

## Approval notice and statement of reasons


### *Petroleum (Environment) Regulations 2016 (NT) (Regulations)*

Interest holder	Origin Energy B2 Pty Ltd ABN 42 105 431 525
Petroleum interest(s)	Exploration Permits 98 (EP98) and 76 (EP76)
Environment management plan (EMP) title	Beetaloo Sub-basin Multi-well Drilling, Stimulation and Well Testing Program Environment Management Plan EP98 & EP76
EMP document reference	ORI10-3
Regulated activity	<ul style="list-style-type: none"> <li>• civil construction activities at the existing Amungee NW site, including expansion of the lease and camp pads</li> <li>• site set-up and mobilisation</li> <li>• exploration and appraisal (E&amp;A) activities at the Amungee NW and Velkerri 76 sites including drilling, hydraulic fracture stimulation (HFS) and well testing</li> <li>• on-site wastewater management to support ongoing E&amp;A program</li> <li>• site demobilisation</li> <li>• site rehabilitation</li> </ul>
Is the EMP a new plan submitted under reg 6 or a revision of a current plan submitted in accordance with reg 18, or regs 15 and 17?	This is a new plan submitted under reg 6.
Was the regulated activity referred <sup>1</sup> for consideration whether environmental impact assessment was required?	No
Was environmental impact assessment <sup>2</sup> required?	N/A
Has an environmental approval <sup>3</sup> been issued for the regulated activity?	N/A
Has an Authority Certificate under the <i>Northern Territory Aboriginal Sacred Sites Act 1989</i> been issued for the regulated activity?	Yes Authority Certificates C2014/184 and C2020/003
Date an EMP compliant with reg 8 was first submitted under reg 6	21 December 2021
Date within which the EMP was published for comment under reg 8A, if applicable	13 January to 10 February 2022
Date further information was required and submitted under reg 10, if applicable	4 March 2022 required 18 March 2022 submitted (ORI10-2) 27 April 2022 required 5 May 2022 submitted (ORI10-3)
Date of resubmission notice under reg 11(2)(b), if applicable	9 March 2022

<sup>1</sup> This means a referral under the *Environment Protection Act 2019 (NT) (EP Act)* and/or the *Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act)*.

<sup>2</sup> This means a requirement for an environmental impact assessment to be conducted under the EP Act and/or the EPBC Act.

<sup>3</sup> This means an approval granted under the EP Act and/or the EPBC Act.

Date EMP was resubmitted under reg 11(3), if applicable	30 March 2022
Date a notice setting out a proposed timetable for consideration of the EMP was issued under reg 11(2A), or reg 11(3)(c), if applicable	27 April 2022 13 May 2022
Proposed timetable given in notice under reg 11(2A), or reg 11(3)(c), if applicable	13 May 2022 20 May 2022
Where provided under s29B of the <i>Northern Territory Environment Protection Authority Act 2012 (NT) (NT EPA Act)</i> , the dates the Northern Territory Environment Protection Authority (NT EPA) was requested to, and provided, advice on EMP	Date of Minister's request for advice: 25 February 2019 Date of NT EPA Advice: 10 May 2022 NTEPA2021/0169-016~0001
Date of decision	19 / 5 / 2022
Decision maker	 Signature  Hon Eva Dina Lawler MLA, Minister for Environment

## 1 Approval notice

1. I approve the EMP under reg 11(3)(a)(i).
2. The approval is subject to the following conditions:

### **Condition 1:**

The interest holder must submit to the Department of Environment, Parks and Water Security (DEPWS), via Onshoregas.DEPWS@nt.gov.au the following:

- i. Notification of the commencement of hydraulic fracturing activities prior to commencement.
- ii. An updated timetable for the regulated activity that is to be provided on the last day of each quarter (being 31 March, 30 June, 30 September and 31 December each year), that identifies activities completed in the current quarter and:
  - regulated activities in the next quarter, including duration;
  - activities in the next quarter based on commitments in the EMP relevant to the stage of the activity, including duration;
  - due dates for satisfaction of Ministerial approval conditions in the next quarter; and
  - due dates for regulatory reporting in the next quarter.
- iii. During civil works (and noting civil works is taken to include any type of earth moving, land clearing, installation of gravel pits, establishment of well pads, establishment of access tracks), weekly reports indicating:
  - the status and progress of vegetation clearing and civil works at each location the activity is conducted;

- any fires potentially threatening the activity from external or internal sources;
  - the outcome of inspections of erosion and sediment control measures, and corrective actions taken; and
  - the outcome of inspections and risk assessments for determining suitability of use of unsealed roads by any vehicle or machinery other than a light vehicle in the wet season.
- iv. During drilling, daily on-site reports, to be consolidated and provided weekly, indicating:
- status and progress of drilling at each location;
  - freeboard available in drill cutting pits (in cm); and
  - the outcome of general site inspections relevant to drilling and waste, and corrective actions taken.
- v. During hydraulic fracturing and flowback, weekly reports indicating:
- status and progress of hydraulic fracturing;
  - weekly measurement of stored volume (in ML) and freeboard available (in cm) of wastewater storage tanks, unless operated in the wet season, during which it must be measured daily; and
  - the outcome of general site inspections relevant to hydraulic fracturing and waste, and corrective actions taken.
- vi. During the wet season, weekly reports indicating:
- the outcome of inspections of erosion and sediment control measures, and corrective actions taken;
  - the outcome of daily inspections of any secondary containment in use, and corrective actions taken;
  - any halt to the regulated activity due to wet season conditions; and
  - daily measurements of freeboard available in drill cutting pits and wastewater treatment tanks (in cm) whenever operational.
- vii. For avoidance of doubt, if wastewater is present in tanks or drill cutting pits contain waste drill fluids and cuttings, these are considered to be operational. Reports must continue to be provided as per parts iv and v above, irrespective of whether there is manned activity occurring on site if the wastewater infrastructure is operational.
- viii. In the event that multiple regulated activities under the EMP are being conducted concurrently, the weekly submission of consolidated daily reports may be further consolidated to a single submission, but must clearly identify the locations and activities to which the information pertains, in relation to each item listed in conditions iii to v above, inclusive.

**Condition 2:**

The interest holder must provide an annual report to DEPWS, via Onshoregas.DEPWS@nt.gov.au, on its environmental performance, in accordance with item 11(1)(b) in schedule 1 of the Petroleum (Environment) Regulations 2016 (NT). With respect to the reports required to be submitted in accordance with item 11(1)(b) in schedule 1 of the Petroleum (Environment) Regulations 2016 (NT):

- i. The first report must cover the 12 month period from the date of the approval, and be provided within 3 calendar months of the end of the reporting period.
- ii. Each report must align with the template and Guideline prepared by DEPWS for this purpose and be provided each year until such time a notification is made to the Minister under regulation 14 that the activity is complete, or until the EMP is revised and re-approved.

**Condition 3:**

In support of clause D.6.2 of the Code of Practice: Onshore Petroleum Activities in the Northern Territory, an emissions report must be provided to DEPWS by 30 September each year, via Onshoregas.DEPWS@nt.gov.au, which summarises actual annual greenhouse gas emissions from conduct of the regulated activity estimated and reported under the Commonwealth National Greenhouse and Energy Reporting Act 2007 versus predicted emissions in the EMP. The emissions report should include:

- iii. A summary of all regulated activities conducted which have contributed to greenhouse gas emissions during the reporting period; and
- iv. Explanation of differences between actual and predicted emissions with reference to all parts of the regulated activity with potential to create greenhouse gas emissions.

FOOTNOTE: Clause D.6.2(b) of the Code requires annual actual greenhouse gas emissions to be provided even where emissions are below the NGERs threshold of 25 ktCO<sub>2</sub>-e for scope 1 and scope 2 emissions reporting.

**Condition 4:**

To support clause C.7.2 of the Code of Practice: Onshore Petroleum Activities in the Northern Territory, all accidental releases of liquid contaminant or hazardous chemical must be immediately recorded in a site spill register. The spill register and geospatial files specifying the location of the spill must be submitted to DEPWS via Onshoregas.DEPWS@nt.gov.au three months after the 12 month anniversary of the approval of the EMP each year while the EMP is in force. The register must include:

- i. The location, source and volume of the spill or leak;
- ii. Volume of impacted soil removed for appropriate disposal and the depth of any associated excavation;
- iii. The corrective actions taken or proposed to be taken to prevent recurrence of an incident of a similar nature; and
- iv. GPS co-ordinates of the location of the spill.

**Condition 5:**

In support of clause B.4.17.2 of the Code of Practice: Onshore Petroleum Activities in the Northern Territory, the interest holder must:

- i. undertake quarterly groundwater monitoring at each control and impact monitoring bore for a minimum of three years after establishment, unless otherwise advised by DEPWS.
- ii. provide to DEPWS, via Onshoregas.DEPWS@nt.gov.au, the results of quarterly groundwater monitoring, as soon as practicable and no later than 2 months after collection, in a format to be determined by DEPWS.

- iii. provide to DEPWS, via Onshoregas.DEPWS@nt.gov.au, an interpretative report of groundwater quality based on the groundwater monitoring required to be conducted at the well site(s) in accordance with Table 6 of the Code. The interpretative report must be provided annually within 3 months of the anniversary of the approval date of the EMP and include:
  - identification of any change to groundwater quality or level attributable to conduct of the regulated activity at the well site(s) and discussion of the significance and cause of any such observed change
  - interpretation of any statistical outliers observed from baseline measured values for each of the analytes
  - discussion of any trends observed
  - a summary of the results including descriptive statistics
  - description of the layout of the groundwater monitoring bores and wells, indicative groundwater flow directions and levels in accordance with the Preliminary Guideline Groundwater Monitoring Bores for Exploration Petroleum Wells in the Beetaloo Sub-basin.
- iv. develop site-specific performance standards for groundwater quality and interquartile ranges for analytes at each of the impact monitoring bores established, based on the first 3 years of groundwater monitoring, and provide to DEPWS, via Onshoregas.DEPWS@nt.gov.au within 6 months of the 3 year anniversary of approval of the EMP.

**Condition 6:**

In support of clause 16 of the *Water Act 1992 (NT)* and clause B.4.2 of the Code of Practice: Onshore Petroleum Activities in the Northern Territory, the interest holder must undertake groundwater level/pressure monitoring at each impact monitoring bore established, using a logger to record water level for 2 weeks prior to, during, and 4 weeks after completion of hydraulic fracturing operations at each well pad. Data logging should record at a minimum of every 4 minutes for the duration of the recording period. The logging data should be provided to DEPWS via Onshoregas.DEPWS@nt.gov.au within 2 weeks of completion of groundwater level monitoring in each impact monitoring bore.

**Condition 7:**

The interest holder must provide to DEPWS within 6 weeks of completion of well flowback operations at each new exploration well established under the EMP a report on the risk assessment of flowback wastewater from the hydraulic fracturing phase, via Onshoregas.DEPWS@nt.gov.au. The risk assessment must be:

- i. prepared by a suitably qualified person
- ii. prepared in accordance with the monitoring wastewater analytes specified in section C.8 of the Code of Practice: Onshore Petroleum Activities in the Northern Territory.

## 2 Material considered

1. The following material has been taken into account in making this decision:
  - a. Beetaloo Sub-basin Multi-well Drilling and Well Testing Program EP98 and EP76, (ORI10-3).
  - b. The principles of ecologically sustainable development referenced in reg 5A and the approval criteria set out in reg 9(1).
  - c. The NT EPA advice provided at my request under s29B of the NT EPA Act.
  - d. The Authority Certificate issued under the *Northern Territory Aboriginal Sacred Sites Act 1989*.
  - e. The Code of Practice: Onshore Petroleum Activities in the Northern Territory (Code) as set out in reg 4A.
  - f. All public comments submitted under reg 8B.

## 3 Statement of reasons

1. The EMP meets the approval criterion in reg 9(1)(a), because it contains all the information required by Schedule 1 of the Regulations. reg 9(1)(a)
2. I have taken into account the approval criterion in reg 9(1)(b) by noting the nature and scale of the regulated activity and bearing it in mind during my consideration of the impacts and risks. In particular, I note that: reg 9(1)(b)
  - i. The nature of the regulated activity is as follows:
    - i. civil construction activities at the existing Amungee NW site, including expansion of the lease and camp pads
    - ii. site set-up and mobilisation
    - iii. exploration and appraisal (E&A) activities at the Amungee NW and Velkerri 76 sites including drilling, HFS and well testing
    - iv. on-site wastewater management to support ongoing E&A program
    - v. site demobilisation
    - vi. site rehabilitation
  - ii. The scale of the regulated activity is as follows:
    - i. The existing footprint size of the Amungee NW and Velkerri 76 sites is 5.56 ha and 6.7 ha respectively. Both sites consist of pre-existing lease pads, camp pads, and access tracks. An additional 16.24 ha of land clearing is proposed at Amungee NW, which will involve expansion of the well pad (6.44 ha) and camp pad (0.3 ha), construction of a helipad and laydown yard (1 ha each), 4 ha for the construction of a new fence line and firebreak, and 3.5 ha for a new gravel pit. The total footprint of the regulated activity is 21.8 ha.
    - ii. The estimated groundwater usage is 110 ML for both the Amungee NW and Velkerri 76 sites, for a total of 220 ML.
    - iii. Peak traffic movements for the regulated activity is 44 (across both sites); truck load-out for wastewater transport is 20 movements at Amungee NW and 40 movements for Velkerri 76.

- iv. Peak workforce will be 70 during drilling and HF activities, 2-4 during well testing.
  - v. Generation of approximately 273,030 tonnes of carbon dioxide equivalent (tCO<sub>2</sub>-e) over a 3-year period (2022, 2023 and 2024). Diesel combustion will contribute: 1280 tCO<sub>2</sub>-e from transport, 8376 tCO<sub>2</sub>-e from horizontal drilling, 732 tCO<sub>2</sub>-e from the drilling and stimulation camps, 770 tCO<sub>2</sub>-e from land clearing (Amungee NW only), 1464 tCO<sub>2</sub>-e from well testing and 2832 tCO<sub>2</sub>-e from well stimulation. Fugitive emissions from drill cuttings, completion and wastewater storage will produce 6015 tCO<sub>2</sub>-e. Flaring emissions have been provided for two scenarios: 90 days (125,781 tCO<sub>2</sub>-e) and 180 days (251,561 tCO<sub>2</sub>-e).
  - vi. Rehabilitation will be completed within 12 months of completion of petroleum activities.
3. The approval criteria in reg 9(1)(c) requires that I be satisfied that the activity will be carried out in a manner by which the environmental impacts and environmental risks of the activity will be reduced to a level that is both: (i) as low as reasonably practicable; and (ii) acceptable. In assessing whether the EMP meets the approval criteria, I note that my decision is a prescribed decision (under reg 5A) for s 6A of the Act, and as such requires me to consider and apply the principles of ecologically sustainable development. In accordance with reg 12(3), I provide the following information about how the EMP meets the approval criteria, and the manner in which I have taken into account the principles of ecologically sustainable development when considering whether or not the plan meets the approval criteria. reg 9(1)(c)
4. The principles of ecologically sustainable development are defined at sections 18-24 of the *Environment Protection Act 2019*, and I address each in turn:
- i. The decision-making principle (s 18 *Environment Protection Act 2019*) requires effective integration of long-term and short-term environmental and equitable considerations, and for processes to provide for community involvement in relation to decisions and actions that affect the community. Related to this, I note the following:
    - i. The regulated activity is low impact and of short duration and forms one component of a broader onshore petroleum exploration program in the region. The regulated activity will inform decision-making about longer-term petroleum activities.
    - ii. Public consultation on the EMP was required under the Petroleum (Environment) Regulations 2016, as the EMP proposes drilling and hydraulic fracturing activities. The EMP was made available for public comment for 28 days from 13 January 2022 to 10 February 2022.
    - iii. The Department received 376 public submissions on the EMP, consisting of 363 form letters via internet campaigns. There were 13 unique submissions, including three in support of the EMP and one submission received via the advertised Departmental public engagement modes. NT submissions represent approximately 15% of the total number of submissions received and interstate submissions represent approximately 28%. Overseas submissions comprised 56% of the total received. The balance of the submissions (1%) were from undisclosed geographical regions. The submissions received did not identify new issues that have not already been addressed in this or previously approved EMPs, or the Scientific Inquiry into Hydraulic Fracturing in the NT (HFI). The NTG agencies and NT EPA

Onshore Gas Committee comments were addressed by the interest holder via an updated EMP.

- iv. I note the issues raised in public submissions across the following broad environmental themes:

Theme	Overview of issue raised
Chemicals	<ul style="list-style-type: none"> <li>• Adequacy of Chemical Risk Assessment and description of chemicals</li> <li>• Toxicity of HF fluids</li> <li>• Lack of clarity on the treatment path and environmental impacts for drilling waste</li> <li>• Chemical spills</li> </ul>
Climate change	<ul style="list-style-type: none"> <li>• Greenhouse gas emissions (project specific and cumulative)</li> <li>• Compatibility of emissions with NT government net zero 2050 targets</li> <li>• Carbon offsets</li> </ul>
Flora and fauna (environment)	<ul style="list-style-type: none"> <li>• Open tanks risk for birds (e.g. Gouldian finch)</li> <li>• Absence of adequate baseline assessment for flora and fauna or sufficient follow-up surveys</li> <li>• Proximity of activities to wetland habitat of bird species, incl. migratory birds</li> <li>• Impacts to fauna from human activity, noise, light and traffic</li> <li>• Contamination of aquifers impacting stygofauna</li> <li>• Potential Impacts of fragmentation on vegetation communities</li> <li>• Potential impacts to threatened species not fully understood</li> </ul>
Regulation and compliance	<ul style="list-style-type: none"> <li>• SREBA incomplete</li> <li>• Referral under the EP Act and the EPBC Act</li> <li>• Regulatory separation (transparency of the Well Operations Management Plan (WOMP))</li> <li>• Cumulative impacts not considered from other exploration activities in the region ('exploration creep')</li> </ul>
Social and cultural	<ul style="list-style-type: none"> <li>• Free prior and informed consent from Traditional Owners not received</li> <li>• Benefits to affected communities versus environmental costs</li> <li>• Limited direct consultation with Traditional Owners</li> <li>• Lack of 'social licence' to operate</li> </ul>
Waste	<ul style="list-style-type: none"> <li>• Overtopping of storage tanks/ponds/sumps during the wet season</li> </ul>
Water	<ul style="list-style-type: none"> <li>• Well casing corrosion</li> <li>• Contamination of aquifers and connected surface water (e.g. Lake Woods)</li> </ul>

- v. The specific issues of concern raised in public submissions have been addressed in the NT EPA Advice which I have considered. I recognise the importance the community places overall, on assessment of cumulative impacts, environmental protection and ensuring decisions are based on the principles of ecologically sustainable development. I have taken into account any public submissions in making my decision. The EMP appropriately identifies the risk and potential impacts from the regulated activity and commits to mitigation, management and monitoring measures to address these risks and potential impacts.

- vi. I am satisfied that the community has had a reasonable opportunity to be involved in processes in relation to this decision.
  - vii. Next, I have considered short-term and long-term environmental impacts of carrying out the regulated activity. Environmental impacts include direct and indirect effects on the physical, biological, economic, cultural and social aspects of the environment, and may include cumulative impacts or occur over time.
  - viii. The information before me suggests short-term environmental impacts are manageable with the proposed mitigations in place.
  - ix. The information before me suggests long-term environmental impacts are negligible.
  - x. There is no particular contest between economic, social and environmental considerations that requires further mention.
  - xi. Taking an integrated view of long-term and short-term environmental and equitable considerations, I am satisfied that the considerations on balance and taken together support approval of the EMP.
- ii. The precautionary principle (s 19 *Environment Protection Act 2019*) applies when there are threats of serious or irreversible environmental damage, and requires that lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation. I am satisfied that the regulated activity does not pose a threat of serious or irreversible environmental damage. While conduct of the regulated activity will likely result in minor and short-term impacts, I am satisfied the measures identified by the interest holder are effective to prevent a threat of serious or irreversible environmental damage.
- i. I have carefully evaluated the proposed precautionary measures against the risk-weighted consequences of impacts given the options available, and with a view to avoiding serious or irreversible damage to the environment wherever practicable. The EMP combined with the conditions I have imposed mitigates risks of serious or irreversible damage due to lack of full scientific certainty to a level that is both as low as reasonably practicable and acceptable.
- iii. The principle of evidence-based decision-making (s 20 *Environment Protection Act 2019*) requires decisions to be made on the best available evidence in the circumstances that is relevant and reliable. I am of the view that the evidence before me satisfies this requirement for the following reasons: I am satisfied that the best available evidence has been obtained because:
- i. The EMP was developed by an ecologist, archaeologist and environmental consultants, with experience in the Beetaloo Sub-basin.
  - ii. The interest holder employed a comprehensive process to obtain relevant information including baseline assessments, archaeological assessments, stakeholder engagement and consultation with relevant NT government agencies.
  - iii. The EMP was made available for public comment to identify any deficiencies or additional evidence required from 13 January to 10 February 2022.
  - iv. The EMP has undergone review and assessment by a multi-disciplinary team in DEPWS and NT government agencies, with experience in

environmental science, engineering, and risk management options for the regulated activity which has informed my decision on the EMP.

- v. The interest holder has amended the EMP to address areas of uncertainty or requiring clarification.
- vi. Public submissions raised a range of concerns regarding the proposed regulated activity which I must consider under the principle of evidence-based decision-making. I now turn to consideration of these concerns:
  - (1) Some of the submissions raised concern about the toxicity of hydraulic fracturing chemicals and the adequacy of the chemical risk assessment and description of chemicals. The chemical risk assessment was undertaken in accordance with the Environment Management Plan Content Guideline and included in the EMP.
  - (2) Concern was raised about the lack of clarity on the treatment path and environmental impacts for drilling waste. As outlined in the EMP, the solid material resulting from drilling operations will be tested and a suitably qualified third party will determine whether the material is suitable to be disposed of on the lease pad using a 'mix-bury-cover' approach as per the Code, the *Waste Management and Pollution Control Act 1998* (NT) (WMPC Act) and the National Environmental Protection Site Contamination Assessment) measures. Drilling material will be contained in a bunded lined sump that is capped with topsoil to mitigate infiltration. If on-site disposal is not feasible, all solid material waste from the four proposed wells will be transported off-site to an alternative suitable exploration location (such as Kyalla 117 N2) or a licenced facility. Off-site disposal will be undertaken in accordance with the WMPC Act. All fluids collected in the sumps will either be evaporated in the sump or transferred to wastewater tanks for storage and evaporation. The residual concentrated liquid waste stream will be disposed of off-site at a licenced facility in accordance with the WMPC Act.
  - (3) Concern was raised about the potential environmental impacts from chemical spills. The EMP contains a Wastewater Management Plan (WWMP) and Spill Management Plan (SMP) that include secondary containment barriers where hazardous chemicals and fuel are stored. The interest holder will conduct monitoring and management to meet environmental performance standards for spills or unauthorised releases of potential contaminants at the Amungee NW and Velkerri 76 sites, with the interest holder required to report to the Department if an environmental performance standard in the EMP is not met. All wastes from the regulated activity will be transported in accordance with the WMPC Act.
  - (4) Some submissions raised concern about a lack of carbon offsets. The interest holder has committed in the EMP to include annual offset targets for residual emissions. These annual targets demonstrate a clear linear trajectory towards net zero by 2050 and extend beyond the three year life of the EMP and would achieve net zero by 2047. The proposed offsets are consistent with the NT Greenhouse Gas Emissions Management for New and Expanding Large Emitters Policy.
  - (5) Concern was raised about greenhouse gas emissions, both project specific and cumulative. Each EMP is assessed on its merits and compliance with the Code in accordance with the Regulations.

Greenhouse gas emissions have been considered in the assessment of the EMP. The cumulative impact assessment of greenhouse gas emissions considered the current existing wells and those approved and proposed by the interest holder. I note also the interest holder's emissions offset commitment.

- (6) Concern was raised about the risk of open tanks on birds (e.g. Gouldian finch). Experience from similar operations conducted in the Northern Territory and other jurisdictions shows impacts to birdlife from open cuttings pits are considered low due to the saline nature of the water not being attractive or injurious to bird species. Based on industry experience in management of hydraulic fracturing flowback using separators and flaring prior to discharge into open tank systems in the Beetaloo, Cooper Basin in South Australia, Western Queensland and the Kimberley as well as internationally, the risk to birdlife from open tank storage of hydraulic fracturing flowback water is considered low.
- (7) Some submissions raised concern about contamination of aquifers impacting stygofauna. Hydraulic fracturing does not interact with groundwater and unlikely to have an impact on stygofauna. Interest holders are required to use only drilling fluids that are non-toxic while drilling through aquifers, in order to avoid impacts to groundwater. The potential impact on groundwater dependent ecosystems in general is negligible, given the depth to groundwater in the location of the regulated activity is greater than 20 m (~ 89 m at Velkerri 76 S2 and 106 m at Amungee NW), the typical depth at which terrestrial groundwater dependent ecosystems are found.
- (8) Some concern was raised about the absence of adequate baseline assessment for flora and fauna or sufficient follow-up surveys. A detailed baseline assessment of flora and fauna in the proposed areas and potential impacts from clearing were considered in the EMP. The EMP refers to flora and fauna baseline surveys conducted at Velkerri 76 and Amungee NW. Vegetation surveys have been conducted at these two sites from 2004 to 2018. These surveys involved detailed habitat assessments which included identification of vegetation community, dominant flora species at each strata, habitat condition, disturbance factors, and fauna attributes. A recent follow-up vegetation survey was conducted at the site in August/September 2021, which included the proposed disturbance areas. The interest holder used data from the NT Fauna database, data from fauna surveys undertaken elsewhere within the region and incidental fauna surveys at Amungee NW in 2021.
- (9) Concern was raised about the proximity of activities to wetland habitat of bird species, including migratory birds. The nearest wetland to the proposed activity is Lake Woods (listed in the National directory of important Wetlands), located 161 km from Amungee NW and 125 km to Valkerri 76. The closest creek to any site is Newcastle Creek, located 13 km from the Velkerri 76 S2 site. Ephemeral streams (Stream Order 1 and 2) are located over 20km from Amungee NW and along the existing Velkerri access tracks. The streams are overland flow paths that only flow for a short period during the wet season, with waterholes forming at the beginning of the dry season. Due to the separation distance from the sites to the closest watercourse, these features are unlikely to be directly impacted by the activities proposed in the EMP.

- (10) Concern was raised about the potential Impacts of fragmentation on vegetation communities. The Amungee NW and Velkerri 76 sites are 30-40 km away from the Bullwaddy Conservation Reserve and are unlikely to have a significant environmental impact. The likelihood of impact on vegetation communities from the proposed 16.24 ha of land clearing at Amungee NW resulting in fragmentation is low. Land clearing will be conducted in accordance with NT Land Clearing Guidelines. No land clearing will occur at the existing Velkerri 76 site. The vegetation communities in and around the sites are regionally extensive and not subjected to extensive clearing.
- (11) The potential impacts to fauna from human activity was raised as an issue. It is highly unlikely that offsite impacts to wildlife will be created as a result of noise, light and traffic. The duration of drilling and HF activities is short and lighting levels will be minimised to the level required to complete work safely. Traffic volumes are expected to be small, with impact levels consistent with standard road traffic levels.
- (12) Concern was raised that the potential impacts to threatened species are not fully understood. The Department's Flora and Fauna Division considered that the proposed activities in the EMP do not pose a significant risk to threatened species. This assessment was based on a search of DEPWS flora and fauna databases (using a 50km buffer), environmental descriptions in the EMP and expert knowledge of species' habitat requirements.
- (13) Various public submissions requested the NT EPA 'call-in' the EMP under the EP Act and requested the NT government refer the EMP to the Commonwealth for assessment under the and EPBC Act. The EMP was considered by the NT EPA, as is reflected by this Advice, and was subject to review by a full range of NT government agencies, including by specialists in environmental impact assessment, fauna and flora, water quality and quantity, land management, bushfire, weeds, traffic, public health and social impacts. As recommended by NT EPA referral guidance, the interest holder also undertook a self-assessment against both the EP Act and the EPBC Act, and concluded a referral is not required.
- (14) Concern was raised about regulatory separation, with regards to the transparency of the WOMP. The interest holder must have a WOMP accepted by the Minister for Industry, Tourism and Trade prior to commencement of the regulated activity that will be implemented for the drilling program design, to ensure isolation of the Gum Ridge Formation and overall petroleum well integrity is achieved, verified and monitored. I have received advice that the WOMP meets the requirements of the Code and therefore manages risks from well integrity failure to as low as reasonably practicable and acceptable levels.
- (15) Concern was raised about cumulative impacts not being considered from other exploration activities in the region ('exploration creep'). The Petroleum (Environment) Regulations do not preclude an interest holder submitting separate EMP for each activity. Each EMP is assessed on its merits and compliance with the Code in accordance with the Regulations. Cumulative impacts from greenhouse gas emissions and water use have been included in the EMP.

- (16) Concern was raised that free prior and informed consent was not received from Traditional Owners, in addition to limited direct consultation. The interest holder conducted stakeholder engagement with Traditional Owners through the Northern Land Council (NLC) and undertaken in accordance with:
- section 41(6) of the *Aboriginal Land Rights (Northern Territory) Act 1976*, when supplying information to Native Title holders for the purposes of negotiating an onshore gas exploration agreement
  - regulation 7 of the *Petroleum (Environment) Regulations 2016*, during the preparation of an EMP, which outlines the minimum requirements that an interest holder must meet when undertaking stakeholder engagement
  - regulation 9 of the *Petroleum (Environment) Regulations 2016* during the preparation of an EMP, which requires the proponent to include an Authority Certificate in accordance with section 3 of the *Northern Territory Aboriginal Sacred Sites Act 1989*.
- The interest holder has engaged with the Traditional Owners, NLC, and the Aboriginal Areas Protection Authority (AAPA) as part of their stakeholder engagement. They also hold an AAPA Authority Certificate that covers the proposed works areas. The EMP includes a stakeholder engagement report, which makes clear that there are processes to ensure there is no risk or impact to sacred sites and cultural heritage as a result of the proposed work.
- (17) A concern was raised about the benefits to affected communities versus environmental costs. The *Petroleum (Environment) Regulations* define 'environmental impact' as an adverse change, or potential adverse change. Beneficial effects are therefore outside of this definition.
- (18) A number of submissions commented on the lack of a 'social licence' to operate. The NT Government has worked with a range of stakeholders, including industry, to develop a transparent and codified framework for decision making and compliance reporting of the industry. Examples of some of the initiatives being delivered through the NT Government's hydraulic fracturing Implementation Plan includes:
- increased transparency of gas companies' activities and impacts on our community or environment, through development of a new online portal as the central point for data on industry activity and environmental, social, health and cultural baselines and impacts
  - publication of drilling and hydraulic fracturing EMPs for public comment, the rationale for government decisions, and environmental monitoring and compliance reporting data.
- (19) Concern was raised about overtopping of storage tanks/ponds/sumps during the wet season. The outcome intended by HFI recommendation (7.12) was that the use of enclosed tanks was to prevent the risk of open wastewater ponds overflowing during significant rainfall events. This outcome has been maintained in the Code. The NT Government sought advice from CSIRO and its scientific peers on best practice for wastewater storage. Water will be allowed into evaporation ponds to reduce the amount of water stored in tanks and the impacts of transporting large volumes offsite for subsequent

treatment and disposal. This is necessary during the early stages of exploration when on-site treatment and recycling is not feasible. All storage tanks will be designed and engineered to meet Australian Standards and the Code. Tanks are a fully engineered storage solution, including meeting secondary containment being double-lined or double-walled. Storage tanks and pits are designed and operated to prevent overtopping due to rainfall and drill cutting sumps include sufficient freeboard to accommodate in excess of the anticipated rainfall based on a 1:1000-year Average Recurrence Interval (ARI) for the duration of the regulated activity. In conclusion, the risk of overtopping is considered unlikely.

- (20) Concern was raised about well casing corrosion. In accordance with clause B.4 of the Code, all onshore shale gas wells (including exploration wells constructed for the purposes of production testing) have mandatory requirements for well construction, with cementing extending up to at least the shallowest problematic hydrocarbon bearing, organic carbon rich or saline aquifer zone.
- (21) Concern was also raised about contamination of aquifers and connected surface water (e.g. Lake Woods). In accordance with the Code clause B.4, all onshore shale gas wells (including exploration wells constructed for the purposes of production testing) are to be constructed to international standards, with cementing extending up to at least the shallowest problematic hydrocarbon-bearing, organic carbon rich or saline aquifer zone. The EMP outlines the controls identified in the Well Operations Management Plan (WOMP) that will be implemented for the drilling program design to ensure isolation of the Gum Ridge Formation, aquifer protection and overall petroleum well integrity is achieved. These include:
- development of critical controls and hold points throughout the well construction process that will need verification by a competent person prior to proceeding to the next operation
  - barrier verifications and monitoring throughout well construction, maintaining primary and secondary well control measures
  - a cemented production casing string that will provide an additional barrier between producing hydrocarbon bearing zones and shallow aquifers, with pressure testing once the cement is set to ensure overall integrity of the production casing
  - multiple strings of steel casing with each casing string cement grouted to the surface and multiple engineered and system mitigations to adequately detect water quality threats to the Gum Ridge Formation and Anthony Lagoon aquifers
  - well barrier integrity validation testing for each well with a report demonstrating compliance with the Code to be provided to the regulator (DITT) for approval

Development of the Amungee NW-1H and Velkerri 76 wells has verified the distances between aquifers and hydraulic fracturing will be greater than 1 km, minimising groundwater pathways/contamination. The well design and construction method described in the EMP surpasses the requirements of the Code for protection of aquifers. The interest holder will install control and impact groundwater monitoring bores in the vicinity of the exploration wells, with monitoring results made public. A Well Integrity Management Plan and a Well Operations

Management Plan (WOMP) is provided separately to this EMP and sent to DITT for review and acceptance prior to works commencing.

These plans will only be accepted if they comply with the requirements detailed in the Code. As per the Code, the interest holder must demonstrate that they have a system or process for managing well integrity throughout the whole well life cycle that complies with ISO 165301:2017 Well integrity - Part 1: Life cycle governance.

- vii. I believe the information regarding the proposed regulated activity adequately provides the best available evidence in the circumstances that is relevant and reliable to the evidence-based decision-making process.
- iv. The principle of intergenerational and intra-generational equity (s 21 *Environment Protection Act 2019*) requires that the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of present and future generations. I have given consideration to the impact on present and future generations as follows:
  - i. This criterion requires me to turn my mind to whether the benefits of the proposal disproportionately burden present or future generations, or particular groups or communities of present or future generations.
  - ii. I have considered the use of groundwater and am satisfied that the proposed use will not result in either short-term or long-term impacts to other groundwater users.
  - iii. I have considered the protection of cultural heritage and am satisfied that conduct of the regulated activity will not impact on preservation of cultural heritage for the benefit of future generations.
  - iv. I have considered the potential benefit for future generations from increased economic activity in the region and am satisfied that exploration is a necessary precursor for future economic gains that may be achieved through a viable onshore petroleum industry.
  - v. I have considered whether the health, diversity and productivity of the environment is maintained or enhanced for the benefit of each of these relevant groups and conclude that on balance, the health, diversity, and productivity of the environment is not reduced by the regulated activity for each identified group or community.
  - vi. The environmental burdens of the regulated activity will not disproportionately affect particular stakeholders.
  - vii. I have considered the effect of greenhouse gas emissions and note that the contribution from this activity is negligible in a NT context. I consider that cumulative emissions are not significant when considered in context of 2019 NT and Australian emissions, which were approximately 20 million tonnes and 519 million tonnes respectively. Origin's total cumulative GHG emissions (across 11 EMPs) over the 2022-2024 period are estimated to be approximately 283,527 tCO<sub>2</sub>-e (between 45,297 and 177,780 tCO<sub>2</sub>-e per annum). The potential emissions of all of Origin's activities in the NT represent between 0.23% and 0.89% of the total NT GHG emissions for 2019 or 0.009% to 0.034% of Australia's total emissions.
  - viii. I also note the interest holder commitment for greenhouse gas emissions offsets in section 3.18.2 of the EMP are consistent with the principles endorsed by the NT EPA:

- (1) offsetting should apply to the whole of a project
  - (2) offsetting should apply to exploration phase activities as well as production activities
  - (3) offsetting should adopt a pro-rata approach that links the level of residual emissions to be offset to the net zero by 2050 target
  - (4) offsets should apply for Scope 1 and Scope 2 emissions; and
  - (5) offsets should relate to actual emissions, not forecast emissions in an EMP.
- ix. Cultural values relating to sacred sites will be protected through the application of Authority Certificates issued to the interest holder under the *Northern Territory Aboriginal Sacred Sites Act 1989* and measures for reporting on discovery of archaeological sites during civil maintenance activities.
- x. Accordingly I do not believe that the carrying out of the regulated activity in accordance with the EMP would have an effect contrary to the principle of inter or intra-generational equity.
- v. The principle of sustainable use (s 22 *Environment Protection Act 2019*) requires that natural resources should be used in a manner that is sustainable, prudent, rational, wise and appropriate. In applying this principle, I have considered the following:
- i. I note the findings of the HFI that states: “... in the short to medium term, the Australian National Energy Market is likely to require higher levels of flexible, gas-fired generation, which can provide a reliable, low emissions substitute for ageing coal-fired generation, and essential security services to complement variable renewable electricity generation.”<sup>4</sup>
  - ii. I note the NT Government's commitment to implementing all the recommendations of the HFI, including working with the Australian government to seek to ensure that there is no net increase in lifecycle greenhouse gas emitted in Australia from any onshore petroleum produced in the NT.
  - iii. I note the EMP has addressed the cumulative impact associated with current and future groundwater takes – addressed in the Water Extraction Licence (WEL) GRF 10285 Statement of Decision, which was assessed to be well within the sustainable yield of the Gum Ridge Formation (1,412,800 to 2,825,600 GL).
  - iv. Accordingly, I am satisfied that the concept of sustainable use of natural resources has been taken into account.
- vi. The principle of biological diversity and ecological integrity (s 23 *Environment Protection Act 2019*) requires that biological diversity and ecological integrity should be conserved and maintained. I have applied this principle as follows:
- i. I believe the information I have regarding the existing biodiversity and ecosystems that are to be affected by the regulated activity; the effects that are likely; and the mitigation measures reasonably available, is sufficient.
  - ii. The EMP identifies 20 fauna species listed as threatened under the EPBC Act and/or the *Territory Parks and Wildlife Conservation Act 1976*

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<sup>4</sup> Refer section 9.7.4 of the *Scientific Inquiry into Hydraulic Fracturing in the Northern Territory*; p 233. Available at: <https://frackinginquiry.nt.gov.au/inquiry-reports?a=494286>

(TPWC Act). No core habitat for these species was identified at the Amungee NW or Velkerri 76 sites (lease pad, camp pad and access tracks). An assessment of the likelihood of occurrence indicates two listed threatened species that may possibly occur in the wider landscape based on habitat suitability and previous records. These include the Gouldian Finch *Erythrura gouldiae* (Endangered EPBC Act, Vulnerable TPWC Act) and Crested Shrike-tit (northern) *Falcunculus frontatus whitei* (Vulnerable EPBC Act, Near Threatened TPWC Act).

- iii. The Department's Flora and Fauna Division is satisfied that the regulated activity does not pose a significant risk to threatened species, important habitats or significant vegetation types. Further, the mitigation controls identified in the EMP are adequate to reduce risks associated with potential impacts on biodiversity, such as noise, vehicle strike, dust, erosion and spills to be as low as reasonably practicable.
- iv. The EMP outlines measures to minimise impacts on affected environmental values, including the management of threatening processes such as weeds and fire. Where relevant, management measures for the threatening process are consistent with the requirements of the Code, NT Land Clearing Guidelines and Weed Management Planning Guideline: Onshore Petroleum Projects. Specific examples of mitigation controls including constructing and maintaining firebreaks around the Amungee NW and Velkerri 76 lease and camp pads; six-monthly monitoring around infrastructure to detect the introduction/spread of weed species; and ensuring that all vehicles and equipment are cleaned and have valid weed hygiene declarations prior to accessing the site. The conservation of biological diversity and ecological integrity is vital to the achievement of ecologically sustainable development. Given the fundamental nature of this consideration, I have given central importance to the conservation of biodiversity and ecological integrity in weighing whether I am satisfied the approval criterion in reg 9(1)(c) has been met.
- v. It is often the case that the conservation of biological diversity and ecological integrity is vital to the achievement of ecologically sustainable development. By their nature, ecosystems are complex and interdependent; this needs to be considered in relation to what preserves their integrity. Biological diversity also represents a wealth of potential natural resources that may provide options for present and future generations. I have born this in mind when considering the weight to be given to the evidence before me regarding the potential impacts of the regulated activity on biodiversity and ecological integrity.
- vi. The measures to conserve and maintain biological diversity and ecological integrity in the EMP are appropriate, given the nature and scale of the regulated activity.
- vii. If carried out in accordance with the EMP, the risks of the regulated activity to the conservation of biological diversity and ecological integrity are considered to be mitigated to an acceptable level.
- vii. The principle of improved valuation, pricing and incentive mechanisms (s 24 *Environment Protection Act 2019*) requires that environmental factors should be included in the valuation of assets and services, through application of the 'polluter pays' principles, consideration of full life cycle costs of providing goods and services, and pursuing environmental goals in the most cost-effective way. I have applied the principle as follows:

- i. The pollution and waste that will be generated by the regulated activity in the general course of its operation includes domestic waste, drilling waste, and waste from hydraulic fracturing and emissions.
  - ii. I am satisfied that both hazardous and non-hazardous waste will be disposed of in accordance with the requirements of the WMPC Act and the *Radiation Protection Act 2004* by the interest holder at its own cost, as outlined in the Wastewater Management Plan (Appendix G).
  - iii. In relation to the risks of a pollution event that may occur unintentionally during the operations of the regulated activity, I consider that the following measures are in place to ensure the interest holder bears the costs of containment, avoidance, and abatement. This includes:
    - (1) impacts and risks associated with contamination of soil, surface water and groundwater, which are managed through meeting mandated requirements for well integrity and clean-up of spills and leaks and remediation of impacted soil
    - (2) impacts and risks associated with loss of containment of wastewater, which are managed through containment measures.
  - iv. In relation to full life cycle costs, it is expected that the regulated activity will have a life cycle of five years, and at the end of this cycle the interest holder will take action to remove any residual pollution and waste as detailed by the EMP.
  - v. In addition, the interest holder is required to provide an environmental security sufficient to allow third party intervention for rehabilitation and remediation should it be required, ensuring the interest holder bears the costs of pollution.
  - vi. The Spill Management Plan (Appendix F) includes commitments to immediately remediate spills and leaks, so as to reduce the risk of long-term contamination of the environment and avoid environmental impact legacies.
  - vii. With these measures are in place, I am satisfied that the EMP ensures that environmental costs are not left as externalities to be paid for by Territory taxpayers or the local community. They will be fairly paid for by those who stand to benefit from the regulated activity, such as the interest holder, and consumers who choose to purchase the interest holder's products. To the extent there are some costs to the Territory, I am satisfied that this is appropriate given the broader economic benefits.
  - viii. In relation to options to pursue environmental goals in relation to the regulated activity, I have taken into account that these goals should be pursued in the most cost-effective way.
  - ix. I believe approval of the EMP with the conditions I have imposed is consistent with the principle of improved valuation, pricing and incentive mechanisms.
- viii. The NT EPA did not require the EMP to be referred under the EP Act, as the regulated activity does not have the potential to cause a significant impact on the environment. reg 9(3)
- i. The NT EPA reviewed the EMP for the regulated activity against the approval criteria in regulations 9(3)(a) and 9(3)(c) of the Regulations and other matters the NT EPA considered relevant, and has provided advice about the EMP.

- ix. The NT EPA has provided the following in relation to the regulated activity and the EMP:
- i. In accordance with my request under s 29B of the NT EPA Act, the NT EPA reviewed the EMP against the approval criteria in regulation 9(1) of the Regulations and other matters the NT EPA considered relevant, and has provided advice about the EMP. Relevantly:
    - (1) The NT EPA recommended that should the EMP be approved, it be subject to 7 conditions. The NT EPA's recommendations have informed the conditions of this approval. All conditions are outlined in section 1 (2) of this Approval Notice.
    - (2) The NT EPA concluded that the EMP for the regulated activity, subject to the recommended approval conditions, is appropriate for the nature and scale of the regulated activity and demonstrates that the regulated activity can be carried out in a manner that environmental impacts and environmental risks of the activity will be reduced to a level that is as low as reasonably practical and acceptable.
  - ii. I have considered the NT EPA's advice and recommendations and these have been incorporated where relevant into this statement of reasons and the conditions in the Approval Notice.
- x. The existing environment along with its particular values and sensitivities is appropriately identified in section 4 of the EMP, and to the extent I do not agree or there is some uncertainty, I have imposed conditions to address the relevant risk or risks. reg 9(1)(c)
- xi. I agree with the risk assessment set out in section 6 and Appendix M of the EMP, and to the extent I do not agree I have imposed a condition or conditions to address the relevant risk or risks.
- xii. The interest holder's risk assessment is applicable to activities in all seasons and the outcomes are reflected in the EMP that includes, for example; a bushfire management plan (Appendix A); weed management plan (Appendix C); chemical risk assessment (Appendix E); spill management plan (Appendix F); wastewater management plan (Appendix G); erosion and sediment control plan (Appendix H); methane emission plan (Appendix I); rehabilitation management plan (Appendix O); stakeholder engagement management log (Appendix N); and emergency response plan (Appendix Q). The EMP also includes the required elements for the ongoing management of erosion and sediments. This is consistent with the requirements of the Code that allows for the regulated activity to occur in the wet season months when contingency planning is provided and minimum freeboard in wastewater infrastructure is maintained.
- xiii. The anticipated environmental impacts are appropriately identified in section 4 and Appendix M of the EMP. The regulated activities are a continuation of current activities and cumulative effects have been identified and assessed. In EMPs for subsequent stages (if they proceed) the interest holder will need to continue to address cumulative effects.
- xiv. The EMP demonstrates how the interest holder will comply with relevant requirements of the Code in undertaking these regulated activities. This includes reference to applicable Australian and international standards that have been adopted for regulated activity, as applicable. The EMP cross references relevant sections of the Code that apply to the mitigation and management measures to enable the reviewer to identify and confirm that the proposed activities comply with the Code, as applicable. The EMP provides

water management commitments and management plans that meet the requirements of the Code.

- xv. I am satisfied that the interest holder has conducted ongoing stakeholder engagement in accordance with the Regulations. The EMP provides details of stakeholder engagement that meets Regulation 7 and Schedule 1, Clause 9 of the Regulations (Section 5 and Appendix N). Stakeholder engagement records (Appendix N) demonstrate that stakeholders did not raise objections about environmental impacts of the proposed activity that required specific changes from the interest holder. The EMP provides details of written feedback and input from stakeholders as part of the stakeholder engagement records. The risk assessment in the EMP details the potential environmental impacts of the activity and proposed environmental outcomes to manage impacts on social and cultural surroundings.
- xvi. I recognise the importance the community places on the protection of water, human health management of chemicals and waste, stakeholder engagement, social impacts and regulation and compliance. The EMP appropriately identifies the risks and potential impacts from the regulated activity and commits to mitigation and management measures to address these risks and potential impacts.
- xvii. There are no environmental impacts or environmental risks relating to the proposed regulated activity that I consider to be unacceptable.
- xviii. Overall, having regard to the above, I am satisfied that the EMP is appropriate for the nature and scale of the activity, and demonstrates that the regulated activity is to be carried out in manner by which the environmental impacts and environmental risks are reduced to a level that is:
  - i. as low as reasonably practicable; and
  - ii. acceptable.