Appendix A: Modification Notice - Regulation 22

Interest holder	Tamboran B2 Pty Ltd	**EMP Title**	Beetaloo Sub-basin Multi-well Drilling, Stimulation and Well Testing Program Exploration Permit (EP) 98 & 76 Environment Management Plan	**Unique EMP ID**	ORI10-3	**Mod #**	6	**Date**	25 September 2024
Brief Description	The purpose of the regulation 22 is to incorporate all remaining regulated activities associated with the *Beetaloo Basin Drilling, Stimulation and Well Testing Program Velkerri 76 S2 EP76 EMP (ORI5-4)* into the *Beetaloo Sub-basin Multi-well Drilling, Stimulation and Well Testing Program Exploration Permit (EP) 98 & 76 EMP (ORI10-3)*. The regulated activities under the Velkerri 76 S2 DST EMP (ORI5-4.1) to date includes the drilling of the vertical section of Velkerri 76 S2-1, with the 3,000 km horizontal section drilling, HFS and well testing deferred. Tamboran are currently planning to execute the remaining scope at Velkerri 76 S2-1 to 2025/26. To reduce administration burden under multiple EMPs for the same well site, this modification aims to include the horizontal section drilling, stimulation and well testing under ORI10-3, noting well testing of Velkerri 76 S2-1 is already described in ORI10-3.								
Geospatial files included?	Yes								
Does the proposed change result in a new, or increased, or potential or actual environmental impact or risk?	**If an INCREASE in the existing potential or actual environmental risk, is it provided for in the EMP?**	**Does the proposed change require additional mitigation measures to be included?**	**Has additional stakeholder engagement been conducted?**	**Does it require additional environmental performance standards and measurement criteria?**	**Does it affect compliances with Sacred Site Authority Certificates?**	**Does it affect current rehabilitation, weed fire, wastewater, erosion and sediment control, spill or emergency response plans?**	**Will the environmental outcome continue to be achieved, and will the impacts and risks be managed to ALARP and acceptable?**		
No. The Velkerri 76 S2 DST EMP (ORI5-4) covered all impacts and risks associated with the vertical and horizontal drilling, as well as HFS and well testing. These activities were approved by the Minister on 23 December 2019 having determined that the environmental impacts and risks were reduced to a level that is ALARP and acceptable. The Beetaloo Multi-well EMP (ORI10-3) includes provision for drilling, HFS and well testing for Velkerri 76 S2-2H and Velkerri 76 S2-3H and well testing of Velkerri 76 S2-1. The management of risks and impacts are consistent across both EMPs.	Yes. The Beetaloo Multi-well EMP (ORI10-3) currently includes assessment of environmental risk for drilling, HFS and well testing activities. The incorporation of the Velkerri 76 S2-1 regulated activities - horizontal drilling and HFS activities and associated activities that were deferred into ORI10-3 does not change how the activity will be managed. ORI10-3 provides for assessment of the accumulation of all activities on Velkerri 76 S2 well site.	No. Existing mitigation measures are in place for all drilling, HFS and well testing, along with the supporting activities such as water bores, gravel pits and the future rehabilitation. Activities described in the Velkerri 76 S2 DST EMP (ORI5-4) are to be fully subsumed into the Beetaloo Multi-well EMP (ORI10-3).	Not applicable. Stakeholder engagement completed for all activities associated with – Velkerri 76 S2 Water Bore Drilling EMP, Civil EMP and DST EMP. All stakeholders aware that activities on Velkerri 76 S2 are still proposed. Stakeholders will be informed when Tamboran will return to Velkerri 76 S2 well site.	No. The environmental performance standards and measurement criteria are sufficiently captured by the Beetaloo Multi-well EMP (ORI10-3) (i.e. protection of soils, water, rehabilitation, etc.)	No. Amendment to AAPA Certificate C2020/003 and C2022/02 are not required. Note C2020/003 is a variation to the original AAPA Certificate C2019/039 for the Velkerri 76 S2 site. All activities are within the AAPA certificate boundary.	No. Construction, use, management and maintenance of gravel pits and access tracks is already incorporated into the broader regulated activities associated with the planned petroleum wells on Velkerri 76 S2 well site. These activities are captured in existing plans such as rehabilitation, weed, fire, ESCP, that are part of the Beetaloo Multi-well EMP (ORI10-3).	Yes. The environmental outcomes pertaining to the protection of soils, surface water, groundwater, ecology and community are covered by the Beetaloo Multi-well EMP (ORI10-3). The impacts and risks will continue to be managed to ALARP and acceptable.		
Additional contextual information	The purpose of this regulation 22 notification is to clearly identify the regulated activities associated with Velkerri 76 S2-1 horizontal drilling, stimulation and testing, and associated activities are fully subsumed into the *Beetaloo Sub-basin Multi-well Drilling, Stimulation and Well Testing Program Exploration Permit (EP) 98 & 76 EMP (ORI10-3*). No specific update to the environmental risk assessment necessary, as activities already captured and do not materially change the risks or impacts. This regulation 22 notification enables the regulation 14 notice to close out the *Beetaloo Basin Drilling, Stimulation and Well Testing Program Velkerri 76 S2 EP76 EMP (ORI5-4.1)*. This notice will be provided to DEPWS. It is noted that the Beetaloo Multi-well EMP (ORI10-3) has five previous regulation 22 notifications as follows: ORI10-3.1 Water bore location change ORI10-3.2 Change to HF fluids ORI10-3.3 Change to completion fluids ORI10-3.4 Bore infrastructure and EMP edits ORI10-3.5 Velkerri 76 S2 well site civil – gravel pits, access tracks and associated activities. Tamboran B2 Pty Ltd is now the operator. As such any mention of Origin in the Beetaloo Multi-well EMP (ORI10-3) is replaced with Tamboran.								

Interest holder	Tamboran B2 Pty Ltd	EMP Title	Beetaloo Sub-basin Multi-well Drilling, Stimulation and Well Testing Program Exploration Permit (EP) 98 & 76 Environment Management Plan	Unique EMP ID	ORI10-3	Mod #	6	Date	25 September 2024

Current EMP text	Amended EMP text
Executive Summary (ES) Origin Energy B2 Pty Ltd (Origin) is a registered holder and the operator of exploration permits (EP) 98 and EP76, located in the Beetaloo Sub-basin. This Environment Management Plan (EMP) forms the basis of Origin's application to the Northern Territory (NT) Minister for Environment for the drilling, hydraulic fracture stimulation (HFS) and well testing of four additional exploration and appraisal (E&A) wells: two each at the existing Amungee NW and Velkerri 76 S2 sites (Figure 1). This will increase the number of E&A wells at Amungee NW and Velkerri 76 S2 to three each. …… Also located on the Amungee Mungee station but within EP76, Velkerri 76 S2 was constructed under the approved 2019 Beetaloo Basin Velkerri 76 S2 Civil Construction EMP (NT-2050-15-MP-03) and contains the Velkerri 76 S2-1 E&A well which was drilled in 2021 under the approved Beetaloo Basin Drilling, Stimulation and Well Testing Program Velkerri 76 S2 EMP (NT-2050-15-MP-032). The four proposed additional E&A wells covered under this EMP are: • Amungee NW-2H and Amungee NW-3H at the Amungee NW location • Velkerri 76 S2-2H and Velkerri 76 S2-3H at the Velkerri 76 S2 location All wells target the Velkerri shale resource, though the Amungee NW is dry shale and the Velkerri 76 S2 wells are wet gas. The drilling, stimulation and well testing of the four E&A wells at the existing sites is considered an important step in confirming the technical and commercial feasibility of the Velkerri shale resource. The use of multi-well pads is likely to significantly reduce the environmental footprint of any potential development.	**Executive Summary (ES)** Tamboran B2 Pty Ltd (Tamboran) is a registered holder and the operator of exploration permits (EP) 98 and EP76, located in the Beetaloo Sub-basin. This Environment Management Plan (EMP) forms the basis of Tamboran's application to the Northern Territory (NT) Minister for Environment for the drilling, hydraulic fracture stimulation (HFS) and well testing of five exploration and appraisal (E&A) wells: two at the existing Amungee NW well site and three at the Velkerri 76 S2 well site (Figure 1). This increases the number of E&A wells at Amungee NW and Velkerri 76 S2 to three wells at each well site. ….. Also located on the Amungee Mungee station but within EP76, Velkerri 76 S2 was constructed under the approved 2019 Beetaloo Basin Velkerri 76 S2 Civil Construction EMP (NT-2050-15-MP-03) and contains the Velkerri 76 S2-1 E&A well which was vertically drilled in 2021 under the approved Beetaloo Basin Drilling, Stimulation and Well Testing Program Velkerri 76 S2 EMP (NT-2050-15-MP-032). Following this the Velkerri 76 S2-1 well deferred the horizontal drilling section, hydraulic fracturing and well testing until 2025/2026. The four proposed additional E&A wells and the deferred E&A well covered under this EMP are: • Amungee NW-2H and Amungee NW-3H at the Amungee NW location • Velkerri 76 S2-1H, Velkerri 76 S2-2H and Velkerri 76 S2-3H at the Velkerri 76 S2 location. All wells target the Velkerri shale resource, though the Amungee NW is dry shale and the Velkerri 76 S2 wells are wet gas. The drilling, stimulation and well testing of the E&A wells at the existing sites is considered an important step in confirming the technical and commercial feasibility of the Velkerri shale resource. The use of multi-well pads is likely to significantly reduce the environmental footprint of any potential development.
ES, Description of the activity **Table 1: Description of the proposed exploration and appraisal activities for the Amungee NW and Velkerri 76 S2 sites**	**ES, Description of the activity** **Table 1: Description of the proposed exploration and appraisal activities for the Amungee NW and Velkerri 76 S2 sites**

Activity	Description
Amungee NW scope	
No change…..	
Velkerri 76 S2 scope	
Site set-up and mobilisation to support the Velkerri 76 S2-2H and Velkerri 76 S2-3H exploration well	• Use of existing access tracks to and from the Velkerri 76 S2 site and gravel pits from the Stuart Highway (noting 80 km is an existing pastoral track constructed by the pastoralist that Tamboran currently maintain) • Use of the existing Velkerri 76 S2 well pad, camp pad, stockpile storage and helicopter landing pad • Use of existing drilling sump to manage up to 3,000 m^3 • Use of existing sediment basin and site bund for wastewater management and storage • Set-up of two temporary camps – a main camp located on the camp pad (~70-person capacity) and a drilling mini-camp located on the well pad (~8-person capacity) • Set-up of chemical and material storage areas • Set-up of drilling rig, including blow-out preventors, fluid systems and associated equipment such as pipe racks, power generation, offices, ablution blocks and cementing units • Set-up of HFS equipment, completions rig and equipment, well testing equipment, and other associated equipment at Velkerri 76 S2 • Approximately 44 traffic movements per day during site demobilisation
E&A activities at the Velkerri 76 S2 site including drilling, HFS and well testing of Velkerri 76 S2-2H and Velkerri 76 S2- 3H	• Operation of the two temporary camps • Transportation, handling and storage of bulk chemicals, fuels and wastes

Activity	Description
Amungee NW scope	
No change…..	
Velkerri 76 S2 scope	
Site set-up and mobilisation to support Velkerri 76 S2-1H, Velkerri 76 S2-2H and Velkerri 76 S2-3H exploration wells	• Use of existing access tracks to and from the Velkerri 76 S2 site and gravel pits from the Stuart Highway (noting 80 km is an existing pastoral track constructed by the pastoralist that Tamboran currently maintain) • Use of the existing Velkerri 76 S2 well pad, camp pad, stockpile storage and helicopter landing pad • Use of existing drilling sump to manage up to 3,000 m^3 • Use of existing sediment basin and site bund for wastewater management and storage • Set-up of two temporary camps – a main camp located on the camp pad (~70-person capacity) and a drilling mini-camp located on the well pad (~8-person capacity) • Set-up of chemical and material storage areas • Set-up of drilling rig, including blow-out preventors, fluid systems and associated equipment such as pipe racks, power generation, offices, ablution blocks and cementing units • Set-up of HFS equipment, completions rig and equipment, well testing equipment, and other associated equipment at Velkerri 76 S2 • Approximately 44 traffic movements per day during site demobilisation
E&A activities at the Velkerri 76 S2 site including drilling, HFS and well testing of Velkerri 76 S2-1H, Velkerri 76 S2-2H and Velkerri 76 S2- 3H	• Operation of the two temporary camps • Transportation, handling and storage of bulk chemicals, fuels and wastes

Interest holder	Tamboran B2 Pty Ltd	EMP Title	Beetaloo Sub-basin Multi-well Drilling, Stimulation and Well Testing Program Exploration Permit (EP) 98 & 76 Environment Management Plan	Unique EMP ID	ORI10-3	Mod #	6	Date	25 September 2024

Current EMP text	Amended EMP text
• Drilling of the Velkerri 76 S2-2H and Velkerri 76 S2-3H horizontal E&A wells, including the collection of reservoir quality data during drilling • Well design in accordance with the Code of Practice and approved Well Operations Management Plan (WOMP) including isolation of freshwater aquifers • HFS of Velkerri 76 S2-2H and Velkerri 76 S2-3H • Completion and well testing of the Velkerri 76 S2-2H and Velkerri 76 S2-3H E&A wells • Use of existing surface facilities • Well testing of the Velkerri 76 S2-1 vertical well • Storage of condensate • Gas and condensate flaring in accordance with Code of Practice requirements and as per US EPA 40 CFR 63.11, with a flare tip combustion efficiency of 98% • Trucking of condensate (where beneficial usage is authorised) • Beneficial use of appraisal gas and condensate for on-site power generation and use • Maintenance and monitoring works (including well work overs) on Velkerri 76 S2-2H and Velkerri 76 S2-3H wells in accordance with approved WOMP • Build up testing, suspension and decommissioning Velkerri 76 S2-2H and Velkerri 76 S2-3H E&A wells (if required) in accordance with the Code of Practice • Groundwater extraction of approximately 110 ML under existing groundwater extraction licence (WEL GRF 10285) • Monitoring activities (including groundwater, stormwater, soils, leak detection and all other low impact ancillary data collection programs)	• Drilling of the Velkerri 76 S2-1H, Velkerri 76 S2-2H and Velkerri 76 S2-3H horizontal E&A wells, including the collection of reservoir quality data during drilling • Well design in accordance with the Code of Practice and approved Well Operations Management Plan (WOMP) including isolation of freshwater aquifers • HFS of Velkerri 76 S2-1H, Velkerri 76 S2-2H and Velkerri 76 S2-3H • Completion and well testing of Velkerri 76 S2-1H, Velkerri 76 S2-2H and Velkerri 76 S2-3H E&A wells • Use of existing surface facilities • Storage of condensate • Gas and condensate flaring in accordance with Code of Practice requirements and as per US EPA 40 CFR 63.11, with a flare tip combustion efficiency of 98% • Trucking of condensate (where beneficial usage is authorised) • Beneficial use of appraisal gas and condensate for on-site power generation and use • Maintenance and monitoring works (including well work overs) on Velkerri 76 S2-1H, Velkerri 76 S2-2H and Velkerri 76 S2-3H wells in accordance with approved WOMP • Build up testing, suspension and decommissioning Velkerri 76 S2-1H, Velkerri 76 S2-2H and Velkerri 76 S2-3H E&A wells (if required) in accordance with the Code of Practice • Groundwater extraction of approximately 110 ML under existing groundwater extraction licence (WEL GRF 10285) • Monitoring activities (including groundwater, stormwater, soils, leak detection and all other low impact ancillary data collection programs)
1.1 Purpose Origin Energy B2 Pty Ltd (Origin) is a registered holder and the operator of Exploration Permit (EP) 98 and EP76, located in the Beetaloo Sub-basin. This Environment Management Plan (EMP) forms the basis of Origin's application to the Northern Territory (NT) Minister for Environment for the drilling, hydraulic fracture stimulation (HFS) and well testing of four additional E&A wells. These wells are proposed to be drilled on the existing Amungee NW site (two additional wells) and Velkerri 76 S2 site (two additional wells). This will increase the total number of E&A wells on each of the NW and Velkerri 76 S2 sites to three. The proposed additional E&A wells covered under this EMP are: • Amungee NW-2H and Amungee NW-3H at the Amungee NW location • Velkerri 76 S2-2H and Velkerri 76 S2-3H at the Velkerri 76 S2 location The drilling, stimulation and well testing of the additional E&A wells on each of the exploration sites is considered an important step in confirming the technical and commercial feasibility of the Velkerri shale. The Amungee NW site is located in the dry gas window, with recent data acquired from the existing Amungee NW-1H E&A well confirming better than originally determined shale gas prospectively. The Velkerri 76 S2 is located in the wet gas window, with indicative results collected during the drilling of Velkerri 76 S2-1 confirming the presence of wet gas. The Velkerri 76 S2-1 well is a vertical well and is anticipated to be hydraulically fracture stimulated in 2022. The success of the vertical stimulation will underpin the decision to drill additional wells on the Velkerri 76 S2 site to further appraisal the Velkerri shale at this location. This EMP covers the regulated activities required to enable Origin to drill, stimulate, test, maintain and decommission the proposed E&A wells anticipated to be drilled on the Amungee NW and Velkerri 76 S2 site within the 2022-2026 period.	**1.1 Purpose** Tamboran B2 Pty Ltd (Tamboran) is a registered holder and the operator of Exploration Permit (EP) 98 and EP76, located in the Beetaloo Sub-basin. This Environment Management Plan (EMP) forms the basis of Tamboran's application to the Northern Territory (NT) Minister for Environment for the drilling, hydraulic fracture stimulation (HFS) and well testing of five E&A wells. These wells are proposed to be drilled on the existing Amungee NW site (two wells) and Velkerri 76 S2 site (three wells). This will increase the total number of E&A wells on eacch well site, Amungee NW and Velkerri 76 S2, to three E&A petroleum wells. The proposed additional E&A wells covered under this EMP are: • Amungee NW-2H and Amungee NW-3H at the Amungee NW location • Velkerri 76 S2-1H, Velkerri 76 S2-2H and Velkerri 76 S2-3H at the Velkerri 76 S2 location. The drilling, stimulation and well testing of the E&A wells on each of the exploration sites is considered an important step in confirming the technical and commercial feasibility of the Velkerri shale. The Amungee NW site is located in the dry gas window, with recent data acquired from the existing Amungee NW-1H E&A well confirming better than originally determined shale gas prospectively. The Velkerri 76 S2 is located in the wet gas window, with indicative results collected during the drilling of Velkerri 76 S2-1 confirming the presence of wet gas. The Velkerri 76 S2-1 well was vertically drilled in 2021 under the approved *Beetaloo Basin Drilling, Stimulation and Well Testing Program Velkerri 76 S2 EMP* (NT-2050-15-MP-03). Following this, Velkerri 76 S2-1 well deferred the horizontal drilling section, hydraulic fracturing and well testing to the 2025/2026 period. This EMP covers the regulated activities required to enable Tamboran to drill, stimulate, test, maintain and decommission the proposed E&A wells anticipated to be drilled on the Amungee NW and Velkerri 76 S2 site within the 2022-2026 period.
1.2 Project Boundary Tamboran proposes to drill, stimulate and test up to two additional petroleum E&A wells on both the Amungee NW and Velkerri 76 S2 sites within EP 98 and EP 76 (total of four new wells). These wells will target the Velkerri shale resource.The boundary of this EMP is defined as the area which may be affected by E&A activities. This includes: • existing access tracks to the Velkerri 76 S2 site and Amungee NW site	**1.2 Project Boundary** Tamboran proposes to drill, stimulate and test up to two addtiional petroleum E&A wells on the Amungee NW well site and Velkerri 76 S2 well sites within EP 98 and EP 76 (total of four new wells and one re-entry well). The three wells on each well site target the Velkerri shale resource. The boundary of this EMP is defined as the area which may be affected by E&A activities, including: • use and maintenance of existing access tracks to the Velkerri 76 S2 well site and Amungee NW well site

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Current EMP text

- proposed access track (1.1 km) to the Amungee NW2 location (1.5 ha)
- existing Amungee NW and Velkerri 76 S2 well pad, camp pad, and associated infrastructure (i.e. gravel pits (VGP1, VGP2 and VGP3), water bores, laydown yard, helipad and stockpile storage areas)
- existing Velkerri 76 S2 chemical storage areas, well pad bund, sediment basin, wastewater tanks and drilling sump
- proposed expansion of the existing Amungee NW lease pad and camp pad, including the installation of a new fence line and fire break
- proposed construction of a helipad and laydown yard at Amungee NW
- proposed installation of groundwater extraction/ monitoring bores, including 2 groundwater monitoring bores at the Amungee NW2 location (2.0 ha)
- proposed drilling, stimulation, well testing and suspension and abandonment of an additional two petroleum E&A wells at each of the Amungee NW and Velkerri 76 S2 sites
- proposed well testing on the existing Amungee NW-1H and Velkerri 76 S2-1 wells.

The proposed locations of the infrastructure and associated regulated activities are provided in Table 6 and Figure 5 to Figure 8.

Table 6: Associated exploration sites and infrastructure covered under this EMP

Exploration Permit	Infrastructure name	Station	Zone*	Approx. Easting	Approx. Northing
Velkerri 76 S2					
EP 76	Existing approved Velkerri 76 S2 well pad	Amungee Mungee	53	435557	8137497
EP76	Existing approved Velkerri 76 S2-1 E&A well	Amungee Mungee	53	435578	8136331
EP 76	Proposed Velkerri 76 S2-2H E&A well	Amungee Mungee	53	435578	8136346
EP 76	Proposed Velkerri 76 S2-3H E&A well	Amungee Mungee	53	435578	8136362
EP 76	Existing Velkerri 76 S2 main camp	Amungee Mungee	53	435632	8136163
EP 76	Gravel Pit - VGP1	Amungee Mungee	53	398121	8136033
EP 76	Gravel Pit – VGP2	Amungee Mungee	53	432833	8135243
EP 76	Gravel Pit – VGP3	Amungee Mungee	53	398121	8136033
EP 76/117	Existing access tracks (tracks to gravel pits, well site and 80 km existing pastoral track – 18.3 ha)	Amungee Mungee	Refer Figure 5 and Figure 8		

*Universal Transverse Mercator (UTM) geographic coordinate system is Geocentric Datum of Australia (GDA) 94

Amended EMP text

- 1.1 km access track to the Amungee NW2 location (1.5 ha)
- existing Amungee NW and Velkerri 76 S2 well pad, camp pad, and associated infrastructure (i.e. gravel pits (VGP1, VGP2 and VGP3), water bores, laydown yard, helipad and stockpile storage areas)
- existing Velkerri 76 S2 chemical storage areas, well pad bund, sediment basin, wastewater tanks and drilling sump
- proposed expansion of the existing Amungee NW well pad and camp pad, including the installation of a new fence line and fire break
- proposed construction and operation of a helipad and laydown yard at Amungee NW and operation at Velkerri 76 S2
- proposed installation of the two impact monitoring bores (IMB) and an additional two groundwater extraction bores for additional water supply/ monitoring on the existing Velkerri 76 S2 well site (up to 6 in total) and 2 groundwater monitoring bores at the Amungee NW2 location (2.0 ha)
- groundwater extraction and compliance under the water extraction licence # GRF 10285
- drilling two additional petroleum E&A wells at Amungee NW well site and two additional and one re-entry petroleum E&A wells at Velkerri 76 S2 well site (three petroleum E&A wells per site)
- proposed drilling, stimulation, well testing and suspension and abandonment of up to three petroleum E&A wells at each of the Amungee NW and Velkerri 76 S2 sites
- asset maintenance and monitoring activities
- site decommissioning and rehabilitation
- all activities ancillary of the above.

The proposed locations of the infrastructure and associated regulated activities are provided in Table 6 and Figure 5 to Figure 8.

Table 6: Associated exploration sites and infrastructure covered under this EMP

Exploration Permit	Infrastructure name	Station	Zone*	Approx. Easting	Approx. Northing
Velkerri 76 S2					
EP 76	Existing approved Velkerri 76 S2 well pad	Amungee Mungee	53	435557	8137497
EP76	Existing approved Velkerri 76 S2-1H E&A well	Amungee Mungee	53	435578	8136331
EP 76	Proposed Velkerri 76 S2-2H E&A well	Amungee Mungee	53	435578	8136346
EP 76	Proposed Velkerri 76 S2-3H E&A well	Amungee Mungee	53	435578	8136362
EP 76	Existing Velkerri 76 S2 main camp	Amungee Mungee	53	435632	8136163
EP 76	Gravel Pit - VGP1	Amungee Mungee	53	398121	8136033
EP 76	Gravel Pit – VGP2	Amungee Mungee	53	432833	8135243
EP 76	Gravel Pit – VGP3	Amungee Mungee	53	398121	8136033
EP 76/117	Existing access tracks (tracks to gravel pits, well site and 80 km existing pastoral track – 18.3 ha)	Amungee Mungee	Refer Figure 5 and Figure 8		

*Universal Transverse Mercator (UTM) geographic coordinate system is Geocentric Datum of Australia (GDA) 94

Interest holder	Tamboran B2 Pty Ltd	EMP Title	Beetaloo Sub-basin Multi-well Drilling, Stimulation and Well Testing Program Exploration Permit (EP) 98 & 76 Environment Management Plan	Unique EMP ID	ORI10-3	Mod #	6	Date	25 September 2024

<table>
<tr><th>Current EMP text</th><th>Amended EMP text</th></tr>
<tr><td>1.3 Project proponent

The proponent for the project is Origin Energy B2 Pty Ltd as the Operator. Origin representatives can be contacted at origin_nt_beetaloo@originenergy.com.au.</td><td>1.3 Project proponent

The proponent for the project is Tamboran B2 Pty Ltd as the Operator. Tambornan representatives can be contacted at tamboran.contact@tamboran.com.</td></tr>
<tr><td>1.4 Multi-well lease pads

The additional two E&A wells proposed at the Amungee NW and Velkerri 76 S2 sites covered under this EMP are a natural evolution in the Beetaloo Sub-basin E&A project to provide a proof-of-concept for a multi-well pad use within the Velkerri shale resource. The installation of the additional wells on the existing lease pad at Velkerri 76 S2 and on the extended lease pad at Amungee NW will obtain critical subsurface and surface information used to understand the potential productivity of the reservoir and minimise the environmental impact of a future development. The use of multi-well pads is likely to significantly reduce the environmental footprint of any potential development and significantly increase the economic viability of the resource.</td><td>1.4 Multi-well pads

The E&A wells proposed at the Amungee NW and Velkerri 76 S2 sites covered under this EMP are a natural evolution in the Beetaloo Sub-basin E&A project to provide a proof-of-concept for a multi-well pad use within the Velkerri shale resource. The installation of the additional wells on the existing well pad at Velkerri 76 S2 and on the extended lease pad at Amungee NW will obtain critical subsurface and surface information used to understand the potential productivity of the reservoir and minimise the environmental impact of a future development. The use of multi-well pads is likely to significantly reduce the environmental footprint of any potential development and significantly increase the economic viability of the resource.</td></tr>
<tr><td>3. Description of regulated activity

This EMP covers the regulated activities required to enable Tamboran to drill, stimulate, test, maintain and decommission the four proposed horizontal E&A wells within the 2022-2026 period. To accommodate this scope, the activities summarised in Table 8 are proposed to be executed under this EMP.

Table 8: Description of the proposed exploration and appraisal activities for the Amungee NW and Velkerri 76 S2 sites
<table>
<tr><th>Activity</th><th>Description</th></tr>
<tr><td colspan="2">Amungee NW scope</td></tr>
<tr><td colspan="2">No change…..</td></tr>
<tr><td colspan="2">Velkerri 76 S2 scope</td></tr>
<tr><td>Site set-up and mobilisation to support the Velkerri 76 S2-2H and Velkerri 76 S2-3H exploration well</td><td>• Use of existing access tracks to and from the Velkerri 76 S2 site and gravel pits from the Stuart Highway (noting 80 km is an existing pastoral track constructed by the pastoralist that Tamboran currently maintain)
• Use of the existing Velkerri 76 S2 well pad, camp pad, stockpile storage and helicopter landing pad
• Use of existing drilling sump to manage up to 3,000 m^3
• Use of existing sediment basin and site bund for wastewater management and storage
• Set-up of two temporary camps – a main camp located on the camp pad (~70-person capacity) and a drilling mini-camp located on the well pad (~8-person capacity)
• Set-up of chemical and material storage areas
• Set-up of drilling rig, including blow-out preventors, fluid systems and associated equipment such as pipe racks, power generation, offices, ablution blocks and cementing units
• Set-up of HFS equipment, completions rig and equipment, well testing equipment, and other associated equipment at Velkerri 76 S2
• Approximately 44 traffic movements per day during site demobilisation</td></tr>
<tr><td>E&A activities at the Velkerri 76 S2 site including drilling, HFS and well testing of Velkerri 76 S2-2H and Velkerri 76 S2- 3H</td><td>• Operation of the two temporary camps
• Transportation, handling and storage of bulk chemicals, fuels and wastes
• Drilling of the Velkerri 76 S2-2H and Velkerri 76 S2-3H horizontal E&A wells, including the collection of reservoir quality data during drilling
• Well design in accordance with the Code of Practice and approved Well Operations Management Plan (WOMP) including isolation of freshwater aquifers
• HFS of Velkerri 76 S2-2H and Velkerri 76 S2-3H</td></tr>
</table></td><td>3. Description of regulated activity

This EMP covers the regulated activities required to enable Tamboran to drill, stimulate, test, maintain and decommission the four proposed horizontal E&A wells within the 2022-2026 period. To accommodate this scope, the activities summarised in Table 8 are proposed to be executed under this EMP.

Table 8: Description of the proposed exploration and appraisal activities for the Amungee NW and Velkerri 76 S2 sites
<table>
<tr><th>Activity</th><th>Description</th></tr>
<tr><td colspan="2">Amungee NW scope</td></tr>
<tr><td colspan="2">No change…..</td></tr>
<tr><td colspan="2">Velkerri 76 S2 scope</td></tr>
<tr><td>Site set-up and mobilisation to support Velkerri 76 S2-1H, Velkerri 76 S2-2H and Velkerri 76 S2-3H exploration wells</td><td>• Use of existing access tracks to and from the Velkerri 76 S2 site and gravel pits from the Stuart Highway (noting 80 km is an existing pastoral track constructed by the pastoralist that Tamboran currently maintain)
• Use of the existing Velkerri 76 S2 well pad, camp pad, stockpile storage and helicopter landing pad
• Use of existing drilling sump to manage up to 3,000 m^3
• Use of existing sediment basin and site bund for wastewater management and storage
• Set-up of two temporary camps – a main camp located on the camp pad (~70-person capacity) and a drilling mini-camp located on the well pad (~8-person capacity)
• Set-up of chemical and material storage areas
• Set-up of drilling rig, including blow-out preventors, fluid systems and associated equipment such as pipe racks, power generation, offices, ablution blocks and cementing units
• Set-up of HFS equipment, completions rig and equipment, well testing equipment, and other associated equipment at Velkerri 76 S2
• Approximately 44 traffic movements per day during site demobilisation</td></tr>
<tr><td>E&A activities at the Velkerri 76 S2 site including drilling, HFS and well testing of Velkerri 76 S2-1H, Velkerri 76 S2-2H and Velkerri 76 S2- 3H</td><td>• Operation of the temporary camps
• Transportation, handling and storage of bulk chemicals, fuels and wastes
• Drilling of the Velkerri 76 S2-1H, Velkerri 76 S2-2H and Velkerri 76 S2-3H horizontal E&A wells, including the collection of reservoir quality data during drilling
• Well design in accordance with the Code of Practice and approved Well Operations Management Plan (WOMP) including isolation of freshwater aquifers
• HFS of Velkerri 76 S2-1H, Velkerri 76 S2-2H and Velkerri 76 S2-3H</td></tr>
</table></td></tr>
</table>

Interest holder	Tamboran B2 Pty Ltd	EMP Title	Beetaloo Sub-basin Multi-well Drilling, Stimulation and Well Testing Program Exploration Permit (EP) 98 & 76 Environment Management Plan	Unique EMP ID	ORI10-3	Mod #	6	Date	25 September 2024

Current EMP text

- Completion and well testing of the Velkerri 76 S2-2H and Velkerri 76 S2-3H E&A wells
- Use of existing surface facilities
- Well testing of the Velkerri 76 S2-1 vertical well
- Storage of condensate
- Gas and condensate flaring in accordance with Code of Practice requirements and as per US EPA 40 CFR 63.11, with a flare tip combustion efficiency of 98%
- Trucking of condensate (where beneficial usage is authorised)
- Beneficial use of appraisal gas and condensate for on-site power generation and use
- Maintenance and monitoring works (including well work overs) on Velkerri 76 S2-2H and Velkerri 76 S2-3H wells in accordance with approved WOMP
- Build up testing, suspension and decommissioning Velkerri 76 S2-2H and Velkerri 76 S2-3H E&A wells (if required) in accordance with the Code of Practice
- Groundwater extraction of approximately 110 ML under existing groundwater extraction licence (WEL GRF 10285)
- Monitoring activities (including groundwater, stormwater, soils, leak detection and all other low impact ancillary data collection programs)

Table 13: Velkerri 76 S2 site activity summary table

Component	Existing Velkerri 76 S2 site	EMP scope	Total site activity summary
General			
Number of E&A wells	One appraisal well: Velkerri 76 S2-1H spudded 12 August 2021	Two additional E&A wells: Velkerri 76 S2-2H, Velkerri 76 S2-3H	3 E&A wells (One vertical and two horizontal wells)
Number of stimulations	Velkerri 76 S2-1 suspended, vertical stimulation delayed	Stimulation of Velkerri 76 S2-2H, Velkerri 76 S2-3H	3 stimulations
Number of water extraction/monitoring bores	Two existing bores: RN041133 (monitoring), RN041134 (production / monitoring) and 2 additional proposed	0	4
Number of gravel pits approved under EMP	3	3	3
Operational workforce	~20 people during operations	70 people during drilling and stimulation activities 2-4 people during well testing	<70 people
Main camp capacity	N/A camp decommissioned	70-person	70-person
Drilling mini-camp	N/A camp decommissioned	8-person	8-person
Stages per well	20	20	N/A
Proppant use	1500t	180t -250t of proppant per stage per well	10,500 to 14,000t
Water use and stormwater management			
Groundwater extraction licence	All take covered under existing WEL GRF 10285		
Estimated groundwater usage	N/A	110 ML	110 ML
Stormwater retention basin	Existing sediment basin	Existing sediment basin	Existing sediment basin
Wastewater management			
Flowback/wastewater volume generated on-site	1.8 ML[2]	24 ML (12 ML/well)	24 ML (12 ML/well)

Amended EMP text

- Completion and well testing of Velkerri 76 S2-1H, Velkerri 76 S2-2H and Velkerri 76 S2-3H E&A wells
- Use of existing surface facilities
- Storage of condensate
- Gas and condensate flaring in accordance with Code of Practice requirements and as per US EPA 40 CFR 63.11, with a flare tip combustion efficiency of 98%
- Trucking of condensate (where beneficial usage is authorised)
- Beneficial use of appraisal gas and condensate for on-site power generation and use
- Maintenance and monitoring works (including well work overs) on Velkerri 76 S2-1H, Velkerri 76 S2-2H and Velkerri 76 S2-3H wells in accordance with approved WOMP
- Build up testing, suspension and decommissioning Velkerri 76 S2-1H, Velkerri 76 S2-2H and Velkerri 76 S2-3H E&A wells (if required) in accordance with the Code of Practice
- Groundwater extraction of approximately 110 ML under existing groundwater extraction licence (WEL GRF 10285)
- Monitoring activities (including groundwater, stormwater, soils, leak detection and all other low impact ancillary data collection programs)

Table 13: Velkerri 76 S2 site activity summary table

Component	Existing Velkerri 76 S2 site	EMP scope	Total site activity summary
General			
Number of E&A wells	One appraisal well: Velkerri 76 S2-1 spudded 12 August 2021	Two additional E&A wells: Velkerri 76 S2-2H, Velkerri 76 S2-3H and horizontal section of Velkerri 76 S2-1H	3 E&A wells
Number of stimulations	Velkerri 76 S2-1 suspended, stimulation delayed until drilling of horizontal section of well and incorporated under ORI10-3 EMP	Stimulation of Velkerri 76 S2-1, Velkerri 76 S2-2H and Velkerri 76 S2-3H	3 stimulations
Number of water extraction/monitoring bores	Two existing bores: RN041133 (monitoring), RN041134 (production / monitoring), 2 additional bores and 2 contingent groundwater extraction and monitoring bores.	0	6
Number of gravel pits approved under EMP	3	3	3
Operational workforce	70 people during drilling and stimulation activities 2-4 people during well testing	70 people during drilling and stimulation activities 2-4 people during well testing	<70 people
Main camp capacity	70-person	70-person	70-person
Drilling mini-camp	8-person	8-person	8-person
Stages per well	20	20	N/A
Proppant use	1,500t	180t -250t of proppant per stage per well	10,500 to 14,000t
Water use and stormwater management			
Groundwater extraction licence	All take covered under existing WEL GRF 10285		

[2] Assumes a vertical 4 stage HFS

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Current EMP text

Enclosed wastewater tank capacity	N/A	Wet season: 26.5 ML (5 x 5.3ML tanks) Dry season: 10.6 ML (2 x 5.3 ML tanks)	Wet season: 26.5 ML Dry season: 10.6 ML
Open treatment tank capacity (including freeboard)	3.2 ML (1 x 3.2 ML tanks)	Wet season: 6.5 ML (5 x 5.3ML tanks) Dry season: 34.4 ML (8 x 5.3ML tanks)	Wet season: 6.5 ML Dry season: 34.4 ML
Bunded tank pad containment capacity	10 ML	10 ML	10 ML
Maximum flowback wastewater on-site	1.8Error! Bookmark not defined.	14.91ML	14.91ML
Flowback/wastewater volume (final predicted for treatment and off-site disposal)	0.2ML	1ML	1ML
Sump capacity	~3,000 m^3	Use existing sump	3,000 m^3
Total volume of drilling mud and cuttings generated	N/A	~1,500m^3	~1,500 m^3
Total volume of waste drilling and completion fluid per well	N/A	2 ML per well	4 ML
Transfer pumps	6 x 6 inch: up to 23 ML/day	6 x 6 inch: up to 23 ML/day	6 x 6 inch: up to 23 ML/day
Greenhouse gases and emissions			
Flares	Vertical and horizontal flare	Horizontal flare	Vertical and horizontal flare
tCO_2-e emissions	N/A	70,229 to 130,852 tCO_2-e (Maximum 180 day well test)	70,229 to 130,852 tCO_2-e (Maximum 180 day well test)

Amended EMP text

Estimated groundwater usage	38 ML	110 ML/well site	220 ML
Stormwater retention basin	Existing sediment basin	Existing sediment basin	Existing sediment basin
Wastewater management			
Flowback/wastewater volume generated on-site	12 ML	24 ML (12 ML/well)	36 ML (12 ML/well)
Enclosed wastewater tank capacity	2 x 3.2 ML:	Wet season: 26.5 ML (5 x 5.3ML tanks) Dry season: 10.6 ML (2 x 5.3 ML tanks)	Wet season: 29.7 ML Dry season: 13.8 ML
Open treatment tank capacity (including freeboard)	2 x 3.2 ML	Wet season: 6.5 ML (5 x 5.3ML tanks) Dry season: 34.4 ML (8 x 5.3ML tanks)	Wet season: 9.7 ML Dry season: 37.6 ML
Bunded tank pad containment capacity	10 ML	10 ML	10 ML
Maximum flowback wastewater on-site	5.12 ML	14.91ML	20.31 ML
Flowback/wastewater volume (final predicted for treatment and off-site disposal)	0.5ML	1ML	1.5ML
Sump capacity	~3,000 m^3	Use existing sump	3,000 m^3
Total volume of drilling mud and cuttings generated	1,500 m^3	~1,500 m^3	~3,000 m^3
Total volume of waste drilling and completion fluid per well	N/A	2 ML per well	4 ML
Transfer pumps	6 x 6 inch: up to 23 ML/day	6 x 6 inch: up to 23 ML/day	6 x 6 inch: up to 23 ML/day
Greenhouse gases and emissions			
Flares	Vertical and horizontal flare	Horizontal flare	Vertical and horizontal flare
tCO_2-e emissions	32,169 to 76,442 tCO_2-e	74,142 to 134,765 tCO_2-e (Maximum 180 day well test)	74,142 to 134,765 tCO_2-e (Maximum 180 day well test)

3.2.3 Existing Velkerri 76 S2-1 exploration well

The existing Velkerri 76 S2-1 E&A well was spudded on the 12 August 2021, with the well completed on 16 October 2021. The Velkerri 76 S2 well was drilled into the Kalala member (below the Velkerri) at a total depth of 2,128 m below ground level (mbgl). The well is currently suspended, with a vertical HFS proposed to be completed in 2022. A copy of the Velkerri 76 S2 well schematic is provided in Figure 12.

3.2.3 Existing Velkerri 76 S2-1 exploration well

The existing Velkerri 76 S2-1 E&A well was spudded on the 12 August 2021, with the well completed on 16 October 2021. The Velkerri 76 S2 well was drilled into the Kalala member (below the Velkerri) at a total depth of 2,128 m below ground level (mbgl). The well is currently suspended, however there is intention to re-enter and complete the vertical and horizontal drilling and HFS in 2025/2026. A copy of the Velkerri 76 S2 well schematic is provided in Figure 12.

The continuation of the drilling of the Velkerri 76 S2-1 exploration well includes:

- Drilling of a horizontal well section up to 3,000 m in length
- Hydraulic fracture stimulation of a horizontal exploration well, with up to 20 stages completed
- Exploration well completion and testing including:
  - Completion of up to 12 months of well testing
  - Storage and treatment of up to 12 ML of flowback onsite.

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Current EMP text	Amended EMP text
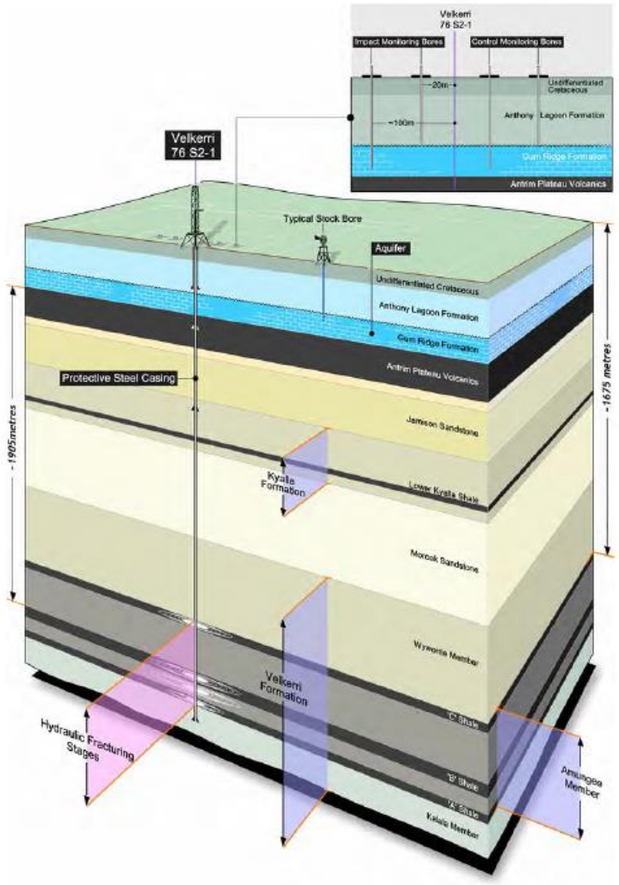	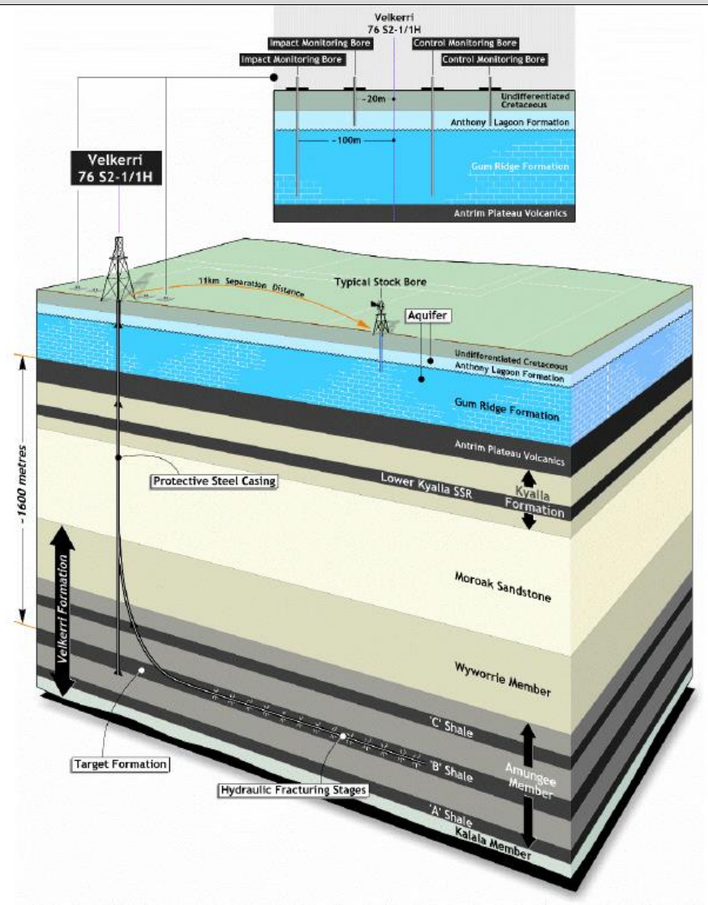
Figure 12: Velkerri 76 S2-1 well schematic	**Figure 12: Velkerri 76 S2-1/1H**
3.3 Groundwater bore installation Groundwater monitoring / extraction bores have been installed at each of the Amungee NW (three existing bores) and Velkerri 76 S2 sites (two existing control bores). Up to 3 additional groundwater monitoring/production bores are to be installed under this EMP at Amungee NW site and 1 new control monitoring bore located at the Amungee NW2 site (refer Table 6). Additional groundwater monitoring bores will be installed on the Velkerri 76 S2 site prior to the stimulation of the vertical well in 2022 under the existing approved Velkerri 76 S2 drilling, stimulation and well testing EMP. The Amungee NW bores will be installed on the proposed activity area (either on the lease pad, camp pad or laydown area). The new Amungee NW2 monitoring bore will be installed in a lightly vegetated area which is the location of a future exploration site. The bores will target the Gum Ridge Formation, as the Anthony Lagoon formation is absent at the Amungee NW site. ……	**3.3 Groundwater bore installation** Groundwater monitoring / extraction bores have been installed at each of the Amungee NW (three existing bores) and Velkerri 76 S2 sites (two existing bores). Up to 3 additional groundwater monitoring/production bores are to be installed under this EMP at Amungee NW site and 1 new control monitoring bore located at the Amungee NW2 site (refer Table 6). The Amungee NW bores will be installed on the proposed activity area (either on the lease pad, camp pad or laydown area). The new Amungee NW2 monitoring bore will be installed in a lightly vegetated area which is the location of a future exploration site. The bores will target the Gum Ridge Formation, as the Anthony Lagoon formation is absent at the Amungee NW site. Up to 4 additional groundwater monitoring/production bores will be installed on the Velkerri 76 S2 well site prior to the stimulation, making a total of 6 monitoring/production bores on site, including one contorl bore and one impact bore installed under the previous EMP (ORI5-4). A further 2 monitoring bores are to be installed on the Velkerri 76 S2 well pad to monitoring impacts from the drilling and stimulation activities. In addition, two contingent groundwater water extraction bore may be drilled on the existing Velkerri 76 S2 well site prior to the commencement of stimulation activities. The extraction bores will only be required where the existing supply points (the impact and control monitoring bores) are unable to supply the full drilling and stimulation campaign due to insufficient yield. These bores will target the Gum Ridge Formation and will be added to Tamboran's water Extraction licence GRF 10285. …….

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Current EMP text	Amended EMP text
3.4 Civil construction activities ……. There is no additional ground disturbance or vegetation clearing proposed at Velkerri 76 S2 under this EMP.	**3.4 Civil construction activities** ……. Ground disturbance or vegetation clearing proposed at Velkerri 76 S2 will not exceed the clearing limits set by the previous EMP (ORI10-3.5) of 27.3 ha based on the following: • Velkerri 76 S2 well site (7.4 ha) • access track construction and maintenance (10.9 ha) • approved gravel pits VGP1, VGP2 and VGP3 (9 ha).
3.8.1 Well design ……. Indicative well sections for the proposed wells at Amungee NW and Velkerri 76 S2 are shown in Figure 15 with a series of well schematics shown in Figure 16 and Figure 17.	**3.8.1 Well design** ……. Indicative well sections for the 2 additional wells at Amungee NW and the 2 additional wells and 1 re-entry well at Velkerri 76 S2 are shown in Figure 15 with a series of well schematics shown in Figure 16 and Figure 17.
3.12 Water supply and use The extraction of water for all activities associated with stimulation is approved under the Water Extraction Licence (WEL) number GRF10285. This approval allows for an extraction of up to 175ML/year from the Gum Ridge Formation to cover all its proposed exploration until December 2024. Water sourced for the EMP activities will be extracted from the existing Gum Ridge Formation bores at the sites, or from the proposed groundwater bores to be installed at Amungee NW. Any new bores constructed to support exploration activities will be registered and added to the WEL. It is estimated that 110ML of water per site (220Ml total) will be extracted from the Gum Ridge Formation at the Amungee NW and Velkerri 76 S2 sites to support the proposed E&A activities over two years. A water balance for the activity is provided in Table 19, noting that all estimates are estimates and subject to operational changes. The anticipated breakdown of groundwater take for the proposed exploration activities consists of the following breakdown per activity: • 5ML per E&A well for drilling (total 20ML) • 40ML per well for stimulation (total 160 ML) • 5ML for camp activities per site (total 10ML) • 15ML civil construction, groundwater bore drilling, dust suppression, water curtain and general activities per site (total 30ML) ……..	**3.12 Water supply and use** The extraction of water for all activities associated with stimulation is approved under the Water Extraction Licence (WEL) number GRF10285. This approval allows for an extraction of up to 450 ML/year from the Gum Ridge Formation to cover all its proposed petroleum activities for the next 10 years (expires 31 July 2034). It is estimated that 110ML of water per site (220ML total) will be extracted from the Gum Ridge Formation at Amungee NW and Velkerri 76 S2 well sites to support the proposed E&A activities over two years. A water balance for the activity is provided in Table 19, noting that all estimates are estimates and subject to operational changes. The anticipated breakdown of groundwater take for the proposed exploration activities consists of the following breakdown per activity: • 5ML per E&A well for drilling (total 20ML) • 40ML per well for stimulation (total 160 ML) • 5ML for camp activities per site (total 10ML) • 15ML civil construction, groundwater bore drilling, dust suppression, water curtain and general activities per site (total 30ML) ……..
3.18 Greenhouse gas emissions …….. **Table 25: Greenhouse gas summary for the proposed activities on Velkerri 76 S2**	**3.18 Greenhouse gas emissions** …….. **Table 25: Greenhouse gas summary for the proposed activities on Velkerri 76 S2**

Activity	Anticipated volume	90-days well test (tCO_2-e)	180-days well test (tCO_2-e)	Estimate methodology and assumptions
Velkerri 76 S2				
Diesel Combustion - transport	118KL of diesel per well	640	640	Diesel estimated using forecasted usage estimates multiplied by NGERS emission factor from NGER Determination: Division 2.4.2 Method 1 emissions of carbon dioxide, methane and nitrous oxide from liquid fuels other than petroleum-based oils or greases, section 2.41 Method 1—emissions of carbon dioxide, methane and nitrous oxide and Part 3—Fuel combustion—liquid fuels and certain petroleum-based products for stationary energy purposes item 40: • Energy Content Factor (GJ/kill) 38.6 • CO2 Factor 69.9 kgCO2-e/ GJ of diesel • CH4 Factor 0.1 kgO2-e/ GJ of diesel • N2O Factor 0.2 kgCO2-e/ GJ of diesel

Activity	Anticipated volume	90-days well test (tCO_2-e)	180-days well test (tCO_2-e)	Estimate methodology and assumptions
Velkerri 76 S2				
Diesel Combustion - transport	118KL of diesel per well	960	960	Diesel estimated using forecasted usage estimates multiplied by NGERS emission factor from NGER Determination: Division 2.4.2 Method 1 emissions of carbon dioxide, methane and nitrous oxide from liquid fuels other than petroleum-based oils or greases, section 2.41 Method 1—emissions of carbon dioxide, methane and nitrous oxide and Part 3—Fuel combustion—liquid fuels and certain petroleum-based products for stationary energy purposes item 40: • Energy Content Factor (GJ/kill) 38.6 • CO2 Factor 69.9 kgCO2-e/ GJ of diesel • CH4 Factor 0.1 kgO2-e/ GJ of diesel • N2O Factor 0.2 kgCO2-e/ GJ of diesel

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Diesel combustion – horizontal drilling	11,200KL of diesel per well per day	4,188	4,188	Diesel estimated using forecasted drilling estimates multiplied by NGERS emission factor from NGER Determination: Division 2.4.2 Method 1 emissions of carbon dioxide, methane and nitrous oxide from liquid fuels other than petroleum-based oils or greases, section 2.41 Method 1—emissions of carbon dioxide, methane and nitrous oxide and Part 3—Fuel combustion—liquid fuels and certain petroleum-based products for stationary energy purposes item 40: • Energy Content Factor (GJ/kill) 38.6 • CO2 Factor 69.9 kgCO2-e/ GJ of diesel • CH4 Factor 0.1 kgO2-e/ GJ of diesel • N2O Factor 0.2 kgCO2-e/ GJ of diesel
Diesel Combustion camps (drilling and stimulation)	0.5 KL per day	366	366	Diesel consumption estimated from historical data, assuming 270 days per CY and multiplied by NGERS emission factor from NGER Determination: Division 2.4.2 Method 1 emissions of carbon dioxide, methane and nitrous oxide from liquid fuels other than petroleum-based oils or greases, section 2.41 Method 1—emissions of carbon dioxide, methane and nitrous oxide and Part 3—Fuel combustion— liquid fuels and certain petroleum-based products for stationary energy purposes item 40: • Energy Content Factor (GJ/kill) 38.6 • CO2 Factor 69.9 kgCO2-e/ GJ of diesel • CH4 Factor 0.1 kgO2-e/ GJ of diesel • N2O Factor 0.2 kgCO2-e/ GJ of diesel
Fugitive methane emissions – drill cuttings	0.906t of methane per well	25	25	Estimate by engineer based on gas saturation and core volume multiplied by NGERS Global Warming Potential (GWP) of 28 tCO2e/tCH4.
Fugitive emissions – completion (venting)	51.8t of methane per completion	2901	2901	2 completion days anticipated per well. Table 5-23 Compendium of Greenhouse Gas Emissions Methodologies for the Oil and Gas Industry; American Petroleum Institute (API), 2009 NGERS completion factor of 25.9 tonnes of methane per day multiple by NGERS Global Warming Potential (GWP) of 25tCO_2e/tCH4
Fugitive Emission wastewater storage	11.25ML of flowback per well	69	69	11.25ML/ well wastewater (assumes 25 stages, 1.5ML per stage and a recovery of 30%). Emissions multiplied by Table 5-10 produced saltwater tank methane flashing emission factors – Compendium of Greenhouse Gas Emissions Methodologies for the Oil and Gas Industry; American Petroleum Institute (API), 2009 emission factor of 0.11tCH4/ML (assuming 2% salinity, 250 psi separator pressure) multiplied by NGERS Global Warming Potential (GWP) of 28tCO2e/tCH4. Assumes 50% of injected flowback is returned to the surface.
Well testing flared natural gas emissions	0.3TJ per day of natural gas per vertical E&A well (5.27t CH4 per day) 5 TJ per day of natural gas per horizontal E&A well (175.57t CH4 per day)	60,258	120,515	Flared estimate using forecasted P50 success case production rates multiplied by NGER Determination: Subdivision 3.3.2.2—Oil or gas exploration and development (emissions that are flared) section 3.44 Method 1—oil or gas exploration and development item 1: • CO2 Factor 2.8 tCO2-e/ t unprocessed gas • CH4 Factor 0.933 tCO2-e/ t unprocessed gas • N2O Factor 0.026 tCO2-e/ t unprocessed gas
Well testing stationary sources	500L per day	366	732	Diesel consumption estimated from historical data, assuming 270 days per CY and multiplied by NGERS emission factor from NGER Determination:

Amended EMP text

Diesel combustion – horizontal drilling	11,200KL of diesel per well per day	6,282	6,282	Diesel estimated using forecasted drilling estimates multiplied by NGERS emission factor from NGER Determination: Division 2.4.2 Method 1 emissions of carbon dioxide, methane and nitrous oxide from liquid fuels other than petroleum-based oils or greases, section 2.41 Method 1—emissions of carbon dioxide, methane and nitrous oxide and Part 3—Fuel combustion—liquid fuels and certain petroleum-based products for stationary energy purposes item 40: • Energy Content Factor (GJ/kill) 38.6 • CO2 Factor 69.9 kgCO2-e/ GJ of diesel • CH4 Factor 0.1 kgO2-e/ GJ of diesel • N2O Factor 0.2 kgCO2-e/ GJ of diesel
Diesel Combustion camps (drilling and stimulation)	0.5 KL per day	366	366	Diesel consumption estimated from historical data, assuming 270 days per CY and multiplied by NGERS emission factor from NGER Determination: Division 2.4.2 Method 1 emissions of carbon dioxide, methane and nitrous oxide from liquid fuels other than petroleum-based oils or greases, section 2.41 Method 1—emissions of carbon dioxide, methane and nitrous oxide and Part 3—Fuel combustion— liquid fuels and certain petroleum-based products for stationary energy purposes item 40: • Energy Content Factor (GJ/kill) 38.6 • CO2 Factor 69.9 kgCO2-e/ GJ of diesel • CH4 Factor 0.1 kgO2-e/ GJ of diesel • N2O Factor 0.2 kgCO2-e/ GJ of diesel
Fugitive methane emissions – drill cuttings	0.906t of methane per well	38	38	Estimate by engineer based on gas saturation and core volume multiplied by NGERS Global Warming Potential (GWP) of 28 tCO2e/tCH4.
Fugitive emissions – completion (venting)	51.8t of methane per completion	4,352	4,352	2 completion days anticipated per well. Table 5-23 Compendium of Greenhouse Gas Emissions Methodologies for the Oil and Gas Industry; American Petroleum Institute (API), 2009 NGERS completion factor of 25.9 tonnes of methane per day multiple by NGERS Global Warming Potential (GWP) of 25tCO_2e/tCH4
Fugitive Emission wastewater storage	11.25ML of flowback per well	104	104	11.25ML/ well wastewater (assumes 25 stages, 1.5ML per stage and a recovery of 30%). Emissions multiplied by Table 5-10 produced saltwater tank methane flashing emission factors – Compendium of Greenhouse Gas Emissions Methodologies for the Oil and Gas Industry; American Petroleum Institute (API), 2009 emission factor of 0.11tCH4/ML (assuming 2% salinity, 250 psi separator pressure) multiplied by NGERS Global Warming Potential (GWP) of 28tCO2e/tCH4. Assumes 50% of injected flowback is returned to the surface.
Well testing flared natural gas emissions	0.3TJ per day of natural gas per vertical E&A well (5.27t CH4 per day) 5 TJ per day of natural gas per horizontal E&A well (175.57t CH4 per day)	60,258	120,515	Flared estimate using forecasted P50 success case production rates multiplied by NGER Determination: Subdivision 3.3.2.2—Oil or gas exploration and development (emissions that are flared) section 3.44 Method 1—oil or gas exploration and development item 1: • CO2 Factor 2.8 tCO2-e/ t unprocessed gas • CH4 Factor 0.933 tCO2-e/ t unprocessed gas • N2O Factor 0.026 tCO2-e/ t unprocessed gas
Well testing stationary sources (diesel combustion)	500L per day	366	732	Diesel consumption estimated from historical data, assuming 270 days per CY and multiplied by NGERS emission factor from NGER Determination: Division 2.4.2 Method 1 emissions of carbon dioxide, methane and nitrous oxide from liquid fuels other than petroleum-based oils or greases, section 2.41 Method 1—emissions of carbon dioxide, methane and nitrous oxide and Part 3—Fuel combustion— liquid fuels and certain petroleum-based products for stationary energy purposes item 40: • Energy Content Factor (GJ/kill) 38.6

Current EMP text

(diesel combustion)				Division 2.4.2 Method 1 emissions of carbon dioxide, methane and nitrous oxide from liquid fuels other than petroleum-based oils or greases, section 2.41 Method 1—emissions of carbon dioxide, methane and nitrous oxide and Part 3—Fuel combustion— liquid fuels and certain petroleum-based products for stationary energy purposes item 40: • Energy Content Factor (GJ/kill) 38.6 • CO2 Factor 69.9 kgCO2-e/ GJ of diesel • CH4 Factor 0.1 kgO2-e/ GJ of diesel • N2O Factor 0.2 kgCO2-e/ GJ of diesel
Well stimulation – stationary sources		1,416	1,416	Diesel consumption estimated from historical data, assuming 270 days per CY and multiplied by NGERS emission factor from NGER Determination: Division 2.4.2 Method 1 emissions of carbon dioxide, methane and nitrous oxide from liquid fuels other than petroleum-based oils or greases, section 2.41 Method 1—emissions of carbon dioxide, methane and nitrous oxide and Part 3—Fuel combustion— liquid fuels and certain petroleum-based products for stationary energy purposes item 40: • Energy Content Factor (GJ/kill) 38.6 • CO2 Factor 69.9 kgCO2-e/ GJ of diesel • CH4 Factor 0.1 kgO2-e/ GJ of diesel • N2O Factor 0.2 kgCO2-e/ GJ of diesel
TOTAL		**70,229**	**130,852**	

Amended EMP text

				• CO2 Factor 69.9 kgCO2-e/ GJ of diesel • CH4 Factor 0.1 kgO2-e/ GJ of diesel • N2O Factor 0.2 kgCO2-e/ GJ of diesel
Well stimulation – stationary sources		1,416	1,416	Diesel consumption estimated from historical data, assuming 270 days per CY and multiplied by NGERS emission factor from NGER Determination: Division 2.4.2 Method 1 emissions of carbon dioxide, methane and nitrous oxide from liquid fuels other than petroleum-based oils or greases, section 2.41 Method 1—emissions of carbon dioxide, methane and nitrous oxide and Part 3—Fuel combustion— liquid fuels and certain petroleum-based products for stationary energy purposes item 40: • Energy Content Factor (GJ/kill) 38.6 • CO2 Factor 69.9 kgCO2-e/ GJ of diesel • CH4 Factor 0.1 kgO2-e/ GJ of diesel • N2O Factor 0.2 kgCO2-e/ GJ of diesel
TOTAL		**74,142**	**134,765**	

7.5 Rehabilitation Plan

Once a determination has been made to decommission an asset, a site-specific rehabilitation strategy will be developed for each disturbed area in consultation with DEPWS. A specific strategy for each area is required to ensure the operational history of the site is considered during rehabilitation planning (such as spills etc.). As per the Code of Practice, rehabilitation will commence within 12 months of determining an asset is no longer required.

Each petroleum well will be plugged and decommissioned in accordance with the Petroleum Codes of Practice. All tanks, surface infrastructure and wastes will be removed from site and disposed of in accordance with the Waste Management and Pollution Control Act 1998.

All remaining assets with a residual beneficial use (such as water bores, laydown yards, gates, fences, fresh water tanks etc.) will be offered for transfer to the pastoralist, subject to DEPWS approval and compliance with the Code of Practice. Prior to considering the transfer of ownership, Origin will:

- undertake an assessment of the current status of the asset and whether it can be beneficially used by the local pastoralist. Where a beneficial use is anticipated, identify works required to be undertaken to ready the asset for transfer (i.e. any repairs, site remediation, equipment removal etc.)
- obtain written agreement from the pastoralist to take ownership of the asset and document any stipulated liabilities.

Where an asset cannot be beneficially utilised, the site will be rehabilitated to the pre-existing condition using assisted natural regeneration. This will include:

- Removal of all surface facilities
- Removal of all weeds and contaminated materials/wastes
- Re-spreading of stockpiled topsoil
- Backfilling of all open sumps
- Reshaping the site to as close to natural form as possible
- Ripping or scarifying any compacted surface
- Spreading of stockpiled vegetation to aid in surface water flow control
- Spreading seed of suitable local native species which has been determined through analogue sites representative surrounding vegetation communities
- Any native seed supply and rehabilitation services will be sourced using Indigenous suppliers (where available).
- Yearly monitoring of the rehabilitation success requirements to assess the rehabilitation status of a site and determine where additional remedial works are required

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Once a determination has been made to decommission an asset, a site-specific rehabilitation strategy will be developed for each disturbed area in consultation with DEPWS. A specific strategy for each area is required to ensure the operational history of the site is considered during rehabilitation planning (such as spills etc.). As per the Code of Practice, rehabilitation will commence within 12 months of determining an asset is no longer required.

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- undertake an assessment of the status of the asset and whether it can be beneficially used by the local pastoralist. Where a beneficial use is anticipated, identify works required to be undertaken to ready the asset for transfer (i.e. any repairs, site remediation, equipment removal etc.)
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Interest holder	Tamboran B2 Pty Ltd	**EMP Title**	Beetaloo Sub-basin Multi-well Drilling, Stimulation and Well Testing Program Exploration Permit (EP) 98 & 76 Environment Management Plan	**Unique EMP ID**	ORI10-3	**Mod #**	6	**Date**	25 September 2024

Current EMP text	**Amended EMP text**
The rehabilitation plan for Amungee is provided in Appendix O. Rehabilitation at Velkerri 76 S2 will be conducted in accordance with this EMP, the Beetaloo Basin Velkerri 76 S2 Drilling, Stimulation and Well Testing Program EMP (NT-2050-15-MP-032) and the Beetaloo Basin Velkerri 76 S2 Civil Construction EMP (NT-2050-15-MP-031).	The rehabilitation plan for Amungee NW and Velkerri 76 S2 is provided in Appendix O.
All other appendices are consistent with the Beetaloo Multi-well EMP (ORI10-3), including the Appendix H ESCP and Appendix O Rehabilitation Plan recently updated as part of ORI10-3.5 regulation 22.	