Approval notice and statement of reason

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

Interest holder	Santos QNT Pty Ltd – STO3-8 ACN 083 077 196
Petroleum interest(s)	Exploration Permit 161 (EP161)
Environment management plan (EMP) title	McArthur Basin Hydraulic Fracturing Program NT Exploration Permit (EP) 161
EMP document reference	STO3-8
Regulated Activity	Hydraulic fracturing, flowback and appraisal testing of Tanumbirini-1, 2H and 3H, and Inacumba 1/1H and 2H.
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 revision of a current plan submitted in accordance with regulations 15 and 17.
Was the regulated activity referred[1] for consideration whether environmental impact assessment was required?	No
Was environmental impact assessment[2] required?	N/A
Has an environmental approval[3] been issued for the regulated activity?	N/A
Has an Authority Certificate under the Northern Territory *Aboriginal Sacred Sites Act 1989* been issued for the regulated activity?	Yes Authority Certificate C2019/043
Date an EMP compliant with reg 8 was first submitted under reg 6	8 June 2021
Date within which the EMP was published for comment under reg 8A, if applicable	9 June 2021 – 7 July 2021
Date further information was required and submitted under reg 10, if applicable	13 July 2021 required 30 July 2021 submitted 19 August 2021 required 20 August 2021 submitted
Date of resubmission notice under reg 11(2)(b), if applicable	N/A
Date EMP was resubmitted under reg 11(3), if applicable	N/A
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	2 September 2021 30 September 2021
Proposed timetable given in notice under reg 11(2A), or reg 11(3)(c), if applicable	30 September 2021 7 October 2021
Where provided under s29B of the *Northern Territory Environment Protection Authority Act 2012* (NT) (NT EPA Act), 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: 27 September 2021 (NTEPA2021/0097-006~0001)

[1] 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).
[2] This means a requirement for an environmental impact assessment to be conducted under the EP Act and/or the EPBC Act.
[3] This means an approval granted under the EP Act and/or the EPBC Act.

Date of decision	6/10 / 2021
Decision maker	Eva Lawler Signature Hon Eva Dina Lawler MLA, Minister for Environment

1 Approval notice

1. I approve the revised McArthur Basin Hydraulic Fracturing Program NT Exploration Permit (EP) 161 (the **EMP**) that relates to the Regulated Activity under reg 11(2)(a)(i), noting this approval excludes the part of the EMP that relates to hydraulic fracturing at the Inacumba location.
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. 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.
ii. notification of the commencement of hydraulic fracturing activities prior to commencement including notification of the installed enclosed wastewater tank volumes at Tanumbirini and Inacumba well sites.
iii. during hydraulic fracturing, flowback and if wastewater is present in tanks, 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 and reported daily
    - the outcome of general site inspections relevant to hydraulic fracturing and waste, and corrective actions taken.
    - any halt to the regulated activity due to wet season conditions
    - any fires potentially threatening the activity from external or internal sources.

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):

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. the annual environment performance 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 reported under the Commonwealth *National Greenhouse and Energy Reporting Act 2007* versus predicted emissions in the EMP.[4] The emissions report should include:

i. a summary of regulated activities conducted which have contributed to greenhouse gas emissions
ii. explanation of differences between actual and predicted emissions with reference to all parts of the regulated activity with potential to create greenhouse gas emissions.

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 recorded in a spill register as soon as practicable. The spill register and geospatial files specifying the location of the spill must be submitted to DEPWS via Onshoregas.DEPWS@nt.gov.au with the Annual Environment Performance Report each year while the EMP is in force. The register must include:

i. the location source and volume of the spill
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
iv. GPS coordinates 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

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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 bore 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*.

Condition 8: The interest holder must provide fortnightly, via Onshoregas.DEPWS@nt.gov.au, forecast weather and forecast bushfire danger for the duration of the regulated activity.

Condition 9: In addition to the methane leak detection requirements of Section D.5.2 and Table 10 of the Code, the Interest Holder must also undertake leak detection and reporting (LDAR) within seven days of commissioning the well.

[4] 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_2-e for scope 1 and scope 2 emissions reporting.

2 Material considered

1. The following material has been taken into account in making this decision:
   a. Revised McArthur Basin Hydraulic Fracturing Program NT Exploration Permit (EP) 161 Environment Management Plan, dated 1 September 2021.
   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)**
   a. The nature of the regulated activity is as follows:
      i. hydraulic fracturing of 3 wells at the Tanumbirini multi-well pad and for 2 wells at Inacumba multi-well pad.
      ii. microseismic monitoring (to model the fractures).
      iii. production testing of each well over a period of 90-300 days.
      iv. flowback water storage (enclosed tanks) and treatment (open tanks).
      v. long term build up test of 2 years for each well.
   b. The scale of the regulated activity is as follows:
      i. hydraulic fracturing of Tanumbirini-2H (10 stages), Tanumbirini-3H (16 stages) and two Inacumba wells (up to 25 stages each), located on two multi-well pads, approximately 350 km southeast of Katherine, NT, in the McArthur Basin.
      ii. estimated water use of 175.5 ML, which is less than the maximum water entitlement under existing groundwater extraction licences GRF10280 (193.5 ML/year) and U10335 (195 ML/year).
      iii. wastewater storage and treatment of maximum 21 ML at Tanumbirini, and 40 ML at Inacumba.
      iv. estimated maximum greenhouse gas emissions of 55,537 to 89,216 tonnes carbon dioxide equivalent (tCO_2-e) per financial year, based on flaring of 90-300 days.
      v. well surveillance for all five wells over a period of two years
      vi. A peak work-force of 35-65 people and a traffic flow increase of 40-60 trucks per well

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 (ALARP); 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 *Petroleum Act 1984*, 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 section 18-24 of the *Environment Protection Act 2019*, and I address each in turn:

    a. 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 with activities staged over five years 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 hydraulic fracturing activities. The EMP was made available for public comment for 28 days from 9 June 2021 to 7 July 2021. Additionally, ongoing stakeholder engagement is conducted by the interest holder. Stakeholder feedback has informed the EMP development and public comment has been considered when making the approval decision.

        iii. The Department received 12 public submissions on the EMP. 10 of the 12 submissions originate from the NT. 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 Northern Territory (HFI). The NTG agencies and NT EPA Onshore Gas Committee comments were addressed by the interest holder via an updated EMP.

        iv. 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.

        v. I am satisfied that the community has had a reasonable opportunity to be involved in processes in relation to this decision.

        vi. 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.

vii. The information before me suggests short-term environmental impacts are manageable with the proposed mitigations in place.

viii. The information before me suggests long-term environmental impacts are unlikely with the requirements under the wastewater and spill management plans.

ix. There is no particular contest between economic, social and environmental considerations that requires further mention.

x. 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.

b. 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. The risk assessment clearly demonstrates consideration of risk events in the context of the environment in which the regulated activity is conducted and its particular values and sensitivities, and the spatial extent and duration of the potential impact. The interest holder has appropriate controls in place to mitigate potential impacts, for example as specified in a wastewater and spill management plan. I am satisfied that 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. I am satisfied 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 ALARP and acceptable.

c. 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 satisfied that the best available evidence has been obtained because:

i. The revised EMP was developed by an ecologist, archaeologist and environmental consultants, with experience in the Beetaloo Sub-basin and McArthur Basin.

ii. The interest holder employed a comprehensive process to obtain relevant information including baseline assessments, archaeological assessment, chemical risk assessments, stakeholder engagement and consultation with relevant NT government agencies.

iii. The EMP was provided for public comment to identify any deficiencies or additional evidence required from 9 June 2021 to 7 July 2021.

iv. The EMP has undergone review and assessment by a multi-disciplinary team in DEPWS with expertise in environmental science, engineering, and risk management options for the regulated activity and they have provided advice to me on the strengths and limitations of the EMP.

v. The interest holder provided further information to address these concerns. Specifically, the interest holder elaborated on cumulative impacts near the

activity area, reduced the extended production testing period, and provided greenhouse gas emission estimates per financial year. Furthermore, a water-balance was provided to clarify the wastewater volumes expected to be on-site over time, and to demonstrate the proposed wastewater storage capacity is sufficient.

vi. Some concerns have been raised in the public submissions which I must consider under the principle of evidence-based decision-making. I now turn to consideration of these concerns:

(1) Concern was raised about the adequacy of the chemical risk assessment. Public submissions stated that some chemicals should be thoroughly analysed as they are a major risk. It was also stated that the impact of hydraulic fracturing fluids on birds required assessment, specifically migratory birds. The interest holder has completed a Chemical Risk Assessment (Appendix A) in accordance with the Environment Management Plan Content Guideline. This two-tiered assessment concluded the majority of the chemicals used in hydraulic fracture operations are of low health concern and no unacceptable risks to birds are associated with these chemicals. In addition, I have included a condition requiring a risk assessment on the flowback fluid wastewater to reassess risks based on actual wastewater data.

(2) The greenhouse gas emissions (GHG) emitted by this project was a concern in public submissions. The interest holder has reduced the extended production period in a revision of the EMP, which has lowered the GHG emissions by the project, resulting in a maximum conservative estimate of 89,216 tCO_2-e emitted in one financial year. Cumulative emissions in the Beetaloo Sub-basin (~0.48 $MtCO_2$-e over 5 years) contribute to approximately 0.47% of the yearly NT emissions and to 0.02% of Australia's emissions.[5] It is also noted that emissions in an exploration phase are generally higher than, and not reflective of, emissions in a production phase.

(3) Public submissions raised concerns about the lack of an NT emissions policy. On 1 September the NT Government released the Greenhouse Gas Emissions Management for New and Expanding Large Emitters policy (Large Emitters Policy). This policy identifies the government's minimum requirements for how greenhouse gas emissions are to be managed from new, or expanding industrial and land use development projects. This is part of the government's work towards responding to the impacts of climate change and form part of a suite of initiatives that are being implemented to achieve a net zero emissions by 2050 target. Government is also developing a draft greenhouse gas emissions offset policy and has committed to working with the Australian Government to implement recommendation 9.8 of the HFI, which relates to the offsetting of GHG from the onshore petroleum industry in the NT.

(4) Concern was raised about underestimation of fugitive emissions from flowback fluids as a result of underperformance of the separator. Estimated emissions during well completions are provided in the EMP, which reflect the fugitive emissions. The estimates are consistent with the Emissions Factors from the National Greenhouse and Energy Reporting (Measurement) Determination 2008 and the Australian National

[5] DISER 2021. State and territory greenhouse gas inventories: annual emissions. https://www.industry.gov.au/data-and-publications/national-greenhouse-accounts-2019/state-and-territory-greenhouse-gas-inventories-annual-emissions

Greenhouse Accounts National Inventory Report 2011 Volume 1. Furthermore, all emissions from exploration, well construction (including during flowback) and workovers will be measured using methods consistent with the National Greenhouse and Energy Reporting (Measurement) Determination 2008, and reports will be submitted to DEPWS.

(5) Public submissions raised concerns about the absence of an adequate baseline assessment for the region, stating that the findings of the Strategic Regional Environmental and Baseline Assessment (SREBA) would not be applicable to the interest holder's EP161, as it lies outside of the Beetaloo Sub-basin. The SREBA covers the Beetaloo Region[6], inclusive of the location of the regulated activity.

(6) Concerns were raised about the impacts of noise, and how this would potentially drive species away from habitats. The interest holder has noise mitigation measures in place. Recent modelling has shown that a sound power level of 121 dBA (estimated maximum level of activities is 120 dBA) is reduced to 25 dBA at a distance of 4,131 m from the source. This demonstrates there is a low level of noise disturbance by the activity.

(7) The public submissions noted inconsistencies in the groundwater dependent ecosystems (GDEs) in the EMP, and the absence of stygofauna in the EMP. The EMP was revised to include information about stygofauna and to clearly identify GDEs in the project area. The GDEs are Beauty Creek Springs, riparian vegetation communities present along the watercourses and stygofauna. Impacts on any of these ecosystems are considered unlikely.

(8) Concern was raised about the impact from invasive species on biodiversity in the region, specifically from cane toads accessing and breeding in water storage pits. All flowback fluid wastewater from the activities will be stored in above-ground tanks, not pits. The vertical sides of these tanks will prevent access of cane toads, and therefore there is unlikely to be any impact on biodiversity in the region.

(9) Public submissions raised concerns about impact on human health and safety, specifically about silica inhalation, exposure to radioactive materials and the impact of venting or flaring. All interest holders must comply with NT occupational health and safety legal requirements, under legislation and regulations administered by NT WorkSafe. Flares and flare stacks are designed, prepared and operated in accordance with the relevant industry standards and must be positioned as per hazardous area classification with an appropriate buffer and proper barriers.

(10) Public submissions raised the need for the EMP to be referred under the *Environment Protection Act 2019* (NT) (EP Act) and the Australian Government *Environment Protection Biodiversity Conservation Act 1999* (EPBC Act). The interest holder has undertaken an analysis of the potential for the regulated activity to have a significant impact on matters of national environmental significance (MNES) defined under the EPBC Act, and the environmental values defined under the EP Act (NT). It was determined there is no potential for a significant impact which would require referral under either statute, with the proposed controls implemented.

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[6] Strategic regional environmental and baseline assessment (SREBA) fact sheet

(11) Concerns were raised about scientific uncertainty, transparency, regulatory separation and transparency of the Well Operations Management Plan (WOMP). All EMPs that relate to drilling or hydraulic fracturing are subject to 28-day public consultation, and their availability for public review is also advertised. All EMPs are also subject to review by NT government agencies, including by specialists in fauna and flora, water quality and quantity, land, bushfire, weeds, traffic, public health and social impacts. This process allows for transparency and a scientifically sound assessment. The WOMP is assessed by petroleum engineers in the Department of Industry, Tourism and Trade (DITT). These officers have the technical expertise necessary to evaluate well construction and integrity and ensure that the WOMP complies with the relevant sections of the Code. I am satisfied there is an accepted WOMP in place to conduct hydraulic fracturing activities at the Tanumbirini well site.

(12) Concerns were raised about a lack of transparency with regards to flowback fluid reports, water quality results and associated risk assessments. Both flowback fluid reports and results of groundwater monitoring are published online on the DEPWS website. Furthermore, key information and data about onshore petroleum activities can be accessed by the public via the Northern Territory Government's Petroleum Onshore Information, NT (POINT) portal.

(13) Submissions raised that there was an inadequate assessment of cumulative impacts. Groundwater use is subject to the requirements of the *Water Act 1992* (NT) and the interest holder has obtained a water extraction licence, which included a detailed assessment by DEPWS of resource availability. The EMP has been updated to include a section about greenhouse gas emissions in conjunction with other activities near the project area. The assessment showed that the yearly cumulative impact of the activities near EP161 contribute 0.47% to NT's total yearly emissions, which is significantly lower than other industries in the NT such as agriculture and fuel combustion.

(14) Concern was raised about the social and cultural impacts from hydraulic fracturing, and about the adequacy of stakeholder engagement. This includes engagement with the landholder, but also native title parties. Specifically, a local Aboriginal Corporation raised concerns about receiving adequate representation during the stakeholder engagement process, resulting in confusion about the interest holder's proposed activities and thus a lack of informed consent. The EMP includes a stakeholder engagement log, which demonstrates that the interest holders have engaged with a range of stakeholders, including direct engagement with leaseholders, Aboriginal stakeholders and the Northern Land Council (as an agent for Aboriginal stakeholders). As a result of the public submission, the interest holder has reached out to the local Aboriginal Corporation to provide information addressing concerns raised in the public submission. No response has been received at the time of submission of the revised EMP. The stakeholder log demonstrates the interest holder's attempts to consult with the landholder and discuss any feedback.

(15) Concern was raised about the absence of an environmental protection bond for pastoralists, and about the impact from increased traffic in relation to safety of mustering cattle, COVID transmission and biodiversity impacts. The leaseholder has been engaged with regards to

an extended and updated Land Access and Compensation Agreement as a forum to address any concerns from either party.

(16) Public submissions raised concern about the benefit of the interest holder's activity to Territorians. The activities under the EMP require highly specialised personnel who often have to be sourced from interstate. However, the activities also require services from businesses such as machinery hire, infrastructure hire and environmental consultants. These services are generally sourced from local, Northern Territory businesses. The interest holder has updated the EMP to include the estimated local employment for the activities, which ranges from 10-20% for the specialised activities in this EMP, but go up to 100% for activities following the scope of this EMP, such as rehabilitation and monitoring.

(17) Concerns were raised about the impact of drilling fluids or fracking fluids on stygofauna. Hydraulic fracturing does not interact with groundwater and cannot have an impact on stygofauna.

(18) Public submissions raised concerns about the storage of wastewater fluid in open air presenting significant risks to biodiversity in the region, specifically through amphibians being trapped in pits, invasive amphibians breeding in pits and birds drinking the flowback water. The wastewater is stored in above-ground tanks with tall, vertical wells, preventing access to amphibians. Entrapment and breeding of amphibians in wastewater is therefore unlikely. The flowback water is highly saline, which means birds are not likely to ingest significant quantities of flowback water. The chemical risk assessment has demonstrated there are no unacceptable exposures to avian species.

(19) Concerns have been raised about the concentrations of chemicals and the radioactivity in the wastewater, especially after evaporation. The interest holder is required to undertake a risk assessment within 6 weeks after completion of well flowback. The results of this assessment will indicate the potential risks associated with chemical concentration and radioactivity in the wastewater. An evaluation of the hydraulic fracturing chemical additives used in the hydraulic fracture stimulation fluid was done after the hydraulic fracture of Tanumbirini 1 in 2019. The assessment concludes that the data demonstrate that the chemistry of the produced water is consistent with the target formation and the chemicals approved for hydraulic fracturing. No new constituents of potential concern were identified, and all concentrations of constituents detected, including radioactivity of flowback fluid, are within the range anticipated.

(20) Concern was raised about the reliance on US data for estimates of flowback recovery rates. The US data provided in the EMP informs the reader about the range of flowback recovery rates seen across the industry. The EMP is clear on that flowback fluid volumes will mostly depend on the number of fracture stimulation stages, and actual volumes may be significantly lower than the conservative estimates provided in the EMP.

(21) Public submissions raised concern about the capacity of wastewater tanks, with the EMP not clearly demonstrating it would be sufficient for the expected wastewater volumes. The EMP has been updated to include a water balance, which outlines the expected wastewater volumes on site over time, and confirms that the wastewater tanks will have enough capacity to store and treat the wastewater. I have imposed an additional

condition to ensure sufficient wastewater storage capacity prior to commencement of hydraulic fracturing activities.

(22) Concerns were raised about pollution of water caused by the activity. Mitigation measures are in place to minimise any spills or leakages from the activity, and the risk of water pollution has been demonstrated to be ALARP and acceptable.

(23) Corrosion of well casing due to sulphate reducing bacteria was raised as a concern. The Code provides specific detail on mandatory corrosion considerations through the well life cycle including for well design, construction, monitoring and maintenance and well decommissioning. Petroleum wells are designed with multiple barriers, so that a single barrier failure will not lead to a loss of containment. Complete well integrity failure where all well barriers fail is an extremely rare occurrence in contemporary petroleum wells including shale wells.

(24) Public submissions raised concerns about the adequacy of water monitoring and the understanding of aquifers, specifically the Inacumba aquifer. The interest holder has a groundwater monitoring program in place that requires data collection of water quality for the duration of the well site being operational. Both well sites have a control and impact monitoring bore. The potential risk of impact to aquifers, regardless of their depth or hydraulic characteristics, are minimised through implementation of the Code. As the risk of water pollution is demonstrated to be ALARP and acceptable, the current understanding of the Inacumba aquifer is sufficient for the activities proposed in the EMP.

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.

d. 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 long term use of the subject land, and am satisfied that the regulated activity will not materially affect current or future use of the land for these purposes.

v. 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.

vi. 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.

vii. The environmental burdens of the regulated activity will not disproportionately affect particular stakeholders.

viii. I consider that cumulative emissions (258,655 tCO_2-e) are not significant when considered in context of 2019 NT and Australian emissions, which were approximately 20.65 million tonnes and 518.9 million tonnes respectively.

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. No new ground disturbance is planned to occur.

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.

e. 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."*[7]

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 GHG emitted in Australia from any onshore petroleum produced in the NT.

iii. I consider the cumulative extraction of groundwater for conduct of the regulated activity (175.5 ML) is not significant when considered in the context of the annual water extraction availability at the Inacumba Aquifer (2,400 ML/year) and the Gum Ridge Aquifer (14,128,000 ML/year). No additional groundwater extraction licences are currently required for the regulated activity. Any future consideration of groundwater use will include an application for an extraction licence.

iv. Accordingly, I am satisfied that the concept of sustainable use of natural resources has been taken into account.

f. 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.

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[7] 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

ii. The regulated activity is not proposed to be conducted in Petroleum Reserved Blocks.

iii. Site selection for conduct of the regulated activity was informed by a previous detailed ecological assessment. Given the careful site selection and the small area footprint of the regulated activity, there is unlikely to be an impact to groundwater dependent ecosystems, threatened species, significant habitats and vegetation types.

iv. Avoidance and mitigation measures outlined in the EMP are adequate to reduce risks from, for example, vehicle-strike, dust, erosion and/or spills to ALARP, in relation to potential impacts on biodiversity.

v. It is often the case that the conservation of biological diversity and ecological integrity is vital to the achievement of ecologically sustainable development. Ecosystems of their nature involve complex and interdependent systems and relationships and 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.

g. 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, wastewater 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 *Waste Management and Pollution Control Act* 1998 (NT) and the *Radiation Protection Act* 2004 (NT) by the interest holder at its own cost, as outlined in the Wastewater Management Plan (Appendix G). Emissions are minimised to the greatest extent possible for an exploration phase activity, through avoidance of planned venting and a leak detection monitoring program, as outlined in the Methane Emissions Management Plan (Appendix J).

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 adequate 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 loss of containment of wastewater, which are managed through secondary containment measures, maintenance of freeboard on open treatment tanks, installation of leak detection systems, and monitoring for leaks.

(2) 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.

iv. In relation to full life cycle costs, it is expected that the regulated activity will have a life cycle of 5 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 H) 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.

viii. I believe approval of the EMP with the conditions I have imposed is consistent with the principle of improved valuation, pricing and incentive mechanisms.

h. The NT EPA did not require the EMP to be referred under the *Environment Protection Act 2019*, 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.

i. 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 regulations 9(1)(b) and 9(1)(c) of the Regulations and other matters the NT EPA considered relevant, and has provided advice about the EMP. Relevantly:

(1) As per the NT EPA advice I will make my decision in relation to the part of the plan that relates to the scope of works at the Inacumba well pad after the Well Operations Management Plan (WOMP) has been reviewed and confirmed to be compliant with the relevant provisions in the Code by technical experts (petroleum engineers) in DITT.

(2) The NT EPA recommended that should the EMP be approved, it be subject to 9 conditions. The NT EPA's recommendations have informed the conditions of this approval. I have not accepted the condition recommended by the NT EPA for publishing of reports on the interest holder's corporate website as it is an existing regulatory requirement that these reports are published on the Department's website. All conditions relevant to this approval notice are outlined in section 1 (2) of this Approval Notice.

(3) 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.

j. The existing environment along with its particular values and sensitivities is appropriately identified in chapter 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)**

k. I agree with the risk assessment set out in table 6-1 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.

l. 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 Weed Management Plan (Appendix E); Fire Management Plan (refer section 7.2); Wastewater Management Plan (Appendix G); Emergency Response Plan (Appendix K); Stakeholder Engagement Records (Appendix I); Chemical Risk Assessment (Appendix A); and Spill Management Plan (Appendix H). The EMP also includes the required elements for the ongoing management of erosion and sediments in accordance with the previously approved erosion and sediment control plan.[8] 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.

m. The anticipated environmental impacts are appropriately identified in table 6-1 of the EMP. The regulated activity 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.

n. The EMP demonstrates how the interest holder will comply with relevant requirements of the Code in undertaking these regulated activity. 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.

o. 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 (Chapter 9 and Appendix I). Stakeholder engagement records 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

[8] Refer McArthur Basin 2019 Civils and Seismic Program Environment Management Plan, approved 6 June 2019. Available at: https://depws.nt.gov.au/onshore-gas/environment-management-plan/approved-emps.

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.

p. 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.

q. There are no environmental impacts or environmental risks relating to the proposed regulated activity that I consider to be unacceptable.

r. 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.