



# Kyalla 117 N2-1H: 6 Months Flowback and produced water report

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## 1 Introduction

Origin Energy B2 Ltd (Origin) was granted approval for the Kyalla 117 N2 Drilling, Stimulation and Well Testing Environmental Management Plan (NT-2050-15-MP-025) on 13 August 2019. The Kyalla 117 N2-1H well was successfully stimulated in September 2020, with flowback operations commencing on 24 October 2020 post well completion. In accordance with the Northern Territory (NT) Petroleum (Environment) Regulation 2016 (PER), a report on the quality of hydraulic flowback fluid (Section 37A) and produced water (Section 37B) must be submitted to the Minister within six (6) months of completing Hydraulic Fracturing Activities (HFS). The following section satisfies these regulatory reporting requirements.

## 2 Reporting requirement

### 2.1 37A Report about flowback fluid

In accordance with section 37A, Origin is required to provide certain information relating to chemicals or Naturally Occurring Radioactive Material (NORM) found within flowback fluid within six (6) months of commencing flowback operations. The information required under section 37A of the PER's, is provided in Table 1.

Table 1 37A Report about flowback fluid

Reporting requirement	Kyalla 117 N2 information
(a) The identity of any chemical or NORM found in the flowback fluid	Characterisation of the flowback was completed with the analytes listed in the Code of Practice: Onshore Petroleum Activities in the Northern Territory (Code of Practice) C.8 Wastewater chemistry analytes. The full list of analytes is listed in Appendix A.
(b) The concentration of any chemical or NORM found in the flowback fluid	Characterisation of the flowback was completed with the analytes listed in the Code of Practice: C.8 Wastewater chemistry analytes. The full list of analytes and their concentration are listed in Appendix A.
(c) Details regarding how any chemical or NORM has been or will be managed	All flowback, including chemical and NORM constituents, are currently stored within double lined, enclosed wastewater tanks as per the code of Practice. Each tank has continuous leak detection and level monitoring, with all freeboard having a 1:1000 Annual re-occurrence interval wet/dry season freeboard.
(d) Details regarding how any chemical or NORM has been or will be transported	Flowback, and associate chemical and NORM constituents, will be transported by licenced listed water transport provider, in accordance with the NT Waste Management and Pollution Control Act 1998.
(e) Details regarding how any chemical or NORM has been or will be treated	Flowback, including chemical and NORM constituents, will be treated in open wastewater tanks to reduce the volume of flowback through evaporation.
(f) Details regarding any action proposed to be taken to prevent any chemical or NORM spill	A spill management plan and emergency management has been implemented, as a part of the approved Kyalla 117 N2 Drilling, stimulation and well testing EMP NT-2050-15-MP-025. Actions implemented to prevent the spill of chemical or NORM from flowback water include: <ul style="list-style-type: none"><li>• Use of double lined enclosed tanks</li><li>• Use of secondary containment for all transfer points</li></ul>

Reporting requirement	Kyalla 117 N2 information
	<ul style="list-style-type: none"> <li>• Use of continuous leak detection and level monitoring on wastewater tank fluid levels with alarms</li> <li>• Lease pad is fully bunded to contain 110% of the volume of the largest tank</li> <li>• Routine (daily during wet season and weekly during dry season) site inspections</li> <li>• Procedures in place to manage significant rainfall events</li> </ul>
(g) Details of the emergency contingency plan included in the environment management plan to which the activity relates	<p>An emergency management plan (NT-2050-15-MP-024) was developed, as a part of the approved Kyalla 117 N2 Drilling, stimulation and well testing EMP NT-2050-15-MP-025. Contingent plans include:</p> <ul style="list-style-type: none"> <li>• Response processes for onsite and offsite spills</li> <li>• Onsite wastewater transfer equipment to transfer wastewater in case of a spill</li> <li>• First response civil equipment onsite to contain a spill</li> </ul>
(h) The requirements in relation to the management of any chemical or NORM of the prescribed chemical legislation	<p>The management of flowback wastewater must be undertaken in accordance with the approved EMP NT-2050-15-MP-025 and Code of Practice for Onshore Petroleum Activities in the Northern Territory. This includes requirements to manage the environmental risks associated with generation, storage, treatment and disposal.</p> <p>All flowback wastewater is classified as a listed waste under the Waste Management and Pollution Control Act 1998. Transport and disposal of flowback must be undertaken in accordance with this Act.</p> <p>The NORM levels of the wastewater do not meet the limits, as described in the NT Radiation Protection Regulation 2007</p>

## 2.2 37B Report about produced water

In accordance with section 37B, Origin is required to provide certain information relating to chemicals or NORM found within produced water within 6 months of produced water being extracted. The information required under section 37B of the PER's, is provided in Table 2.

Table 2 Report about produced water

Reporting requirement	Kyalla 117 N2 information
(a) The identity of any chemical or NORM found in the flowback fluid	N/A- no produced water has been encountered during the Kyalla 117 N2 flowback activities.
(b) The concentration of any chemical or NORM found in the flowback fluid	N/A- no produced water has been encountered during the Kyalla 117 N2 flowback activities.
(c) Details regarding how any chemical or NORM has been or will be managed	N/A- no produced water has been encountered during the Kyalla 117 N2 flowback activities.
(d) Details regarding how any chemical or NORM has been or will be transported	N/A- no produced water has been encountered during the Kyalla 117 N2 flowback activities.

Reporting requirement	Kyalla 117 N2 information
(e) Details regarding how any chemical or NORM has been or will be treated	N/A- no produced water has been encountered during the Kyalla 117 N2 flowback activities.
(f) Details regarding any action proposed to be taken to prevent any chemical or NORM spill	N/A- no produced water has been encountered during the Kyalla 117 N2 flowback activities.
(g) Details of the emergency contingency plan included in the environment management plan to which the activity relates	N/A- no produced water has been encountered during the Kyalla 117 N2 flowback activities.
(h) The requirements in relation to the management of any chemical or NORM of the prescribed chemical legislation	N/A- no produced water has been encountered during the Kyalla 117 N2 flowback activities.

Appendix A- Kyalla 117 N2 summary Data

Chemical Group	Analyte	Unit	EQL#	Minimum Concentration	Maximum Concentration	Average concentration
Physical chemistry	pH (field)		0.1	4.55	7.6	5.6
	Electrical conductivity (field)	µs/cm	1	2,040	204,600	140,548
	Total dissolved solids (Lab)	mg/L	2	30,000	300,000	207,500
	Total Suspended solids (Lab)	Mg/L	3	35	210	100
	Dissolved Oxygen (field)	%	0.1	1.5	21.1	9.4
BTEX	Benzene	µg/L	1	31	85	57
	Ethylbenzene	µg/L	1	2	2	2
	Toluene	µg/L	1	25	74	50
	Xylene (m & p)	µg/L	1	3	16	8
	Xylene (o)	µg/L	1	2	9	5
	Xylene Total	µg/L	1	5	25	11
	Sum of BTEX	µg/L	1	63	190	119
Inorganics	Alkalinity (Bicarbonate) as CaCO3	mg/L	1	95	310	164
	Alkalinity (Carbonate)_as CaCO3	mg/L	1	ND	ND	ND
	Alkalinity (Hydroxide) as CaCO3	mg/L	1	ND	ND^	ND
	Alkalinity (Total) as CaCO3	mg/L	1	95	310	164
	Ammonia (filtered)	mg/L	0.01	23	140	101
	Ammonia as N (filtered)	mg/L	0.01	19	110	83
	Bromide (filtered)	mg/L	0.05	120	1000	780

Chemical Group	Analyte	Unit	EQL#	Minimum Concentration	Maximum Concentration	Average concentration
	Calcium (filtered)	mg/L	0.01	1,500	21,000	15,611
	Chloride (filtered)	mg/L	1	15,000	120,000	91,875
	Cyanide Total	mg/L	0.004	ND	ND	ND
	Electrical Conductivity (Lab)	µS/cm	1	43,000	204,000	175,375
	Fluoride (filtered)	mg/L	0.1	0.6	0.6	0.6
	Formaldehyde	mg/L	0.05	0.06	0.06	0.06
	Kjeldahl Nitrogen Total	mg/L	0.05	110	140	133
	Magnesium (filtered)	mg/L	0.01	320	4,700	3,402
	Nitrate (as N)	mg/L	0.01	0.14	0.14	0.14
	Nitrite (as N)	mg/L	0.01	0.02	0.02	0.02
	Nitrogen (Total)	mg/L	0.05	110	140	133
	pH (Lab)	pH_Units	0.01	5.8	6.8	6
	Phosphorus	mg/L	0.01	0.62	10	4
	Phosphorus filterable reactive (as P) (filtered)	mg/L	0.005	0.45	11	6
	Potassium (filtered)	mg/L	0.01	240	1300	868
	Silicon as Si	mg/L	0.02	16	19	17
	Silicon as Si (filtered)	mg/L	0.02	10	15	12
	Sodium (filtered)	mg/L	0.01	6,600	35,000	29,622
	Sodium Absorption Ratio (filtered)	-	0.01	40	64	57
	Sulphate as SO4	mg/L	1	20	210	60
	Suspended Solids	mg/L	5	35	210	100
	Total Dissolved Solids	mg/L	2	100,000	120,000	113,333

Chemical Group	Analyte	Unit	EQL#	Minimum Concentration	Maximum Concentration	Average concentration
	Total Dissolved Solids (filtered)	mg/L	10	30,000	300,000	207,500
	Total Hardness (filtered)	No unit		52000	68000	60,667
Metals	Aluminium	mg/L	0.001	0.17	0.17	0.17
	Aluminium (filtered)	mg/L	0.001	0.035	0.035	0.035
	Antimony	mg/L	0.001	ND	ND	ND
	Antimony (filtered)	mg/L	0.001	ND	ND	ND
	Arsenic	mg/L	0.0005	0.0064	0.0064	0.0064
	Arsenic (filtered)	mg/L	0.0005	0.0038	0.0038	0.0038
	Barium	mg/L	0.001	88	2300	1,561
	Barium (filtered)	mg/L	0.001	47	2200	1,531
	Beryllium	mg/L	0.001	ND	ND	ND
	Beryllium (filtered)	mg/L	0.001	ND	ND	ND
	Boron	mg/L	0.001	2.8	6	4
	Boron (filtered)	mg/L	0.001	2.9	5.8	4
	Cadmium	mg/L	0.0001	ND	ND	ND
	Cadmium (filtered)	mg/L	0.00005	ND	ND	ND
	Chromium (III+VI)	mg/L	0.0005	0.0055	0.0055	0.0055
	Chromium (III+VI) (filtered)	mg/L	0.0005	0.0048	0.0048	0.0048
	Cobalt	mg/L	0.0002	0.0071	0.041	0.03
	Cobalt (filtered)	mg/L	0.0002	0.007	0.041	0.03
	Copper	mg/L	0.001	0.11	0.11	0.11
	Copper (filtered)	mg/L	0.001	ND	ND	ND
Iron	mg/L	0.001	73	260	177	



Chemical Group	Analyte	Unit	EQL#	Minimum Concentration	Maximum Concentration	Average concentration
	Iron (filtered)	mg/L	0.001	60	250	160
	Lead	mg/L	0.0002	0.0051	0.25	0.15
	Lead (filtered)	mg/L	0.0002	0.0077	0.21	0.1
	Manganese	mg/L	0.0005	11	170	125
	Manganese (filtered)	mg/L	0.0005	10	170	127
	Mercury	mg/L	0.0001	ND	ND	ND
	Mercury (filtered)	mg/L	0.0001	ND	ND	ND
	Molybdenum	mg/L	0.001	0.038	0.038	0.04
	Molybdenum (filtered)	mg/L	0.001	0.038	0.038	0.04
	Nickel	mg/L	0.0005	0.035	0.063	0.05
	Nickel (filtered)	mg/L	0.0005	0.036	0.066	0.05
	Selenium	mg/L	0.001	ND	ND	ND
	Selenium (filtered)	mg/L	0.001	ND	ND	ND
	Silver	mg/L	0.001	ND	ND	ND
	Silver (filtered)	mg/L	0.001	ND	ND	ND
	Strontium	mg/L	0.001	40	570	420
	Strontium (filtered)	mg/L	0.001	39	560	405
	Thorium	mg/L	0.001	ND	ND	ND
	Thorium (filtered)	mg/L	0.001	ND	ND	ND
	Tin	mg/L	0.001	ND	ND	ND
	Tin (filtered)	mg/L	0.001	ND	ND	ND
	Uranium	mg/L	0.001	ND	ND	ND
	Uranium (filtered)	mg/L	0.001	ND	ND	ND
	Vanadium	mg/L	0.001	ND	ND	ND
	Vanadium (filtered)	mg/L	0.001	ND	ND	ND
	Zinc	mg/L	0.001	0.031	2	1

Chemical Group	Analyte	Unit	EQL#	Minimum Concentration	Maximum Concentration	Average concentration
	Zinc (filtered)	mg/L	0.001	0.018	1.9	1
Organic	Dissolved Organic Carbon	mg/L	1	31	540	221
	Total Organic Carbon	mg/L	1	29	580	231
PAH/Phenols	2,3,4,6-tetrachlorophenol	µg/L	1	2	2	2
	2,4,5-trichlorophenol	µg/L	1	ND	ND	ND
	2,4,6-trichlorophenol	µg/L	1	ND	ND	ND
	2,4-dichlorophenol	µg/L	1	ND	ND	ND
	2,4-dimethylphenol	µg/L	1	1	3	3
	2,4-dinitrophenol	µg/L	1	ND	ND	ND
	2,6-dichlorophenol	µg/L	1	1	1	1
	2-chlorophenol	µg/L	1	ND	ND	ND
	2-methyl-4,6-dinitrophenol	µg/L	1	ND	ND	ND
	2-methylphenol	µg/L	1	ND	ND	ND
	2-nitrophenol	µg/L	1	ND	ND	ND
	3-&4-methylphenol	µg/L	1	1	3	2
	3/4-Methylphenol (m/p-cresol)	µg/L	2	ND	ND	ND
	3-methylcholanthrene	µg/L	1	ND	ND	ND
	4-chloro-3-methylphenol	µg/L	1	ND	ND	ND
	4-nitrophenol	µg/L	1	ND	ND	ND

Chemical Group	Analyte	Unit	EQL#	Minimum Concentration	Maximum Concentration	Average concentration
	7,12-dimethylbenz(a)anthracene	µg/L	1	ND	ND	ND
	Acenaphthene	µg/L	1	ND	ND	ND
	Acenaphthylene	µg/L	1	ND	ND	ND
	Anthracene	µg/L	1	ND	ND	ND
	Benz(a)anthracene	µg/L	1	ND	ND	ND
	Benzo(a)pyrene	µg/L	0.5	ND	ND	ND
	Benzo(b)fluoranthene	µg/L	1	ND	ND	ND
	Benzo(b,j,k)fluoranthene	µg/L	2	ND	ND	ND
	Benzo(e)pyrene	µg/L	1	ND	ND	ND
	Benzo(g,h,i)perylene	µg/L	1	ND	ND	ND
	Benzo(k)fluoranthene	µg/L	1	ND	ND	ND
	Chrysene	µg/L	1	ND	ND	ND
	Dibenz(a,h)anthracene	µg/L	1	ND	ND	ND
	Dinoseb	µg/L	1	ND	ND	ND
	Fluoranthene	µg/L	1	ND	ND	ND
	Fluorene	µg/L	1	ND	ND	ND
	Hexachlorophene	µg/L	1	ND	ND	ND
	Indeno(1,2,3-c,d)pyrene	µg/L	1	ND	ND	ND
	Naphthalene	µg/L	1	ND	ND	ND
	Pentachlorophenol	µg/L	1	2	2	2
	Phenanthrene	µg/L	1	ND	ND	ND
	Phenol	µg/L	1	1	2	2

Chemical Group	Analyte	Unit	EQL#	Minimum Concentration	Maximum Concentration	Average concentration
	Pyrene	µg/L	1	ND	ND	ND
	Carcinogenic PAH, BaP TEQ, <LOR=LOR	µg/L	2.7	ND	ND	ND
	Total PAHs - assumes <LOR results = 0	µg/L	9	ND	ND	ND
Radionuclides	Gross alpha activity_ (filtered)	Bq/L	0	23.7	44.4	34
	Gross beta activity (excluding activity of 40K) (filtered)	Bq/L	0	36	97	71
TPH	C6 - C10 Fraction	µg/L	10	120	340	210
	C6 - C10 Fraction minus BTEX (F1)	µg/L	10	32	340	140
	C10 - C16 Fraction	µg/L	10	40	4300	950
	C10 - C16 Fraction minus Naphthalene (F2)	µg/L	10	40	4300	950
	C16 - C34 Fraction	µg/L	50	ND	ND	ND
	C34 - C40 Fraction	µg/L	50	ND	ND	ND
	Total C6-C40	µg/L	50	120	4400	800

^Not Detected

#Estimated quantitation Limit