPD1CELL4	751473.349	6623513.252
72	Produced water storage dam	LWDPD1CELL3	751460.723	6623323.85
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	755611.6	6638072.85
76	Produced water storage dam	TFDPD2	755480.11	6638099.04
77	Treated water quality monitoring	LWWTDM1	751648.02	6622508.31
78	Groundwater quality monitoring	WPKMW18S	755944.01	6638100.84
79	Groundwater quality monitoring	WPKMW18I	755945.07	6638105.04
80	Groundwater quality monitoring	LWDMW4	752080.54	6623038.94
81	Groundwater quality monitoring	LWDMW5	752491.08	6623301.16
82	Groundwater quality monitoring	LWDMW6	752667.55	6623165.03
83	Soil quality monitoring	LWDSMP1	751942.34	6622941.21
84	Soil quality monitoring	LWDSMP2	752164.06	6623143.83
85	Soil quality monitoring	LWDSMP3	752572.6	6623126.32
86	Soil quality monitoring	LWDSMP4	752457.14	6622764.26

Spatial Reference: GDA94 MGA Zone 55

**TABLE 2: GROUNDWATER QUALITY MONITORING (In situ - Quarterly)**

		EPA Identification No	7	8	9	10	11	12
		Location	BWD27PRUPS02	BWD27PRLPS03	BWD26PRUPS01	BWD26PRLPS02	DWH14PRUPS01	DWH14PRLPS02
		Date	16/12/2022	16/12/2022	15/12/2022	15/12/2022	13/12/2022	13/12/2022
		Sample Method	in situ	in situ	in situ	in situ	in situ	in situ
Parameter	Units	LOR	RESULT	RESULT	RESULT	RESULT	RESULT	RESULT
Dissolved Oxygen	mg/L	-	2.15	0.16	0.27	0.42	0.61	0.66
Electrical Conductivity	µS/cm	-	135	214	75	131	210	169
pH	pH Unit	-	5.16	5.92	5.99	5.91	6.03	5.32
Redox Potential	mV	-	37	-16	12	16	13	44
Standing Water Level	mTOC	-	38.61	38.4	29.54	28.97	53.56	54.14

		EPA Identification No	13	14	15	18	20	21
		Location	DWH14PRPUR03	DWH3PRUPS01	DWH3PRLPS02	BWD27PRORA01	BHN14PRORA01	BHN14PRUPS02
		Date	13/12/2022	15/12/2022	15/12/2022	No sample - dry	13/12/2022	13/12/2022
		Sample Method	in situ	in situ	in situ	No sample - dry	in situ	in situ
Parameter	Units	LOR	RESULT	RESULT	RESULT	RESULT	RESULT	RESULT
Dissolved Oxygen	mg/L	-	0.71	1.5	0.49	-	0.31	0.31
Electrical Conductivity	µS/cm	-	664	119	131	-	513	458
pH	pH Unit	-	7.25	5	5.29	-	7.45	7.42
Redox Potential	mV	-	123	59	45	-	-25	-21
Standing Water Level	mTOC	-	53.5	67.44	67.64	-	26.36	15.11

		EPA Identification No	26	27	28	37	38	39
		Location	BWDMW12S	BWDMW12D	BWDMW12I	LWDMW1D	LWDMW1S	LWDMW1I
		Date	5/12/2022	5/12/2022	5/12/2022	14/12/2022	14/12/2022	14/12/2022
		Sample Method	No sample - dry	in situ	No sample - dry	in situ	No sample - dry	No sample - dry
Parameter	Units	LOR	RESULT	RESULT	RESULT	RESULT	RESULT	RESULT
Dissolved Oxygen	mg/L	-	-	2.98	-	1.1	-	-
Electrical Conductivity	µS/cm	-	-	5070	-	1190	-	-
pH	pH Unit	-	-	6.97	-	6.21	-	-
Redox Potential	mV	-	-	-15	-	41	-	-
Standing Water Level	mTOC	-	-	31.18	-	30.22	-	-

		EPA Identification No	40	41	42	43	56	57
		Location	LWDMW2S	LWDMW2D	LWDMW3D	LWDMW3S	WPKMW9D	WPKMW9S
		Date	14/12/2022	14/12/2022	14/12/2022	14/12/2022	12/12/2022	12/12/2022
		Sample Method	No sample - dry	in situ	in situ	No sample - dry	in situ	in situ
Parameter	Units	LOR	RESULT	RESULT	RESULT	RESULT	RESULT	RESULT
Dissolved Oxygen	mg/L	-	-	0.44	0.47	-	0.27	0.47
Electrical Conductivity	µS/cm	-	-	2002	941	-	1217	3278
pH	pH Unit	-	-	6.33	6.35	-	8.26	7.87
Redox Potential	mV	-	-	68	-77	-	-3	-93
Standing Water Level	mTOC	-	-	26.28	21.31	-	15.55	15.78

**TABLE 2: GROUNDWATER QUALITY MONITORING (In situ - Quarterly)**

		EPA Identification No	59	60	61	62	63	64
		Location	WPKMW13I	WPKMW13S	WPKMW14D	WPKMW14S	WPKMW15D	WPKMW15S
		Date	12/12/2022	12/12/2022	12/12/2022	12/12/2022	12/12/2022	12/12/2022
		Sample Method	in situ	in situ	in situ	No sample - dry	in situ	in situ
Parameter	Units	LOR	RESULT	RESULT	RESULT	RESULT	RESULT	RESULT
Dissolved Oxygen	mg/L	-	0.8	0.66	1.11	-	0.91	1.37
Electrical Conductivity	µS/cm	-	1262	3163	1194	-	1276	8640
pH	pH Unit	-	7.92	7.42	7.71	-	7.77	7.48
Redox Potential	mV	-	28	27	34	-	16	21.8
Standing Water Level	mTOC	-	16.93	17.03	21.03	-	22.45	22.61

		EPA Identification No	65	66	78	79
		Location	WPKMW16D	WPKMW16S	WPKMW18S	WPKMW18I
		Date	12/12/2022	12/12/2022	12/12/2022	12/12/2022
		Sample Method	in situ	No sample - dry	No sample - dry	in situ
Parameter	Units	LOR	RESULT	RESULT	RESULT	RESULT
Dissolved Oxygen	mg/L	-	1.83	-	-	1.5
Electrical Conductivity	µS/cm	-	1269	-	-	1307
pH	pH Unit	-	7.41	-	-	7.48
Redox Potential	mV	-	28.4	-	-	26
Standing Water Level	mTOC	-	28.17	-	-	16.12

**TABLE 3: PRODUCED WATER STORAGE QUALITY MONITORING**

		EPA Identification No	69	70	71	72	73	74	75	76
		Location	BWDPD2	BWDPD3	LWDPD1CELL4	LWDPD1CELL3	LWDPD1CELL2	LWDPD1CELL1	TFDPD1	TFDPD2
		Date			14/12/2022	14/12/2022	14/12/2022	14/12/2022		
		Sample Method	No produced water	No produced water	Grab Sample	Grab Sample	Grab Sample	Grab Sample	No produced water	No produced water
Parameter	Units	LOR	RESULT	RESULT	RESULT	RESULT	RESULT	RESULT	RESULT	RESULT
Aluminium	mg/L	0.01	-	-	<0.2	<0.1	<0.1	<0.1	0.05	-
Ammonia as N	mg/L	0.1	-	-	<0.1	0.13	0.12	<0.1	<0.1	-
Arsenic	mg/L	0.001	-	-	0.027	<0.01	<0.01	<0.01	0.002	-
Barium	mg/L	0.001	-	-	1.01	0.785	1.63	6.87	0.601	-
Beryllium	mg/L	0.001	-	-	<0.02	<0.01	<0.01	<0.01	<0.001	-
Bicarbonate Alkalinity as CaCO3	mg/L	1	-	-	<1	16800	8570	7220	1690	-
Boron	mg/L	0.05	-	-	11.1	0.48	0.43	1.19	0.16	-
Bromide	mg/L	0.01	-	-	86.6	14.3	10.3	10.3	4.04	-
Cadmium	mg/L	0.0001	-	-	<0.002	<0.001	<0.001	<0.001	<0.0001	-
Calcium	mg/L	1	-	-	12	6	9	14	3	-
Carbonate Alkalinity as CaCO3	mg/L	1	-	-	109000	8400	15400	9850	3540	-
Chloride	mg/L	1	-	-	22600	3840	3260	2760	1200	-
Chromium	mg/L	0.001	-	-	<0.02	<0.01	<0.01	<0.01	<0.001	-
Cobalt	mg/L	0.001	-	-	<0.02	<0.01	<0.01	<0.01	<0.001	-
Copper	mg/L	0.001	-	-	<0.02	<0.01	<0.01	<0.01	<0.001	-
Dissolved Oxygen	mg/L	-	-	-	0.42	2.51	3.01	3.02	3.02	-
Electrical Conductivity	µS/cm	-	-	-	118033	38178	36403	29180	11143	-
Iron	mg/L	0.05	-	-	0.46	<0.1	0.15	0.2	<0.05	-
Lead	mg/L	0.001	-	-	<0.02	<0.01	<0.01	<0.01	<0.001	-
Magnesium	mg/L	1	-	-	23	10	14	9	<1	-
Manganese	mg/L	0.001	-	-	0.065	0.013	0.013	<0.01	0.002	-
Mercury	mg/L	0.0001	-	-	<0.001	<0.0001	<0.0001	<0.0001	<0.0001	-
Molybdenum	mg/L	0.001	-	-	0.045	<0.01	<0.01	<0.01	0.001	-
Nickel	mg/L	0.001	-	-	<0.02	<0.01	<0.01	<0.01	<0.001	-
Nitrate as N	mg/L	0.1	-	-	0.15	0.15	0.72	<0.1	<0.1	-
Nitrite as N	mg/L	0.01	-	-	<0.01	<0.01	<0.01	<0.01	<0.1	-
pH	pH Unit	-	-	-	9.3	9.2	9.05	8.88	9.26	-
Potassium	mg/L	1	-	-	1690	193	140	161	36	-
Redox potential	mV	-	-	-	13	21	24	23	77	-
Selenium	mg/L	0.01	-	-	<0.2	<0.1	<0.1	<0.1	<0.01	-
Sodium Adsorption Ratio	-	0.01	-	-	2890	755	569	459	377	-
Sodium	mg/L	1	-	-	74200	13000	11700	8950	2680	-
Strontium	mg/L	0.001	-	-	1.41	0.781	1.16	1.75	0.321	-
Sulfate as SO4 2-	mg/L	1	-	-	<100	522	235	<100	<100	-
Total Dissolved Solids @180°C	mg/L	10	-	-	202000	34000	30600	23800	7490	-
Total Organic Carbon	mg/L	1	-	-	673	108	106	88	36	-
Total Phosphorus as P	mg/L	0.02	-	-	9.52	0.53	0.21	0.28	0.06	-
Uranium	mg/L	0.001	-	-	<0.02	<0.01	<0.01	<0.01	<0.001	-
Vanadium	mg/L	0.01	-	-	<0.2	<0.1	<0.1	<0.1	<0.01	-
Zinc	mg/L	0.005	-	-	<0.1	<0.05	<0.05	<0.05	<0.005	-

**Note:** \*Limit of reporting (LOR) has been adjusted due to the min matrix interference as per Australian Laboratory Services (ALS) certificate of analysis (COA) ES2245287

**TABLE 4: GROUNDWATER LEVEL MONITORING**

EPA Identification No	44	45	46	47	48	49
Location	Dewhurst 8A-1 (DWH8AQGDGY01)	Dewhurst 8A-2 (DWH8AQGARK02)	Dewhurst 8A-3 (DWH8AQGPOR03)	Bibbiewindi 28A (BWD28QGUPS01)	Bibbiewindi 28B (BWD28QGLPS01)	Bibbiewindi 28C (BWD28QGPUR01)
Start Date	1/11/2022	1/11/2022	1/11/2022	1/11/2022	1/11/2022	1/11/2022
End Date	31/01/2023	31/01/2023	31/01/2023	31/01/2023	31/01/2023	31/01/2023
Sample Obtained	Standing Water Level	Standing Water Level	Standing Water Level	Standing Water Level	Standing Water Level	Standing Water Level
Number of Samples Required	Continuous	Continuous	Continuous	Continuous	Continuous	Continuous
Lowest sample value	-37.076	16.62	-46.291	-	-	-
Mean of sample	-36.994	17.01	-45.497	-	-	-
Highest sample value	-36.923	17.254	-44.728	-	-	-

**Note:** Monitoring points 47,48 and 49: Sensor is faulty and data not available since 21 April 2021