MEMO

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Date: 12 September 2023

Re: Amungee NW-2H Flowback Wastewater Assessment

Introduction

Tamboran Resources ("Tamboran") is conducting exploration and appraisal program within Exploration Permit (EP) 98, EP76 and EP117 in the Beetaloo Sub-basin of the broader McArthur Basin in the Northern Territory (NT). Tamboran recently acquired EP98, EP117 and EP76 (**Figure 1**) from Origin Energy B2 Pty Ltd ("Origin"). As requested, EHS Support, PTY ("EHS Support") performed a risk assessment on flowback water from the Amungee NW-2H well location.

Prior to transfer of assets to Tamboran, Origin prepared Environment Management Plans (EMP) for EP98, EP117 and EP76 to progress exploration activities across their respective tenements. In 2022, an EMP was developed to cover exploration activities, drilling targeted exploration wells on existing Amungee NW and Velkerri 76 S2 sites and subsequent hydraulic fracturing of these wells (Origin, 2022). Tamboran is also developing an updated EMP for EP98, EP117 and EP76; however, at this time the Origin EMP was used as the basis for this evaluation. For the purposes of this assessment, it is assumed that the environmental controls relevant to flowback water storage, reuse, and disposal under the updated Tamboran EMP will be effectively the same as that within the current EMP.

The primary objective of this assessment was to satisfy the regulatory requirements for the Amungee NW-2H well under Item 2A of Regulation 37A under part 3A (reporting requirements for hydraulic fracturing) of the *Northern Territory Petroleum (Environment) Regulations* (2016) and the *Code of Practice: Onshore Petroleum Activities in the Northern Territory* ("Code of Practice") (NT, 2023). Regulation 37A states: *A report under subregulation (2) must be accompanied by a full human health risk assessment relating to any chemical found in the flowback fluid.* Flowback fluid is defined as: *fluid that is a mixture of hydraulic fracturing fluid and formation fluid that is allowed to flow from the well following hydraulic fracturing*. Additionally, Condition 7 of the NT Government Approval Notice and Statement of Reasons (EMP Reference ORI-10-3) requires a report on a risk assessment at each new exploration well (NT, 2022).

Tamboran plans to undertake a pilot on three wells (the Amungee pilot). To date, two horizonal wells have been drilled on the Amungee NW well site. Amungee NW-1H was stimulated and tested in 2016 and re-tested in 2022. Amungee NW-2H was stimulated and tested in 2023. The Amungee NW-1H and Amungee NW-2H targeted the Velkerri shale; this formation is the target of Tamboran's future activities.

This assessment leverages information in the following documents:

- Environment Management Plan (EMP) – ORI10-3: Beetaloo Sub-basin Multi-well Drilling, Stimulation and Well Testing Program Exploration Permit (EP) 98 & 76 Environment Management Plan (Origin,2019).
- Beetaloo 2019 Campaign – Hydraulic Fracturing Chemical Risk Assessment (Appendix D of the EMP; Origin, 2019).
- Stimulation Chemical Risk Assessment (EHS Support, 2023).

The photograph below shows the Amungee NW well pad and the enclosed and open above ground tanks that will be used to manage flowback water.

Conceptual Exposure Model

In development of the EMP, potential exposures to humans and the environment to flowback water were evaluated (Origin, 2022). Multiple mitigation measures and control measures were specified within the EMP and associated Spill Management Plan (Appendix F of EMP) and Wastewater Management Plan (Appendix G of the EMP) to reduce residual risks from exposure to flowback water to As Low As Reasonably Practical (ALARP).

Flowback water is managed in a series of open top tanks throughout the year. Flowback water from the Amungee NW-2H well is conveyed along the flowlines to tanks located on the well lease and managed and comingled in up to five tanks in the wet season and eight tanks in the dry season (Origin, 2022). The lease area is surrounded by a bund to provide secondary containment for water storages. Should a catastrophic tank failure occur, the bund area is of sufficient capacity to retain 11 ML of water.

Mechanical evaporation to enhance evaporation and reduce volume of the flowback water from hydraulic stimulation activities was evaluated in the EMP (Origin, 2022). According to the EMP, evaporator units will be equipped with automated wind speed and direction cut-off mechanisms to stop operations during periods of moderate (i.e., 11 – 16 knots) to minimise potential drift of wastewater outside of the storage tanks during mechanical evaporation. At this time, Tamboran is not planning on conducting mechanical evaporation.

Human receptors identified in the EMP with potential exposure to flowback water stored in tanks or during re-use activities included oil and gas workers (Origin, 2022). Potentially complete exposure pathways include incidental ingestion and dermal contact with flowback during re-use activities. As stated previously, Tamboran is not planning on conducting mechanical evaporation; however, inhalation of mist during mechanical evaporation was conservatively retained as a potential potentially complete exposure scenario.

Significant interactions by fauna with wastewater storages were not observed in previous operations at the Amungee NW site or other sites within the relevant EPs (Origin, 2022). Flowback water is typically hypersaline, which is a deterrent for avian receptors and other fauna from consuming and interacting with wastewater. Based on previous lack of observations of avian receptors contacting flowback water in open top tanks and hypersaline nature of flowback water, potential exposure to avian receptors is considered low. However, as a conservative measure, potential exposure to avian receptors via incidental ingestion was evaluated in this risk assessment.

Management controls and mitigation measures outlined in the EMP are utilized to minimse potential for releases, including catastrophic failure, from storage tanks. However, as a conservative measure, evaluation of potential release of liquids to soils within the containment area was performed for the Amungee NW-2H and exposure to terrestrial receptors was included in this flowback risk assessment.

Data Used in the Risk Assessment

Fourteen samples and one duplicate from Amungee NW-2H flowback water were collected from 27 March 2023 to 15 July 2023. **Attachment A, Table A-1** presents the analytical data from the weekly sampling of the storage tanks. Data collected from Amungee NW-1H[1] was utilised as a reference point for flowback water for wells targeting the Velkerri shales and is also included in **Attachment A, Table A-2**.

Based on the CEM, the point of exposure for human receptors is flowback water used as make up water for hydraulic stimulation of future wells. Additionally, while mechanical evaporation is not currently planned by Tamboran, the point of exposure of inhalation of mist from the flowback tanks during mechanical evaporation was also considered in this assessment. For avian receptors, the point of exposure is flowback water stored in open-top tanks. Additionally, the terrestrial assessment evaluates releases of flowback water from these tanks. As the flowback water is managed through multiple tanks, the samples collected from the flowback water tanks were used in this risk assessment.

[1] The flowback water from Amungee NW-1H was removed from site and is not mixed in with water from NW-2H.

Human Health Risk Assessment

To evaluate potential human health hazards associated with the flowback data, a Tier 1 screening assessment was performed. The objective of the Tier 1 assessment was to identify chemicals of low human health concern that did not require additional chemical risk assessment in a Tier 2 assessment. Chemicals that warranted a Tier 2 assessment were quantitatively evaluated based on potential complete exposure scenarios for human receptors discussed above. Consistent with the NT Radiation Protection Act (2004), an evaluation of potential exposure to radionuclides in flowback water was conducted in addition to the Tier 1 and Tier 2 assessments of chemicals in flowback water. **Attachment B** presents the Tier 1 and Tier 2 assessments of chemicals and radiological parameters in flowback water for Amungee NW-2H.

Tier 1 Screening Assessment

Analytical data of flowback water from Amungee NW-2H was compared to human health risk-based screening levels (RBSLs) using the National Water Quality Management Strategy Australian Drinking Water Guidelines (ADWG; 2011, update January 2022). Where Australian guidelines were not available, international guidelines were used to supplement the risk-based levels including World Health Organization (WHO) Guidelines for drinking-water quality (WHO, 2022) and United States Environmental Protection Agency (USEPA) Regional Screening Levels (RSLs) for tap water (May 2023, and as updated).

Attachment B, **Table B-1** presents the Tier 1 screening assessment of Amungee NW-2H flowback data. The following chemicals exceeded the RBSL:

- Benzene
- Ethylene glycol
- Fluoride
- Antimony
- Arsenic
- Barium
- Boron
- Chromium (total)
- Iron
- Lead
- Manganese
- Nickel
- Strontium
- Formaldehyde
- bis (2-Ethylhexyl) phthalate
- Gross beta-K40
- Acrylamide
- >C10-C16 Fraction (F2) minus naphthalene)
- >C16-C34 Fraction (F3)

A quantitative Tier 2 evaluation of these chemicals was completed, except for lead and radiological parameters. Evaluation of potential exposure to lead and radiological parameters is included in the following sections.

Lead Exposure

The evaluation of lead is accomplished differently from other constituents because of lead's unique toxicological properties. Lead does not have established toxicity values; therefore, a quantitative estimate of risk from exposure to lead cannot be performed in the same manner as for other constituents. Lead produces noncancer adverse effects. According to the Australian Industrial Chemicals Introduction Scheme (AICIS), formerly National Industrial Chemicals Notification and Assessment Scheme (NICNAS), some potential effects of lead toxicity include encephalopathy, neurologic impacts, hypertension, decreased fertility, and bone health (NICNAS, 2016; Agency for Toxic Substances & Disease Registry [ATSDR], 2007). The generally accepted methodology is to estimate blood lead (PbB) levels based on media exposures and compare the estimated PbB levels to PbB levels considered to be protective of adverse health effects.

The USEPA Adult Lead Methodology (USEPA, 2009) is a model developed to predict the probability that the PbB level for a fetus carried by a woman exposed to lead in environmental media would exceed 5 micrograms per decilitre (µg/dL). Guidance states that the exposure duration (ED) should be sufficiently long to allow PbB concentrations to approach quasi-steady state (USEPA, 2016). Based on estimates of the first order elimination half-life for lead in blood of approximately 30 days for adults (Rabinowitz, et al., 1976; Chamberlain et al., 1978), a constant lead intake rate over a duration of 90 days would be expected to achieve a blood lead concentration that is sufficiently close to a quasi-steady state (USEPA, 2003). This is the minimum exposure duration to which this methodology should be applied. A minimum frequency of exposure of 1 day per week is also recommended (USEPA, 2003). Therefore, the minimum amount of exposure necessary for the ALM to be used to predict PbB levels in fetuses of adult workers in flowback water is at least once per week for at least 13 consecutive weeks.

Infrequent exposures (i.e., less than 1 day per week) over a minimum duration of 90 days would be expected to produce oscillations in blood lead concentrations associated with the absorption and subsequent clearance of lead from the blood between each exposure event (USEPA, 2003). Based on the above assumptions regarding the elimination half-life lead in blood, the Technical Review Workshop (TRW) recommends that the ALM should not be applied to scenarios in which the exposure frequency is infrequent (USEPA, 2003). Workers are assumed to potentially be exposed during re-use of flowback water during a stimulation period (i.e. 5 days per week for 1 month or 20 days). This exposure is too infrequent to be evaluated in the ALM. Therefore, exposure of workers to lead in flowback water is considered to be insignificant and is not evaluated quantitatively in the Tier 2 assessment.

Radiological Exposure

The alternative RBSLs for gross alpha and gross beta are only generic screening values (0.5 Becquerels per litre [Bq/L]). Consistent with the ADWG (NHMRC, 2022), if these RBSLs are exceeded, a more detailed assessment is triggered. As outlined in the assessment framework under ADWG for radiological exposures, an order-of-magnitude higher radiological exposure is acceptable as the natural background is higher than the screening level, and thresholds for active intervention have been established at corresponding doses 10 to 50 times higher than the corresponding screening value.

In samples of flowback from Amungee NW-2H, gross alpha and gross beta ranged from 1.39 Bq/L to 29.6 Bq/L and 0.9 Bq/L to 10.4 Bq/L, respectively (**Attachment A**). Analysis of radionuclides was not completed for the Amungee NW-2H flowback water. Consistent with the Amungee NW-1H isotope data (**Attachment A**) and flowback assessment update (Origin, 2023), the source of gross alpha and gross beta activity was assumed to be radium-226. (**Attachment B**, **Table B-2**). Using the methodology in the ADWG (NHMRC, 2022), an annual dose was calculated for radium-226, assuming individual radionuclides consumed in water based on annual residential water consumption of drinking water (750 litres per year [L/year], NHMRC, 2022) and worker water consumption (0.00208 L/year; Origin, 2022) and the maximum radionuclide concentration. The recommended Guideline total annual dose is 1 millisievert per year (mSv/year) for radioactivity in drinking water. The recommended dose considers the total estimated dose per year from all radionuclides in drinking water (exclusive of potassium-40). Using the annual water consumption of drinking water for residential receptors, the total dose slightly exceeded the recommended Guideline of 1 mSv/year in drinking water at 8.4 mSv/yr. However, the total dose calculated using worker annual water consumption was multiple orders of magnitude less than 1 mSv/year at 0.000023 mSv/year. Assuming the source of gross alpha and gross beta in Amungee NW-2H is radium 226, a worker would need to consume 89 L/year of flowback water to equal 1 mSv/year. Background exposure to radionuclides is around 2.5 mSv/year and exposures greater than 10 mSv/year pose potential risks that warrant action. Given that the annual dose calculated using worker exposure assumptions is significantly less than 1 mSv/year and ingestion of flowback water by a worker is multiple orders of magnitude less than 89 L/year, no additional action is warranted.

Additionally, further reduction of concentrations is anticipated if blending with bore water occurs as part of re-use of flowback as makeup water. Precipitation of naturally occurring radioactive materials (NORMs) typically occurs in the flowback tank and accompany non-NORM solids that were produced with the flowback, rather than remaining dissolved in flowback water (Australian Radiation Protection and Nuclear Safety Agency [ARPANSA], 2008). Solids within the frac tank will be managed in accordance with the EMP ORI10-3.

Tier 2 Quantitative Assessment

A Tier 2 assessment was completed for workers potentially exposed to chemicals in flowback identified in the Tier 1 assessment. Potentially complete exposure pathways were consistent with the EMP and included incidental ingestion and dermal contact with flowback during re-use activities. As stated previously, Tamboran is not planning on conducting mechanical evaporation; however, inhalation of mist during mechanical evaporation was also considered a complete pathway.

Cumulative risks were calculated and specifically refers to the summation of risks for each receptor across exposure pathways, routes of exposure (e.g. ingestion, inhalation, dermal contact), and chemicals. Exposure assumptions used in the Tier 2 assessment were consistent with those used in the EMP to evaluate worker exposure to stimulation chemicals (Origin, 2022; **Attachment B**, **Table B-3**). For the worker potentially exposed to flowback water during re-use activities, the stimulation period is assumed to be 1 month, with work occurring 5 days per week. For the mechanical evaporation scenario, a worker is assumed to be within the vicinity of the tanks at the Site for 1 hour per day, 5 days per week, for 6 months of year or during the wet season (or 120 days).

Threshold (noncarcinogenic) risk estimates were based on the ratio of the intake of each constituent for each exposure pathway and exposure route divided by the appropriate toxicity criteria to produce a hazard quotient (HQ). The HQs for all exposure pathways for each constituent were summed for each receptor to produce a hazard index (HI). The target hazard level of noncarcinogenic risk estimates is an HI of 1 (enHealth, 2012a; NEPM, 2013); cumulative HI greater than 1 indicate the potential for adverse health effects.

For non-threshold (carcinogenic) risk estimates, risks are identified as the additional probability of an individual developing cancer over a lifetime as a result of exposure. Cumulative cancer risks were calculated by summing the individual constituent cancer risk estimates for the exposure pathways for each receptor. The target risk level of carcinogenic risk estimates is 1 in 100,000 or 10^{-5} (enHealth, 2012a; NEPM, 2013).

Risk estimates for the worker exposed to flowback during re-use activities is presented on **Attachment B**, **Table B-4**. **Table B-5** presents risk estimates for workers during use of mechanical evaporators to facilitate evaporation of flowback water. Neither estimated cancer risk or HI exceeded the respective thresholds for the worker exposed to flowback water during reuse activities (**Attachment B**, **Table B-4**). Estimated cancer risk also did not exceed the threshold of 10^{-5} for inhalation of mists during mechanical evaporation (**Attachment B**, **Table B-5**). Noncancer hazards slightly exceeded the threshold HI of 1 at 3, with barium (HQ of 2.7) the primary driver, for the mechanical evaporation scenario.

It is a common approach within Australia to further assess noncancer hazards exceeding 1, when an HI is between 1 and 10 it does not imply that risks are unacceptable but rather that there is some erosion of the conservatism inherent in the assumptions of the calculation of the HI (enHealth, 2012a). Additionally, while it was conservatively assessed, mechanical evaporation is not currently planned for Amungee NW-2H flowback water. Therefore, while the HI slightly exceeded the target level of 1 for this scenario, no further action is needed. The primary exposure pathway to flowback water for human receptors is workers potentially exposed to flowback water during reuse of flowback water as makeup water in future stimulation activities. Risk estimates for this scenario were *de minimis* therefore, no further action is needed.

Avian Risk Assessment

According to the EMP, previous operations at the Amungee NW site have not identified significant interaction with fauna within open wastewater storage tanks (Origin, 2022). However, as a conservative measure, an avian risk assessment was completed to evaluate potential exposure of avian receptors to chemicals detected above screening criteria in flowback water samples from Amungee NW-2H.

Laboratory analyses of these wastewater samples for inorganic, organic and radionuclide analytes was completed pursuant to the monitoring wastewater chemistry analytes specified in Section C.8 of the Code of Practice (NT, 2019).

Consistent with the avian risk assessment completed for the stimulation chemical risk assessment (EHS Support, 2023), this avian risk assessment conducted on the flowback/produced water samples included the following two steps:

1. Screening Assessment – Identify chemicals of low ecological concern that do not require additional evaluation in the risk assessment process based on a comparison to the Australian and New Zealand Guidelines (AZNG) for Fresh & Marine Water Quality (ANZG, 2018) trigger values or, absent such values, alternative screening criteria as noted in **Attachment C**.
2. Quantitative Risk Evaluation – Identify chemicals that are a concern for avian receptors, and therefore require an additional evaluation to characterise the potential risks. The potential exposure was assessed using a quantitative evaluation of the potentially complete avian exposure pathway and the screening assessment.

Tier 1 Screening Assessment

The screening assessment consisted of a focused evaluation of the potential risks to avian receptors if exposed to chemicals detected in flowback/produced water samples (**Attachment C**, **Table C-1**). The objective of the screening assessment was to identify chemicals of low concern to avian receptors that do not require additional evaluation in the risk assessment process.

The screening assessment used freshwater trigger values (ANZG, 2018) which are deemed to be protective of aquatic species such as fish, invertebrates, and algae assuming chronic, continual, and prolonged contact with surface water at a 95 percent protection level. In instances where no trigger values were available, alternative screening criteria were employed and are noted as such in **Attachment C**. Inherently this approach is considered highly conservative given the following:

- In toxicological testing, aquatic species are more sensitive than terrestrial species to chemicals due to their emersion within the fluid, additional modes of action (for example, impacts on gill function) and the potential for secondary stressors to impact health.
- Even if exposed, avian receptors will have limited periods of duration in contact with the fluids. Roosting, breeding, and continuous access will not occur on the water body; therefore, contact will be episodic in nature and possibly only involve ingestion during dry periods.

Chemicals detected in the flowback/produced water samples with concentrations exceeding the conservatively adopted water quality criteria were carried through the quantitative risk evaluation.

The detected chemicals analysed in the wastewater samples that had concentrations exceeding the conservatively adopted water quality criteria and that may pose a potential risk to avian receptors include:

- Aluminium
- Antimony
- Arsenic
- Boron
- Cadmium
- Chromium (III+VI)
- Copper
- Nickel
- Silver
- Ammonia
- >C10 - C16 Fraction minus Naphthalene (F2)
- >C16 - C34 Fraction (F3)

Attachment C, **Table C-1** presents the results of the Tier 1 screening level assessment.

Tier 2 Quantitative Risk Assessment

Potential exposure of avian receptors to the chemicals of concern in the flowback/produced water samples was quantitatively assessed for representative avian species that were previously evaluated in the stimulation chemical risk assessments (EHS Support, 2023). The potential avian exposure pathway was assessed based on the potential ingestion of flowback/produced water by avian receptors using standard methods and in accordance with the methodologies used in the previous avian risk assessments.

Potential dietary intake of water containing these chemicals was compared to toxicity reference values (TRVs) developed specifically for avian wildlife. Exposure assumptions for the dietary intake and TRV development were designed to be conservative to reduce uncertainty in the quantitative risk estimates. The potential risks were estimated using a chemical-specific HQ. As with the human health risk assessment, an HI is the sum of the HQs on an avian species-specific basis. A potential HI threshold level of less than 1 indicates there are no unacceptable exposures to the avian species.

Table 1 summarises the results of the quantitative risk evaluation and includes a short-term (21-day) and long-term (1-year) scenario of fluid exposure that aligns with the current approach of off-site transportation, re-use and management of fluids and a possible future scenario with possible longer-term storage on-site. The HIs for all the assessed avian species were orders of magnitude less than the threshold HI of 1 for the 21-day scenario exposure scenarios and did not exceed the HI target of 1 under the longer-term on-site storage scenario. Given the hypersaline nature of the flowback water and sufficient surface water resources in the vicinity of the Amungee NW well lease except during periods of water scarcity of the dry season (i.e., limited 3 to 6 months per year), it is unlikely that avian receptors would ingest the flowback water stored in open top tanks. Therefore, there were no unacceptable exposures to the avian species from potential ingestion of chemicals in flowback/produced water.

Table 1 Hazard Indices for Target Avian Species Exposed to Flowback Water

Avian Species	Hazard Index for 21 days of Storage	Hazard Index for 1 year of Storage
Crested Pigeon	6E-02	1E+00
Willie Wagtail	7E-02	1E+00
Peaceful Dove	6E-02	1E+00
Cattle Egret	5E-02	9E-01
Brown Honeyeater	7E-02	1E+00

Attachment C, **Table C-2** through **Table C-7** present the detailed calculations and outcomes of the quantitative risk evaluation for the target avian species in **Table 1**.

Terrestrial Risk Assessment

This terrestrial soil risk assessment was conducted assuming chemicals detected in flowback water samples would ultimately be incorporated into soils within the bund that could pose an exposure risk to terrestrial receptors. To assess a potential release of liquids to soil within the containment area, concentrations of chemicals in soil that would result from a release of flowback/produced water to soil within the bunded area were calculated. These concentrations were compared, where possible, to ecological soil screening criteria.

Calculation of Chemical Concentrations in Soil

This terrestrial risk assessment evaluated the potential for a release of flowback from the tank to the bunded area soils. The vertical depth of associated infiltration from this hypothetical release was estimated as 1 metre (m) based on modelling (EHS Support, 2023). Using this information, the area of the compound and the depth of infiltration of the volume of affected soil with the bund area were calculated at 90,000 cubic metres (m^3). Maximum and median concentrations of detected chemicals in flowback/produced water from the sampled flowback/produced water samples were used to determine their respective maximum and median concentrations in soils (C_{soil}) according to Equation 1 below.

$$C_{soil} = C_{wat} \times V_{tank} / M_{Soil} / D_{soil} \qquad \text{Eq. } 1$$

Where:

- C_{wat} = maximum detected concentration of chemical in wastewater from four wells
- V_{tank} = volume of the largest enclosed storage tank in the event of a complete release (litres [L])
- M_{soil} = mass of soil (9×10^5 m^3)

- D_{soil} = bulk density of soil (1,350 kilograms per cubic metre [kg/m^3])

The volume of water in the tank, which is the maximum storage volume for one of the tanks within the bunded area on the Site is approximately 11 megalitres (ML; 1.1 x 10^{-7} L) (correspondence from Tamboran). For uncovered tanks containing flowback, freeboard is increased to account for accumulation of precipitation. Conservatively, a maximum volume of 11 ML was used in the calculation of soil concentrations.

Tier 1 Screening Assessment

Chemical calculated maximum and median soil concentrations are presented in (**Attachment D**, **Table D-1**). These concentrations reflect a range of chemical concentrations potentially expected in the 1-m stratum of soil adjacent to the enclosed storage tanks as a result of a release from a tank. Ecological soil screening levels defined by National Environment Protection (Assessment of Site Contamination) Measure (ASC NEPM) were used to determine a ratio of the calculated concentration in soil to screening criteria. In certain instances, where NEPM values were not available, other data available from the European Union, the USEPA, or background threshold values for the McArthur Basin surficial soils were used as the screening level.

To determine whether the maximum or median soil concentrations exceeded the screening level, a ratio of the soil concentration to the screening levels was calculated. If the ratio exceeded 1, the estimated concentration for the chemical exceeded the screening level. Calculated ratios did not exceed 1, except for ethylene glycol, bromide, and bromine. Therefore, with the exception of those chemicals, the calculated soil concentrations for both the maximum and median flowback concentrations did not exceed the terrestrial screening levels.

Ethylene glycol in water and in soil will breakdown within several days to a few weeks (Agency for Toxic Substances and Disease Registry [ATSDR], 2010). Ethylene glycol is readily biodegradable, is not expected to bioaccumulate and has low potential to adsorb to soil (EHS Support, 2023). Therefore, the potential for ethylene glycol to be present in flowback water and partition to soils at concentrations resulting in an exceedance of the soil screening level is expected to be low.

Bromine is a naturally occurring element that normally is found as bromide in living organisms and the environment. Bromide ions would be expected to partition to water rather than soils in the environment given their high-water solubility and the negative charges on the ions available (ECHA). Therefore, while estimated concentrations of bromine in soils as a result of a release of failure of a full tank flowback, concentrations in soils within the bunded area resulting in an exceedance of the soil screening level is expected to be low.

Given that the predicted soil concentration was based on a potential maximum tank volume (including freeboard of 1.3 ML during the dry season) it is unlikely that a potential release to soils within the bunded area of stored flowback water would result in an unacceptable level of ecological risks.

Assessment of BTEX

In addition to the risk evaluations, assessment of benzene, toluene, ethylbenzene, and xylene (BTEX) in flowback water was conducted pursuant to Section B.5 of the Code of Practice (Department of Environment and Natural Resources [DENR] and Department of Primary Industry and Resources [DPIR], 2019). Section B.5 states that recycled produced water used in hydraulic fracturing fluids must not contain BTEX levels greater than those expected in produce water from the well being drilled, or in the event BTEX levels expected in produced water are unknown, then BTEX levels in water cannot exceed levels prescribed in Table 8 of Section B.5.

As shown in **Attachment A**, **Table A-1**, only benzene and toluene were detected in a subset of samples collected from the Amungee NW-2H flowback water. **Table 2** presents a comparison of the maximum detection and limits of reporting from the Amungee NW-2H flowback data to the BTEX levels in water used for stimulation and drilling fluids from Table 8 in Section 8.5 of the Code of Practice (DENR and DPIR, 2019). Additionally, detection limits for BTEX did not exceed the Code of Practice thresholds. Therefore, conditions set forth in Section B.5 of the Code of Practice regarding BTEX are satisfied.

Table 2 BTEX Evaluation

Chemical	ANZG (99% Protection Level) (µg/L)	Maximum Detection (µg/L)
Benzene	600	4
Toluene	180	6
Ethylbenzene	80	< 5
Xylene	200	< 2

Table Notes:
% = percent
µg/L = micrograms per litre
< = less than limit of detection
ANZG = Australian and New Zealand Guidelines

Conclusions and Recommendations

In accordance with Regulation 37A under part 3A of the *Northern Territory Petroleum (Environment) Regulations* (2016) and pursuant to Condition 7 of the EMP approval (NT, 2022), a risk assessment of flowback water from the hydraulic fracturing phase of Amungee NW-2H was conducted. This assessment included determination of potential risk to human and avian receptors exposed to flowback from wells Amungee NW-2H. Additionally, an assessment was conducted of a potential release of flowback water to soils within the bunded area. As noted above, the risk evaluation methods used are consistent with those used for the EMP and the hydraulic fracturing fluid risk assessment conducted prior to approval of the activities at the Amungee NW-2H well Site (Origin, 2022; EHS Support, 2023).

Potentially complete exposure pathways for humans were identified during reuse of flowback water as make-up water for future stimulation activities. Mechanical evaporation was also conservatively assessed in this assessment; however, Tamboran is not currently planning on utilising mechanical evaporation for Amungee NW-2H flowback water. There were no unacceptable risks calculated for the reuse of flowback water exposure scenario. With respect to re-use of flowback water from wells Amungee NW-2H and the approved Site activities and associated management controls, no further action is recommended.

This risk assessment conducted for the avian receptors potentially exposed to flowback/produced water concluded there is no unacceptable risk to these receptors potentially exposed to chemicals in the Amungee NW-2H flowback water samples. Therefore, with respect to avian use of flowback water from wells Amungee NW-2H and the approved Site activities and associated management controls, no further action is recommended.

Likewise, a screening assessment was performed to determine the potential risk to terrestrial receptors exposed to soils affected by Amungee NW-2H flowback water based on a hypothetical release scenario. The assessment consisted of a screening level evaluation to determine if a further quantitative risk assessment would be required to assess the potential risk to terrestrial receptors. This screening level risk assessment concluded that no chemicals detected in the flowback water at their maximum or median concentrations, under a hypothetical maximum release scenario, would result in soil levels above screening criteria protective of terrestrial receptors, except for maximum concentrations of ethylene glycol or bromide and bromine. Given the environmental fate of ethylene glycol and bromine and bromide, it is unlikely concentrations of these chemicals would be observed in soils after a potential hypothetical release. Therefore, with the approved Site activities and associated management controls (e.g., maintenance of measures outlined in the EMP), no further action is recommended.

These findings are consistent with the flowback risk assessment that was completed for Amungee NW-1H, which also concluded that there were no unacceptable risks to human or avian receptors. This risk assessment satisfies Condition 7 of the EMP approval (NT, 2022) and requirement 3(a) of Regulation 37A of the Petroleum (Environment) Regulations 2016 (Northern Territory Government, 2022).

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Attachment A Amungee NW Wells Analytical Data

Table A-1
Amungee NW-2H Flowback Water Analytical Data
Amungee NW-2H Flowback Water Assessment
Tamboran

				BTEX								Explosives		Glycols							Halogenated Benzenes
				Naphthalene (VOC)	Benzene	Toluene	Ethylbenzene	Xylene (m & p)	Xylene (o)	Xylene Total	Total BTEX	2,4-Dinitrotoluene	Nitrobenzene	2-butoxyethanol	2-Ethoxyethanol acetate	Diethylene glycol	Diethylene glycol, monobutyl ether	Ethylene glycol	Propylene glycol	Triethylene Glycol	Hexachlorobenzene
				mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	µg/L
EQL	Sample type			0.005	1	2	2	2	2	2	1	4	2	2	2,000	2,000	2,000	2,000	2,000	2	0.5
Field ID		**Location Code**	**Date**																		
Amungee 2H Flowback	**Flowback**	**BET-PW003**	**27 Mar 2023**	<0.005	**3**	4	<2	<2	<2	<2	7	<4	<2								<0.5
	Flowback																				
	Flowback		**02 Apr 2023**	<0.005	**4**	6	<2	<2	<2	<2	10	<4	<2								<0.5
Amungee Nw 2H Flowback	**Flowback**	**BET-PW003**	**01 May 2023**	<0.005	<1	<2	<2	<2	<2	<2	<1	<4	<2								<2.5
	Flowback		**14 May 2023**	<0.005	<1	<2	<2	<2	<2	<2	<1	<4	<2								<2.5
	Flowback		**22 May 2023**	<0.005	<1	<2	<2	<2	<2	<2	<1	<25	<25								<24.8
	Flowback		**28 May 2023**																		
	Flowback		**29 May 2023**	<0.005	1	<2	<2	<2	<2	<2	1	<24	<24								<24.2
Amungee Nw 2H Flowback - duplicate		**BET-PW003**	**01 May 2023**	<0.005	<1	<2	<2	<2	<2	<2	<1			<2	<2,000	<2,000	<2,000	80,000	4,000	<2	
Amungee NW-2H Flowbacl	**Flowback**	**BET-PW003**	**10 Apr 2023**	<0.005	<5	<5	<5	<5	<5	<2	<2	<5	<5								<4.8
	Flowback		**05 Jun 2023**	<0.005	<1	<2	<2	<2	<2	<2	<1	<4	<3								<2.7
	Flowback																				
	Flowback		**19 Jun 2023**	<0.005	1	<2	<2	<2	<2	<2	1	<4	<3								<2.9
	Flowback		**26 Jun 2023**	<0.005	<5	<5	<5	<5	<5	<2	<2	<4	<3								<2.6
	Flowback		**03 Jul 2023**	<0.005	<5	<5	<5	<5	<5	<2	<2	<4	<2								<2.5
	Flowback		**10 Jul 2023**	<0.005	<1	<2	<2	<2	<2	<2	<1	<4	<2								<2.6
	Flowback		**15 Jul 2023**	<0.005	<1	<2	<2	<2	<2	<2	<1	<4	<3								<2.7
Amunge NW 2H Flowback	**Flowback**	**BET-PW003**	**12 Jun 2023**	<0.005	1	<2	<2	<2	<2	<2	1										

Statistics

	Naphthalene (VOC)	Benzene	Toluene	Ethylbenzene	Xylene (m & p)	Xylene (o)	Xylene Total	Total BTEX	2,4-Dinitrotoluene	Nitrobenzene	2-butoxyethanol	2-Ethoxyethanol acetate	Diethylene glycol	Diethylene glycol, monobutyl ether	Ethylene glycol	Propylene glycol	Triethylene Glycol	Hexachlorobenzene
Number of Results	**17**	**17**	**17**	**17**	**17**	**17**	**17**	**17**	**13**	**13**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**13**
Number of Detects	**0**	**5**	**2**	**0**	**1**	**0**	**1**	**6**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**1**	**0**	**0**
Minimum Concentration	**<0.005**	**1**	**<2**	**<2**	**<2**	**<2**	**<2**	**1**	**<4**	**<2**	**<2**	**<2,000**	**<2,000**	**<2,000**	**80,000**	**4,000**	**<2**	**<0.5**
Minimum Detect	**ND**	**1**	**4**	**ND**	**3**	**ND**	**3**	**1**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**80,000**	**4,000**	**ND**	**ND**
Maximum Concentration	**<0.005**	**<5**	**6**	**<5**	**<5**	**<5**	**3**	**10**	**<25**	**<25**	**<2**	**<2,000**	**<2,000**	**<2,000**	**80,000**	**4,000**	**<2**	**<24.8**
Maximum Detect	**ND**	**4**	**6**	**ND**	**3**	**ND**	**3**	**10**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**80,000**	**4,000**	**ND**	**ND**
Average Concentration *	**0.0025**	**1.3**	**1.7**	**1.3**	**1.4**	**1.3**	**1.1**	**1.8**	**3.6**	**3**								**2.9**
Geometric Average *	**0.0025**	**0.94**	**1.4**	**1.2**	**1.3**	**1.2**	**1.1**	**0.99**	**2.7**	**1.8**	**1**	**1,000**	**1,000**	**1,000**	**80,000**	**4,000**	**1**	**1.5**
Median Concentration *	**0.0025**	**0.5**	**1**	**1**	**1**	**1**	**1**	**1**	**2**	**1.5**	**1**	**1,000**	**1,000**	**1,000**	**80,000**	**4,000**	**1**	**1.3**
Standard Deviation *	**0**	**1.1**	**1.4**	**0.59**	**0.72**	**0.59**	**0.49**	**2.7**	**3.8**	**4.1**								**4.2**
Geometric Standard Deviation *	**1**	**2.2**	**1.8**	**1.4**	**1.5**	**1.4**	**1.3**	**2.6**	**2**	**2.5**								**3.1**
95% UCL (Student's-t) *	**0.0025**	**1.774**	**2.33**	**1.514**	**1.687**	**1.514**	**1.323**	**2.89**	**5.512**	**5.041**								**4.98**
% of Detects	**0**	**29**	**12**	**0**	**6**	**0**	**6**	**35**	**0**	**0**	**0**	**0**	**0**	**0**	**100**	**100**	**0**	**0**
% of Non-Detects	**100**	**71**	**88**	**100**	**94**	**100**	**94**	**65**	**100**	**100**	**100**	**100**	**100**	**100**	**0**	**0**	**100**	**100**

* A Non Detect Multiplier of 0.5 has been applied.

EQL = estimated quantiation limit
ug/L = micrograms per litre
mg/L = milligrams per litre
UCL = upper confidence limit

Table A-1
Amungee NW-2H Flowback Water Analytical Data
Amungee NW-2H Flowback Water Assessment
Tamboran

				Herbicides	Inorganics																
				Dinoseb	Total Phosphorus as P (Organic Phosphate as P)	Sulfate as SO4 - Turbidimetric (filtered)	Silicon as SiO2	Silicon as SiO2 (filtered)	Nitrite + Nitrate as N	Reactive Silica	Alkalinity (Bicarbonate as CaCO3)	Alkalinity (Carbonate as CaCO3)	Alkalinity (Hydroxide) as CaCO3	Alkalinity (total) as CaCO3	Ammonia as N	Anions Total	Bromide	Bromine	Bromine (filtered)	Cations Total	Chloride
				µg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	meq/L	µg/L	µg/L	µg/L	meq/L	mg/L
EQL	Sample type			50	0.01	1	0.1	0.1	0.01	0.05	1	1	1	1	0.01	0.01	10	100	100	0.01	1
Field ID		**Location Code**	**Date**																		
Amungee 2H Flowback	**Flowback**	**BET-PW003**	**27 Mar 2023**	<50	2.04	<1	179		0.07		881	<1	<1	881	26.2	174	83,200	53,400	40,000	156	5,540
	Flowback																				
	Flowback		**02 Apr 2023**	<50	1.48	141	186		<0.01		856	<1	<1	856	26.9	210	143,000	61,600	63,300	201	6,730
Amungee Nw 2H Flowback	**Flowback**	**BET-PW003**	**01 May 2023**	<100	0.79	38	198		0.03		430	<1	<1	430	34.4	387	121,000	146,000	145,000	421	13,400
	Flowback		**14 May 2023**	<100	0.45	32	200		<0.01		362	<1	<1	362	34.2	397	170,000	129,000	164,000	432	13,800
	Flowback		**22 May 2023**	<990	0.29	23	192	166	<0.01	173	325	<1	<1	325	31.4		712,000	189,000	180,000		16,400
	Flowback		**28 May 2023**					177		177											
	Flowback		**29 May 2023**	<970	0.31	87	205	178	<0.01	196	246	<1	<1	246	32.6		182,000	202,000	202,000		17,100
Amungee Nw 2H Flowback - duplicate		**BET-PW003**	**01 May 2023**		0.67	36	197		<0.01		435	<1	<1	435	34.4	393	125,000	143,000	143,000	418	13,600
Amungee NW-2H Flowbac	**Flowback**	**BET-PW003**	**10 Apr 2023**	<190	0.77	63	188		0.02		508	<1	<1	508	30.6		108,000	112,000	103,000		10,300
	Flowback		**05 Jun 2023**	<110	0.52	12	220		<0.01		339	<1	<1	339	45.1		318,000	207,000	222,000		21,000
	Flowback																				
	Flowback		**19 Jun 2023**	<120	0.20	4	190		<0.01		262	<1	<1	262	25.6		178,000	196,000	202,000		18,600
	Flowback		**26 Jun 2023**	<100	0.36	5	203		<0.01		266	<1	<1	266	37.3		142,000	185,000	222,000		21,400
	Flowback		**03 Jul 2023**	<100	0.37	3	202		0.06		259	<1	<1	259	35.0		162,000	193,000	249,000		20,100
	Flowback		**10 Jul 2023**	<100	0.38	1	164		<0.01		271	<1	<1	271	1.60		274,000	205,000	242,000		22,200
	Flowback		**15 Jul 2023**	<110	0.32	<1	257		<0.01		274	<1	<1	274	1.67		321,000	227,000	274,000		24,000
Amunge NW 2H Flowback	**Flowback**	**BET-PW003**	**12 Jun 2023**		0.37	25	183		0.02		244	<1	<1	244	1.81	490	215,000	170,000	197,000	548	17,200

Statistics

Statistic	Dinoseb	Total Phosphorus as P (Organic Phosphate as P)	Sulfate as SO4 - Turbidimetric (filtered)	Silicon as SiO2	Silicon as SiO2 (filtered)	Nitrite + Nitrate as N	Reactive Silica	Alkalinity (Bicarbonate as CaCO3)	Alkalinity (Carbonate as CaCO3)	Alkalinity (Hydroxide) as CaCO3	Alkalinity (total) as CaCO3	Ammonia as N	Anions Total	Bromide	Bromine	Bromine (filtered)	Cations Total	Chloride
Number of Results	**13**	**15**	**15**	**15**	**3**	**15**	**3**	**15**	**15**	**15**	**15**	**15**	**6**	**15**	**15**	**15**	**6**	**15**
Number of Detects	**0**	**15**	**13**	**15**	**3**	**5**	**3**	**15**	**0**	**0**	**15**	**15**	**6**	**15**	**15**	**15**	**6**	**15**
Minimum Concentration	**<50**	**0.2**	**1**	**164**	**166**	**<0.01**	**173**	**244**	**<1**	**<1**	**244**	**1.6**	**174**	**83,200**	**53,400**	**40,000**	**156**	**5,540**
Minimum Detect	**ND**	**0.2**	**1**	**164**	**166**	**0.02**	**173**	**244**	**ND**	**ND**	**244**	**1.6**	**174**	**83,200**	**53,400**	**40,000**	**156**	**5,540**
Maximum Concentration	**<990**	**2.04**	**141**	**257**	**178**	**0.07**	**196**	**881**	**<1**	**<1**	**881**	**45.1**	**490**	**712,000**	**227,000**	**274,000**	**548**	**24,000**
Maximum Detect	**ND**	**2.04**	**141**	**257**	**178**	**0.07**	**196**	**881**	**ND**	**ND**	**881**	**45.1**	**490**	**712,000**	**227,000**	**274,000**	**548**	**24,000**
Average Concentration *	**119**	**0.62**	**31**	**198**	**174**	**0.017**	**182**	**397**	**0.5**	**0.5**	**397**	**27**	**342**	**216,947**	**161,267**	**176,553**	**363**	**16,091**
Geometric Average *	**69**	**0.5**	**11**	**197**	**174**	**0.0095**	**182**	**361**	**0.5**	**0.5**	**361**	**18**	**320**	**185,436**	**149,914**	**158,946**	**331**	**14,951**
Median Concentration *	**50**	**0.38**	**23**	**197**	**177**	**0.005**	**177**	**325**	**0.5**	**0.5**	**325**	**31.4**	**390**	**170,000**	**185,000**	**197,000**	**419.5**	**17,100**
Standard Deviation *	**166**	**0.51**	**39**	**21**	**6.7**	**0.021**	**12**	**207**	**0**	**0**	**207**	**14**	**123**	**154,882**	**52,922**	**67,636**	**151**	**5,529**
Geometric Standard Deviation *	**2.5**	**1.9**	**6.3**	**1.1**	**1**	**2.7**	**1.1**	**1.5**	**1**	**1**	**1.5**	**3.4**	**1.5**	**1.7**	**1.5**	**1.7**	**1.6**	**1.5**
95% UCL (Student's-t) *	**200.7**	**0.851**	**49.32**	**207.1**	**184.9**	**0.0263**	**202.7**	**491.4**	**0.5**	**0.5**	**491.4**	**32.84**	**442.7**	**287,382**	**185,334**	**207,312**	**487.1**	**18,606**
% of Detects	**0**	**100**	**87**	**100**	**100**	**33**	**100**	**100**	**0**	**0**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**
% of Non-Detects	**100**	**0**	**13**	**0**	**0**	**67**	**0**	**0**	**100**	**100**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

* A Non Detect Multiplier of 0.5 has been applied.

EQL = estimated quantiation limit
ug/L = micrograms per litre
mg/L = milligrams per litre
UCL = upper confidence limit

Table A-1
Amungee NW-2H Flowback Water Analytical Data
Amungee NW-2H Flowback Water Assessment
Tamboran

				Inorganics												Metals					
				Fluoride	Ionic Balance	Kjeldahl Nitrogen Total	Nitrate (as N)	Nitrite (as N)	Nitrogen (Total)	Reactive Phosphorus as P (Orthophosphate as P)	Sodium	Sodium (filtered)	Sodium Absorption Ratio (filtered)	Total Dissolved Solids (Lab)	Total Suspended Solids (Lab)	Aluminium	Aluminium (filtered)	Antimony	Antimony (filtered)	Arsenic	Arsenic (filtered)
				mg/L	%	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	-	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
EQL	Sample type			0.1	0.01	0.1	0.01	0.01	0.1	0.01	1	1	0.01	10	5	0.01	0.01	0.001	0.001	0.001	0.001
Field ID		**Location Code**	**Date**																		
Amungee 2H Flowback	**Flowback**	**BET-PW003**	**27 Mar 2023**	**2.0**	5.27	57.8	0.07	<0.01	57.9	0.14		3,310	60.3	10,100	19	0.11	0.08	**0.012**	0.002	**0.043**	**0.038**
	Flowback																				
	Flowback		**02 Apr 2023**	1.3	2.13	62.9	<0.01	<0.01	62.9	<0.01		4,230	65.4	12,400	82	0.16	0.02	**0.113**	**0.070**	**0.012**	0.005
Amungee Nw 2H Flowback	**Flowback**	**BET-PW003**	**01 May 2023**	***6.0***	4.17	60.7	0.03	<0.01	60.7	0.09		8,570	77.6	23,800	39	0.36	<0.10	<0.010	<0.010	**0.011**	<0.010
	Flowback		**14 May 2023**	0.9	4.15	50.3	<0.01	<0.01	50.3	<0.10		8,660	73.5	28,700	115	0.22	<0.10	<0.010	<0.010	<0.010	<0.010
	Flowback		**22 May 2023**	0.8		65.5	<0.01	<0.01	65.5	<0.01		9,420	76.9	31,900	98	0.11	<0.10	<0.010	<0.010	<0.010	<0.010
	Flowback		**28 May 2023**																		
	Flowback		**29 May 2023**	1.0		60.9	<0.01	<0.01	60.9	0.01		10,400	80.0	35,000	102	0.24	<0.10	<0.010	<0.010	**0.012**	<0.010
Amungee Nw 2H Flowback - duplicate		**BET-PW003**	**01 May 2023**	1.0	3.02	62.1	<0.01	<0.01	62.1	0.02	8,280	8,500	77.3	23,600	8	0.26	<0.10	<0.010	<0.010	**0.014**	<0.010
Amungee NW-2H Flowbac	**Flowback**	**BET-PW003**	**10 Apr 2023**	1.4		56.5	0.02	<0.01	56.5	0.02		6,070	72.6	19,500	135	0.27	<0.10	<0.010	<0.010	**0.040**	0.010
	Flowback		**05 Jun 2023**	0.9		73.2	<0.01	<0.01	73.2	<0.01		11,100	78.9	34,200	176	0.29	<0.10	<0.010	<0.010	<0.010	<0.010
	Flowback																				
	Flowback		**19 Jun 2023**	0.9		44.9	<0.01	<0.01	44.9	<0.01		10,700	81.0	32,100	104	<0.10	<0.10	<0.010	<0.010	<0.010	<0.010
	Flowback		**26 Jun 2023**	0.6		67.3	<0.01	<0.01	67.3	<0.01		10,900	71.1	33,500	126	<0.10	<0.10	<0.010	<0.010	<0.010	<0.010
	Flowback		**03 Jul 2023**	0.8		65.6	0.06	<0.01	65.7	<0.01		10,500	68.4	36,100	130	<0.10	<0.10	<0.010	<0.010	<0.010	<0.010
	Flowback		**10 Jul 2023**	0.8		64.4	<0.01	<0.01	64.4	<0.01		13,400	94.1	41,600	156	<0.10	<0.10	<0.010	<0.010	<0.010	<0.010
	Flowback		**15 Jul 2023**	1.0		67.3	<0.01	<0.01	67.3	<0.01		14,900	93.1	44,300	168	<0.10	<0.10	<0.010	<0.010	<0.010	<0.010
Amunge NW 2H Flowback	**Flowback**	**BET-PW003**	**12 Jun 2023**	0.8	5.53	57.9	0.02	<0.01	57.9	<0.01		10,700	73.4	31,200	80	0.17	<0.10	**0.025**	<0.010	<0.010	<0.010

Statistics

	Fluoride	Ionic Balance	Kjeldahl Nitrogen Total	Nitrate (as N)	Nitrite (as N)	Nitrogen (Total)	Reactive Phosphorus as P (Orthophosphate as P)	Sodium	Sodium (filtered)	Sodium Absorption Ratio (filtered)	Total Dissolved Solids (Lab)	Total Suspended Solids (Lab)	Aluminium	Aluminium (filtered)	Antimony	Antimony (filtered)	Arsenic	Arsenic (filtered)
Number of Results	15	6	15	15	15	15	15	1	15	15	15	15	15	15	15	15	15	15
Number of Detects	15	6	15	5	0	15	5	1	15	15	15	15	10	2	3	2	6	3
Minimum Concentration	0.6	2.13	44.9	<0.01	<0.01	44.9	0.01	8,280	3,310	60.3	10,100	8	<0.1	0.02	<0.01	0.002	<0.01	0.005
Minimum Detect	0.6	2.13	44.9	0.02	ND	44.9	0.01	8,280	3,310	60.3	10,100	8	0.11	0.02	0.012	0.002	0.011	0.005
Maximum Concentration	6	5.53	73.2	0.07	<0.01	73.2	0.14	8,280	14,900	94.1	44,300	176	0.36	<0.1	0.113	0.07	0.043	0.038
Maximum Detect	6	5.53	73.2	0.07	ND	73.2	0.14	8,280	14,900	94.1	44,300	176	0.36	0.08	0.113	0.07	0.043	0.038
Average Concentration *	1.3	4	61	0.017	0.005	61	0.025		9,424	76	29,200	103	0.16	0.05	0.014	0.0091	0.012	0.0075
Geometric Average *	1.1	3.8	61	0.0095	0.005	61	0.011	8,280	8,822	76	27,230	82	0.13	0.049	0.0073	0.0056	0.0084	0.006
Median Concentration *	0.9	4.16	62.1	0.005	0.005	62.1	0.005	8,280	10,400	76.9	31,900	104	0.16	0.05	0.005	0.005	0.005	0.005
Standard Deviation *	1.3	1.3	7.1	0.021	0	7.1	0.04		3,093	9	9,740	51	0.11	0.011	0.028	0.017	0.013	0.0085
Geometric Standard Deviation *	1.7	1.4	1.1	2.7	1	1.1	3.3		1.5	1.1	1.5	2.4	2.1	1.3	2.4	2.1	2.1	1.7
95% UCL (Student's-t) *	1.952	5.114	64.37	0.0263	0.005	64.38	0.043		10,831	80.34	33,629	125.6	0.21	0.0552	0.0267	0.0168	0.0175	0.0114
% of Detects	100	100	100	33	0	100	33	100	100	100	100	100	67	13	20	13	40	20
% of Non-Detects	0	0	0	67	100	0	67	0	0	0	0	0	33	87	80	87	60	80

* A Non Detect Multiplier of 0.5 has been applied.

EQL = estimated quantiation limit
ug/L = micrograms per litre
mg/L = milligrams per litre
UCL = upper confidence limit

Table A-1
Amungee NW-2H Flowback Water Analytical Data
Amungee NW-2H Flowback Water Assessment
Tamboran

				Metals																	
				Barium	Barium (filtered)	Beryllium	Beryllium (filtered)	Boron	Boron (filtered)	Cadmium	Cadmium (filtered)	Calcium	Calcium (filtered)	Chromium (III+VI)	Chromium (III+VI) (filtered)	Copper	Copper (filtered)	Iron	Iron (filtered)	Lead	Lead (filtered)
				mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
EQL	Sample type			0.001	0.001	0.001	0.001	0.05	0.05	0.0001	0.0001	1	1	0.001	0.001	0.001	0.001	0.05	0.05	0.001	0.001
Field ID		**Location Code**	**Date**																		
Amungee 2H Flowback	Flowback	BET-PW003	27 Mar 2023	4.38	4.17	<0.001	<0.001	12.3	11.6	<0.0001	<0.0001		161	0.012	0.002	<0.001	<0.001	20.5	15.2	<0.001	<0.001
	Flowback																				
	Flowback		02 Apr 2023	7.63	6.90	<0.001	<0.001	14.0	14.2	<0.0001	<0.0001		226	0.031	0.007	0.001	<0.001	40.2	7.08	<0.001	<0.001
Amungee Nw 2H Flowback	Flowback	BET-PW003	01 May 2023	25.0	25.3	<0.010	<0.010	18.2	18.5	<0.0010	<0.0010		676	<0.010	<0.010	<0.010	<0.010	16.2	3.30	<0.010	<0.010
	Flowback		14 May 2023	19.4	30.8	<0.010	<0.010	18.0	20.6	<0.0010	<0.0010		787	0.130	<0.010	0.059	<0.010	20.4	4.35	**0.026**	<0.010
	Flowback		22 May 2023	18.8	37.3	<0.010	<0.010	21.9	20.9	0.0017	<0.0010		822	<0.010	<0.010	<0.010	<0.010	22.1	1.26	<0.010	<0.010
	Flowback		28 May 2023																		
	Flowback		29 May 2023	40.6	12.0	<0.010	<0.010	23.5	21.7	<0.0010	<0.0010		929	0.011	<0.010	0.042	<0.010	27.0	2.41	**0.030**	<0.010
Amungee Nw 2H Flowback - duplicate		BET-PW003	01 May 2023	25.8	25.1	<0.010	<0.010	19.0	19.8	<0.0010	<0.0010	657	663	<0.010	<0.010	<0.010	<0.010	16.8	2.45	<0.010	<0.010
Amungee NW-2H Flowbac	Flowback	BET-PW003	10 Apr 2023	14.3	13.0	<0.010	<0.010	16.9	16.8	<0.0010	<0.0010		372	0.039	<0.010	0.015	<0.010	38.0	1.18	<0.010	<0.010
	Flowback		05 Jun 2023	52.4	54.4	<0.010	<0.010	24.8	23.3	<0.0010	<0.0010		1,150	<0.010	<0.010	0.029	<0.010	31.8	1.04	**0.012**	<0.010
	Flowback																				
	Flowback		19 Jun 2023	51.0	46.1	<0.010	<0.010	20.6	18.9	<0.0010	<0.0010		968	<0.010	<0.010	<0.010	<0.010	30.1	28.8	<0.010	<0.010
	Flowback		26 Jun 2023	64.1	62.8	<0.010	<0.010	21.7	21.1	<0.0010	<0.0010		1,410	0.011	<0.010	0.072	0.023	39.2	0.83	***0.114***	<0.010
	Flowback		03 Jul 2023	64.8	62.7	<0.010	<0.010	22.8	21.8	<0.0010	<0.0010		1,410	<0.010	<0.010	<0.010	<0.010	37.6	2.45	<0.010	<0.010
	Flowback		10 Jul 2023	65.0	71.1	<0.010	<0.010	20.9	22.5	<0.0010	<0.0010		1,070	0.018	<0.010	0.038	<0.010	42.0	0.63	<0.010	<0.010
	Flowback		15 Jul 2023	77.3	80.3	<0.010	<0.010	23.6	25.0	<0.0010	<0.0010		1,410	<0.010	<0.010	0.011	<0.010	45.9	4.05	<0.010	<0.010
Amunge NW 2H Flowback	Flowback	BET-PW003	12 Jun 2023	48.2	55.4	<0.010	<0.010	20.2	19.7	<0.0010	<0.0010		1,260	0.014	<0.010	0.013	<0.010	30.1	4.54	<0.010	<0.010
Statistics																					
Number of Results				15	15	15	15	15	15	15	15	1	15	15	15	15	15	15	15	15	15
Number of Detects				15	15	0	0	15	15	1	0	1	15	8	2	9	1	15	15	4	0
Minimum Concentration				4.38	4.17	<0.001	<0.001	12.3	11.6	<0.0001	<0.0001	657	161	<0.01	0.002	0.001	<0.001	16.2	0.63	<0.001	<0.001
Minimum Detect				4.38	4.17	ND	ND	12.3	11.6	0.0017	ND	657	161	0.011	0.002	0.001	0.023	16.2	0.63	0.012	ND
Maximum Concentration				77.3	80.3	<0.01	<0.01	24.8	25	0.0017	<0.001	657	1,410	0.13	<0.01	0.072	0.023	45.9	28.8	0.114	<0.01
Maximum Detect				77.3	80.3	ND	ND	24.8	25	0.0017	ND	657	1,410	0.13	0.007	0.072	0.023	45.9	28.8	0.114	ND
Average Concentration *				39	39	0.0044	0.0044	20	20	0.00052	0.00044		888	0.02	0.0049	0.02	0.0056	31	5.3	0.015	0.0044
Geometric Average *				30	29	0.0037	0.0037	20	19	0.0004	0.00037	657	757	0.011	0.0048	0.0097	0.0041	29	2.9	0.006	0.0037
Median Concentration *				40.6	37.3	0.005	0.005	20.6	20.6	0.0005	0.0005	657	929	0.011	0.005	0.011	0.005	30.1	2.45	0.005	0.005
Standard Deviation *				24	25	0.0016	0.0016	3.6	3.5	0.00036	0.00016		415	0.032	0.00096	0.023	0.0051	9.7	7.5	0.029	0.0016
Geometric Standard Deviation *				2.3	2.5	2.2	2.2	1.2	1.2	2.5	2.2		1.9	2.7	1.3	4.2	2.6	1.4	2.9	4	2.2
95% UCL (Student's-t) *				49.32	50.38	0.00512	0.00512	21.51	21.33	0.00068482	0.00051201		1,076	0.0347	0.00537	0.0306	0.0079	34.95	8.695	0.0282	0.00512
% of Detects				100	100	0	0	100	100	7	0	100	100	53	13	60	7	100	100	27	0
% of Non-Detects				0	0	100	100	0	0	93	100	0	0	47	87	40	93	0	0	73	100

* A Non Detect Multiplier of 0.5 has been applied.

EQL = estimated quantiation limit
ug/L = micrograms per litre
mg/L = milligrams per litre
UCL = upper confidence limit

Table A-1
Amungee NW-2H Flowback Water Analytical Data
Amungee NW-2H Flowback Water Assessment
Tamboran

				Metals																	
				Magnesium	Magnesium (filtered)	Manganese	Manganese (filtered)	Mercury	Mercury (filtered)	Molybdenum	Nickel	Nickel (filtered)	Potassium	Potassium (filtered)	Selenium	Selenium (filtered)	Silver	Silver (filtered)	Strontium	Strontium (filtered)	Thorium
				mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L
EQL	Sample type			1	1	0.001	0.001	0.0001	0.0001	0.001	0.001	0.001	1	1	0.01	0.01	0.001	0.001	0.001	0.001	1
Field ID		**Location Code**	**Date**																		
Amungee 2H Flowback	**Flowback**	**BET-PW003**	**27 Mar 2023**		41	**0.841**	**0.823**	<0.0001	<0.0001	0.049	0.003	0.003		42	<0.01	<0.01	0.002	<0.001	8.05	7.81	17
	Flowback																				
	Flowback		**02 Apr 2023**		55	**1.35**	**1.23**	<0.0001	<0.0001	0.049	0.003	0.002		52	<0.01	<0.01	<0.001	<0.001	12.6	9.68	4
Amungee Nw 2H Flowback	**Flowback**	**BET-PW003**	**01 May 2023**		151	**2.03**	**2.03**	<0.0001	<0.0001	0.019	<0.010	<0.010		85	<0.10	<0.10	<0.010	<0.010	43.8	43.1	<10
	Flowback		**14 May 2023**		161	**2.16**	**2.20**	<0.0001	<0.0001	0.016	<0.010	<0.010		92	<0.10	<0.10	<0.010	<0.010	49.7	49.2	<10
	Flowback		**22 May 2023**		191	**2.77**	**2.75**	<0.0001	<0.0001	0.011	<0.010	<0.010		93	<0.10	<0.10	<0.010	<0.010	62.9	62.6	<10
	Flowback		**28 May 2023**																		
	Flowback		**29 May 2023**		214	**3.26**	**3.14**	<0.0001	<0.0001	0.014	<0.010	<0.010		102	<0.10	<0.10	<0.010	<0.010	74.3	72.5	<10
Amungee Nw 2H Flowback - duplicate		**BET-PW003**	**01 May 2023**	154	154	**2.09**	**2.03**	<0.0001	<0.0001	0.020	<0.010	<0.010	82	83	<0.10	<0.10	<0.010	<0.010	44.5	42.1	<10
Amungee NW-2H Flowbac	**Flowback**	**BET-PW003**	**10 Apr 2023**		96	**1.74**	**1.67**	<0.0001	<0.0001	0.039	**0.025**	0.016		63	<0.10	<0.10	<0.010	<0.010	26.3	24.2	<10
	Flowback		**05 Jun 2023**		211	**3.64**	**3.20**	0.0001	<0.0001	0.014	<0.010	<0.010		92	<0.10	<0.10	<0.010	<0.010	87.7	86.8	<10
	Flowback																				
	Flowback		**19 Jun 2023**		215	**3.39**	**3.00**	<0.0001	<0.0001	0.014	<0.010	<0.010		95	<0.10	<0.10	<0.010	<0.010	83.7	76.9	<10
	Flowback		**26 Jun 2023**		226	**3.63**	**3.58**	0.0002	<0.0001	0.014	<0.010	<0.010		88	<0.10	<0.10	<0.010	<0.010	104	104	<10
	Flowback		**03 Jul 2023**		228	**3.62**	**3.54**	<0.0001	<0.0001	0.011	<0.010	<0.010		88	<0.10	<0.10	<0.010	<0.010	103	110	<10
	Flowback		**10 Jul 2023**		283	**3.86**	**3.54**	0.0002	<0.0001	0.016	0.014	<0.010		110	<0.10	<0.10	<0.010	<0.010	103	121	<10
	Flowback		**15 Jul 2023**		321	**4.36**	**4.02**	0.0002	<0.0001	<0.010	<0.010	<0.010		120	<0.10	<0.10	<0.010	<0.010	125	138	<10
Amunge NW 2H Flowback	**Flowback**	**BET-PW003**	**12 Jun 2023**		212	**3.13**	**3.14**	<0.0001	<0.0001	0.014	0.014	<0.010		88	<0.10	<0.10	<0.010	<0.010	83.4	91.8	<10

Statistics

	Magnesium	Magnesium (filtered)	Manganese	Manganese (filtered)	Mercury	Mercury (filtered)	Molybdenum	Nickel	Nickel (filtered)	Potassium	Potassium (filtered)	Selenium	Selenium (filtered)	Silver	Silver (filtered)	Strontium	Strontium (filtered)	Thorium
Number of Results	1	15	15	15	17	15	15	15	15	1	15	15	15	15	15	15	15	15
Number of Detects	1	15	15	15	4	0	14	5	3	1	15	0	0	1	0	15	15	2
Minimum Concentration	154	41	0.841	0.823	0.0001	<0.0001	<0.01	0.003	0.002	82	42	<0.01	<0.01	<0.001	<0.001	8.05	7.81	4
Minimum Detect	154	41	0.841	0.823	0.0001	ND	0.011	0.003	0.002	82	42	ND	ND	0.002	ND	8.05	7.81	4
Maximum Concentration	154	321	4.36	4.02	<0.0005	<0.0001	0.049	0.025	0.016	82	120	<0.1	<0.1	<0.01	<0.01	125	138	17
Maximum Detect	154	321	4.36	4.02	0.0002	ND	0.049	0.025	0.016	82	120	ND	ND	0.002	ND	125	138	17
Average Concentration *		184	2.8	2.7	0.000091	0.00005	0.02	0.0073	0.0054		86	0.044	0.044	0.0045	0.0044	67	69	5.7
Geometric Average *	154	163	2.6	2.5	0.000073	0.00005	0.017	0.006	0.0049	82	83	0.037	0.037	0.004	0.0037	54	54	5.3
Median Concentration *	154	211	3.13	3	0.00005	0.00005	0.014	0.005	0.005	82	88	0.05	0.05	0.005	0.005	74.3	72.5	5
Standard Deviation *		77	1	0.95	0.000071	0	0.014	0.0059	0.0031		20	0.016	0.016	0.0013	0.0016	36	40	3.1
Geometric Standard Deviation *		1.8	1.6	1.6	1.9	1	1.8	1.8	1.5		1.3	2.2	2.2	1.9	2.2	2.2	2.4	1.4
95% UCL (Student's-t) *		219	3.26	3.09	0.00012134	0.00005	0.0266	0.00997	0.00679		95.48	0.0512	0.0512	0.00511	0.00512	83.68	87.49	7.156
% of Detects	100	100	100	100	24	0	93	33	20	100	100	0	0	7	0	100	100	13
% of Non-Detects	0	0	0	0	76	100	7	67	80	0	0	100	100	93	100	0	0	87

* A Non Detect Multiplier of 0.5 has been applied.

EQL = estimated quantiation limit
ug/L = micrograms per litre
mg/L = milligrams per litre
UCL = upper confidence limit

Table A-1
Amungee NW-2H Flowback Water Analytical Data
Amungee NW-2H Flowback Water Assessment
Tamboran

				Metals									NA		Organic				Organochlorine Pesticides		
				Thorium (filtered)	Tin	Tin (filtered)	Uranium	Uranium (filtered)	Vanadium	Vanadium (filtered)	Zinc	Zinc (filtered)	Formaldehyde	Propane	Dissolved Organic Carbon	Ethane	Methane	Total Organic Carbon	Other organochlorine pesticides EPAVic	4,4-DDE	a-BHC
				µg/L	mg/L	mg/L	µg/L	µg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L	mg/L	mg/L	µg/L	µg/L	µg/L
EQL	Sample type			1	0.001	0.001	1	1	0.01	0.01	0.005	0.005	0.1	0.01	1	10	0.01	1	0.5	0.5	0.5
Field ID		**Location Code**	**Date**																		
Amungee 2H Flowback	**Flowback**	**BET-PW003**	**27 Mar 2023**	<1	0.006	<0.001	<1	<1	<0.01	<0.01	0.013	0.012	**1.9**		302			356	<0.5	<0.5	<0.5
	Flowback																				
	Flowback		**02 Apr 2023**	<1	0.002	<0.001	<1	<1	0.01	<0.01	0.146	0.038	**3.3**		307			311	<0.5	<0.5	<0.5
Amungee Nw 2H Flowback	**Flowback**	**BET-PW003**	**01 May 2023**	<10	<0.010	<0.010	<10	<10	<0.10	<0.10	<0.052	<0.050	**1.7**		293			398	<2.5	<2.5	<2.5
	Flowback		**14 May 2023**	<10	<0.010	<0.010	<10	<10	<0.10	<0.10	<0.052	<0.050	**4.4**		220			309	<2.5	<2.5	<2.5
	Flowback		**22 May 2023**	<10	<0.010	<0.010	<10	<10	<0.10	<0.10	<0.052	<0.050	**1.2**		258			357	<24.8	<24.8	<24.8
	Flowback		**28 May 2023**																		
	Flowback		**29 May 2023**	<10	<0.010	<0.010	<10	<10	<0.10	<0.10	<0.052	<0.050	**5.8**		280			283	<24.2	<24.2	<24.2
Amungee Nw 2H Flowback - duplicate		**BET-PW003**	**01 May 2023**	<10	<0.010	<0.010	<10	<10	<0.10	<0.10	<0.052	<0.050	**1.0**		283			388			
Amungee NW-2H Flowbacl	**Flowback**	**BET-PW003**	**10 Apr 2023**	<10	<0.010	<0.010	<10	<10	<0.10	<0.10	<0.052	<0.050	**5.4**		283			345	<4.8	<4.8	<4.8
	Flowback		**05 Jun 2023**	<10	<0.010	<0.010	<10	<10	<0.10	<0.10	0.069	<0.050	**4.6**		358			386	<2.7	<2.7	<2.7
	Flowback																				
	Flowback		**19 Jun 2023**	<10	<0.010	<0.010	<10	<10	<0.10	<0.10	<0.052	<0.050	**5.2**		188			234	<2.9	<2.9	<2.9
	Flowback		**26 Jun 2023**	<10	<0.010	<0.010	<10	<10	<0.10	<0.10	<0.052	<0.050	**5.4**		260			391	<2.6	<2.6	<2.6
	Flowback		**03 Jul 2023**	<10	<0.010	<0.010	<10	<10	<0.10	<0.10	<0.052	<0.050	**5.4**		219			210	<2.5	<2.5	<2.5
	Flowback		**10 Jul 2023**	<10	<0.010	<0.010	<10	<10	<0.10	<0.10	<0.052	<0.050	**2.8**		221			322	<2.6	<2.6	<2.6
	Flowback		**15 Jul 2023**	<10	<0.010	<0.010	<10	<10	<0.10	<0.10	<0.052	<0.050	**4.5**		212			327	<2.7	<2.7	<2.7
Amunge NW 2H Flowback	**Flowback**	**BET-PW003**	**12 Jun 2023**	<10	<0.010	<0.010	<10	<10	<0.10	<0.10	<0.052	<0.050	**5.2**		195			255			
Statistics																					
Number of Results				**15**	**15**	**15**	**15**	**15**	**15**	**15**	**15**	**15**	**15**	**2**	**15**	**2**	**2**	**15**	**13**	**13**	**13**
Number of Detects				**0**	**2**	**0**	**0**	**0**	**1**	**0**	**3**	**2**	**15**	**0**	**15**	**0**	**0**	**15**	**0**	**0**	**0**
Minimum Concentration				**<1**	**0.002**	**<0.001**	**<1**	**<1**	**0.01**	**<0.01**	**0.013**	**0.012**	**1**	**<0.01**	**188**	**<10**	**<0.01**	**210**	**<0.5**	**<0.5**	**<0.5**
Minimum Detect				**ND**	**0.002**	**ND**	**ND**	**ND**	**0.01**	**ND**	**0.013**	**0.012**	**1**	**ND**	**188**	**ND**	**ND**	**210**	**ND**	**ND**	**ND**
Maximum Concentration				**<10**	**<0.01**	**<0.01**	**<10**	**<10**	**<0.1**	**<0.1**	**0.146**	**<0.05**	**5.8**	**<0.01**	**358**	**<10**	**<0.01**	**398**	**<24.8**	**<24.8**	**<24.8**
Maximum Detect				**ND**	**0.006**	**ND**	**ND**	**ND**	**0.01**	**ND**	**0.146**	**0.038**	**5.8**	**ND**	**358**	**ND**	**ND**	**398**	**ND**	**ND**	**ND**
Average Concentration *				**4.4**	**0.0049**	**0.0044**	**4.4**	**4.4**	**0.044**	**0.044**	**0.036**	**0.025**	**3.9**	**0.005**	**259**	**5**	**0.005**	**325**	**2.9**	**2.9**	**2.9**
Geometric Average *				**3.7**	**0.0048**	**0.0037**	**3.7**	**3.7**	**0.039**	**0.037**	**0.03**	**0.024**	**3.4**	**0.005**	**254**	**5**	**0.005**	**319**	**1.5**	**1.5**	**1.5**
Median Concentration *				**5**	**0.005**	**0.005**	**5**	**5**	**0.05**	**0.05**	**0.026**	**0.025**	**4.5**	**0.005**	**260**	**5**	**0.005**	**327**	**1.3**	**1.3**	**1.3**
Standard Deviation *				**1.6**	**0.00083**	**0.0016**	**1.6**	**1.6**	**0.015**	**0.016**	**0.033**	**0.0049**	**1.7**	**0**	**48**	**0**	**0**	**59**	**4.2**	**4.2**	**4.2**
Geometric Standard Deviation *				**2.2**	**1.3**	**2.2**	**2.2**	**2.2**	**2**	**2.2**	**1.7**	**1.3**	**1.8**	**1**	**1.2**	**1**	**1**	**1.2**	**3.1**	**3.1**	**3.1**
95% UCL (Student's-t) *				**5.12**	**0.00525**	**0.00512**	**5.12**	**5.12**	**0.0511**	**0.0512**	**0.0508**	**0.0272**	**4.631**	**0.005**	**280.5**	**5**	**0.005**	**351.5**	**4.98**	**4.98**	**4.98**
% of Detects				**0**	**13**	**0**	**0**	**0**	**7**	**0**	**20**	**13**	**100**	**0**	**100**	**0**	**0**	**100**	**0**	**0**	**0**
% of Non-Detects				**100**	**87**	**100**	**100**	**100**	**93**	**100**	**80**	**87**	**0**	**100**	**0**	**100**	**100**	**0**	**100**	**100**	**100**

* A Non Detect Multiplier of 0.5 has been applied.

EQL = estimated quantiation limit
ug/L = micrograms per litre
mg/L = milligrams per litre
UCL = upper confidence limit

EHS Support

Table A-1
Amungee NW-2H Flowback Water Analytical Data
Amungee NW-2H Flowback Water Assessment
Tamboran

				Organochlorine Pesticides																	
				Aldrin	Aldrin + Dieldrin	b-BHC	Chlordane	Chlordane (cis)	Chlordane (trans)	d-BHC	DDD	DDT	DDT+DDE+DDD	Dieldrin	Endosulfan I	Endosulfan II	Endosulfan sulphate	Endrin	Endrin aldehyde	g-BHC (Lindane)	Heptachlor
				µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
EQL	Sample type			0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	2	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Field ID		**Location Code**	**Date**																		
Amungee 2H Flowback	**Flowback**	**BET-PW003**	**27 Mar 2023**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2.0	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Flowback																				
	Flowback		**02 Apr 2023**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2.0	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Amungee Nw 2H Flowback	**Flowback**	**BET-PW003**	**01 May 2023**	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5
	Flowback		**14 May 2023**	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5
	Flowback		**22 May 2023**	<24.8	<24.8	<24.8	<24.8	<24.8	<24.8	<24.8	<24.8	<24.8	<24.8	<24.8	<24.8	<24.8	<24.8	<24.8	<24.8	<24.8	<24.8
	Flowback		**28 May 2023**																		
	Flowback		**29 May 2023**	<24.2	<24.2	<24.2	<24.2	<24.2	<24.2	<24.2	<24.2	<24.2	<24.2	<24.2	<24.2	<24.2	<24.2	<24.2	<24.2	<24.2	<24.2
Amungee Nw 2H Flowback - duplicate		**BET-PW003**	**01 May 2023**																		
Amungee NW-2H Flowbac	**Flowback**	**BET-PW003**	**10 Apr 2023**	<4.8	<4.8	<4.8	<4.8	<4.8	<4.8	<4.8	<4.8	<4.8	<4.8	<4.8	<4.8	<4.8	<4.8	<4.8	<4.8	<4.8	<4.8
	Flowback		**05 Jun 2023**	<2.7	<2.7	<2.7	<2.7	<2.7	<2.7	<2.7	<2.7	<2.7	<2.7	<2.7	<2.7	<2.7	<2.7	<2.7	<2.7	<2.7	<2.7
	Flowback																				
	Flowback		**19 Jun 2023**	<2.9	<2.9	<2.9	<2.9	<2.9	<2.9	<2.9	<2.9	<2.9	<2.9	<2.9	<2.9	<2.9	<2.9	<2.9	<2.9	<2.9	<2.9
	Flowback		**26 Jun 2023**	<2.6	<2.6	<2.6	<2.6	<2.6	<2.6	<2.6	<2.6	<2.6	<2.6	<2.6	<2.6	<2.6	<2.6	<2.6	<2.6	<2.6	<2.6
	Flowback		**03 Jul 2023**	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5
	Flowback		**10 Jul 2023**	<2.6	<2.6	<2.6	<2.6	<2.6	<2.6	<2.6	<2.6	<2.6	<2.6	<2.6	<2.6	<2.6	<2.6	<2.6	<2.6	<2.6	<2.6
	Flowback		**15 Jul 2023**	<2.7	<2.7	<2.7	<2.7	<2.7	<2.7	<2.7	<2.7	<2.7	<2.7	<2.7	<2.7	<2.7	<2.7	<2.7	<2.7	<2.7	<2.7
Amunge NW 2H Flowback	**Flowback**	**BET-PW003**	**12 Jun 2023**																		

Statistics

Statistic	Aldrin	Aldrin + Dieldrin	b-BHC	Chlordane	Chlordane (cis)	Chlordane (trans)	d-BHC	DDD	DDT	DDT+DDE+DDD	Dieldrin	Endosulfan I	Endosulfan II	Endosulfan sulphate	Endrin	Endrin aldehyde	g-BHC (Lindane)	Heptachlor
Number of Results	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13
Number of Detects	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Minimum Concentration	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Minimum Detect	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Maximum Concentration	<24.8	<24.8	<24.8	<24.8	<24.8	<24.8	<24.8	<24.8	<24.8	<24.8	<24.8	<24.8	<24.8	<24.8	<24.8	<24.8	<24.8	<24.8
Maximum Detect	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Average Concentration *	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	3	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9
Geometric Average *	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.9	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Median Concentration *	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3
Standard Deviation *	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.1	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2
Geometric Standard Deviation *	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	2.4	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1
95% UCL (Student's-t) *	4.98	4.98	4.98	4.98	4.98	4.98	4.98	4.98	5.061	4.98	4.98	4.98	4.98	4.98	4.98	4.98	4.98	4.98
% of Detects	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% of Non-Detects	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100

* A Non Detect Multiplier of 0.5 has been applied.

EQL = estimated quantiation limit
ug/L = micrograms per litre
mg/L = milligrams per litre
UCL = upper confidence limit

Table A-1
Amungee NW-2H Flowback Water Analytical Data
Amungee NW-2H Flowback Water Assessment
Tamboran

				Organochlorine Pesticides		PAH															
				Heptachlor epoxide	Methoxychlor	Benzo(b+j+k)fluoranthene	Acenaphthene	Acenaphthylene	Anthracene	Benzo(a)anthracene	Benzo(a) pyrene	Benzo(b+j)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	Naphthalene	Phenanthrene
				µg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
EQL	Sample type			0.5	2	0.001	1	1	1	1	0.5	0.001	1	1	1	1	1	1	1	1	1
Field ID		**Location Code**	**Date**																		
Amungee 2H Flowback	**Flowback**	**BET-PW003**	**27 Mar 2023**	<0.5	<2.0	<0.0010	<1.0	<1.0	<1.0	<1.0	<0.5	<0.0010	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
	Flowback																				
	Flowback		**02 Apr 2023**	<0.5	<2.0	<0.0010	<1.0	<1.0	<1.0	<1.0	<0.5	<0.0010	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Amungee Nw 2H Flowback	**Flowback**	**BET-PW003**	**01 May 2023**	<2.5	<2.5	<0.0050	<2.5	<2.5	<2.5	<2.5	<2.5	<0.0476	<2.5	<47.6	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5
	Flowback		**14 May 2023**	<2.5	<2.5	<0.0051	<2.5	<2.5	<2.5	<2.0	<2.5	<0.0472	<2.0	<47.2	<2.0	<2.0	<2.5	<2.5	<2.0	<2.5	<2.5
	Flowback		**22 May 2023**	<24.8	<24.8	<0.0496	<24.8	<24.8	<24.8	<19.8	<24.8	<0.0476	<19.8	<47.6	<19.8	<19.8	<24.8	<24.8	<19.8	<24.8	<24.8
	Flowback		**28 May 2023**																		
	Flowback		**29 May 2023**	<24.2	<24.2	<0.0484	<24.2	<24.2	<24.2	<19.4	<24.2	<0.0476	<19.4	<47.6	<19.4	<19.4	<24.2	<24.2	<19.4	<24.2	<24.2
Amungee Nw 2H Flowback - duplicate		**BET-PW003**	**01 May 2023**				<47.6	<47.6	<47.6	<47.6	<47.6	<0.0476	<47.6	<47.6	<47.6	<47.6	<47.6	<47.6	<47.6	<47.6	<47.6
Amungee NW-2H Flowbacl	**Flowback**	**BET-PW003**	**10 Apr 2023**	<4.8	<4.8	<0.0096	<4.8	<4.8	<4.8	<3.8	<4.8	<0.0472	<3.8	<47.2	<3.8	<3.8	<4.8	<4.8	<3.8	<4.8	<4.8
	Flowback		**05 Jun 2023**	<2.7	<2.7	<0.0054	<2.7	<2.7	<2.7	<2.2	<2.7	<0.0556	<2.2	<55.6	<2.2	<2.2	<2.7	<2.7	<2.2	<2.7	<2.7
	Flowback																				
	Flowback		**19 Jun 2023**	<2.9	<2.9	<0.0059	<2.9	<2.9	<2.9	<2.9	<2.9	<0.0472	<2.9	<47.2	<2.9	<2.9	<2.9	<2.9	<2.9	<2.9	<2.9
	Flowback		**26 Jun 2023**	<2.6	<2.6	<0.0053	<2.6	<2.6	<2.6	<2.6	<2.6	<0.0490	<2.6	<49.0	<2.6	<2.6	<2.6	<2.6	<2.6	<2.6	<2.6
	Flowback		**03 Jul 2023**	<2.5	<2.5	<0.0050	<2.5	<2.5	<2.5	<2.5	<2.5	<0.0490	<2.5	<49.0	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5
	Flowback		**10 Jul 2023**	<2.6	<2.6	<0.0051	<2.6	<2.6	<2.6	<2.6	<2.6	<0.0476	<2.6	<47.6	<2.6	<2.6	<2.6	<2.6	<2.6	<2.6	<2.6
	Flowback		**15 Jul 2023**	<2.7	<2.7	<0.0053	<2.7	<2.7	<2.7	<2.7	<2.7	<0.0476	<2.7	<47.6	<2.7	<2.7	<2.7	<2.7	<2.7	<2.7	<2.7
Amunge NW 2H Flowback	**Flowback**	**BET-PW003**	**12 Jun 2023**				<47.6	<47.6	<47.6	<47.6	<47.6	<0.0476	<47.6	<47.6	<47.6	<47.6	<47.6	<47.6	<47.6	<47.6	<47.6

Statistics

	Heptachlor epoxide	Methoxychlor	Benzo(b+j+k)fluoranthene	Acenaphthene	Acenaphthylene	Anthracene	Benzo(a)anthracene	Benzo(a) pyrene	Benzo(b+j)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	Naphthalene	Phenanthrene
Number of Results	**13**	**13**	**13**	**17**	**17**	**17**	**17**	**17**	**17**	**17**	**17**	**17**	**17**	**17**	**17**	**17**	**17**	**17**
Number of Detects	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Minimum Concentration	**<0.5**	**<2**	**<0.001**	**<1**	**<1**	**<1**	**<1**	**<0.5**	**<0.001**	**<1**	**<1**	**<1**	**<1**	**<1**	**<1**	**<1**	**<1**	**<1**
Minimum Detect	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**
Maximum Concentration	**<24.8**	**<24.8**	**<0.0496**	**<50**	**<50**	**<50**	**<50**	**<50**	**<0.0556**	**<50**	**<55.6**	**<50**	**<50**	**<50**	**<50**	**<50**	**<50**	**<50**
Maximum Detect	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**
Average Concentration *	**2.9**	**3**	**0.0058**	**8**	**8**	**8**	**7.7**	**8**	**0.021**	**7.7**	**21**	**7.7**	**7.7**	**8**	**8**	**7.7**	**8**	**8**
Geometric Average *	**1.5**	**1.9**	**0.003**	**3.1**	**3.1**	**3.1**	**2.9**	**2.9**	**0.015**	**2.9**	**15**	**2.9**	**2.9**	**3.1**	**3.1**	**2.9**	**3.1**	**3.1**
Median Concentration *	**1.3**	**1.3**	**0.00265**	**1.35**	**1.35**	**1.35**	**1.35**	**1.35**	**0.0238**	**1.35**	**23.8**	**1.35**	**1.35**	**1.35**	**1.35**	**1.35**	**1.35**	**1.35**
Standard Deviation *	**4.2**	**4.1**	**0.0084**	**10**	**10**	**10**	**10**	**10**	**0.008**	**10**	**8**	**10**	**10**	**10**	**10**	**10**	**10**	**10**
Geometric Standard Deviation *	**3.1**	**2.4**	**3.1**	**4.2**	**4.2**	**4.2**	**4.2**	**4.8**	**3.6**	**4.2**	**3.6**	**4.2**	**4.2**	**4.2**	**4.2**	**4.2**	**4.2**	**4.2**
95% UCL (Student's-t) *	**4.98**	**5.061**	**0.00996**	**12.25**	**12.25**	**12.25**	**11.88**	**12.23**	**0.0249**	**11.88**	**24.85**	**11.88**	**11.88**	**12.25**	**12.25**	**11.88**	**12.25**	**12.25**
% of Detects	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
% of Non-Detects	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

* A Non Detect Multiplier of 0.5 has been applied.

EQL = estimated quantiation limit
ug/L = micrograms per litre
mg/L = milligrams per litre
UCL = upper confidence limit

Table A-1
Amungee NW-2H Flowback Water Analytical Data
Amungee NW-2H Flowback Water Assessment
Tamboran

				PAH			Phenols														
				Pyrene	Benzo(a)pyrene TEQ calc (Zero)	PAHs (Sum of total)	3&4-Methylphenol (m&p-cresol)	2,3,5,6-Tetrachlorophenol	2,4,5-Trichlorophenol	2,4,6-Trichlorophenol	2,4-Dichlorophenol	2,4-Dimethylphenol	2,4-Dinitrophenol	2,6-Dichlorophenol	2,3,4,5 & 2,3,4,6-Tetrachlorophenol	2-Chlorophenol	2-Methylphenol	2-Nitrophenol	4,6-Dinitro-2-methylphenol	4,6-Dinitro-o-cyclohexyl phenol	4-chloro-3-methylphenol
				µg/L	mg/L	µg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L	mg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
EQL	Sample type			1	0.0005	0.5	4	0.002	2	2	2	4	0.1	2	0.002	2	4	4	50	50	4
Field ID		**Location Code**	**Date**																		
Amungee 2H Flowback	**Flowback**	**BET-PW003**	**27 Mar 2023**	<1.0	<0.0005	<0.5	<4	<0.002	<2	<2	<2	<4	<0.1	<2	<0.002	<2	<4	<4	<50	<50	<4
	Flowback																				
	Flowback		**02 Apr 2023**	<1.0	<0.0005	<0.5	<4	<0.002	<2	<2	<2	<4	<0.1	<2	<0.002	<2	<4	<4	<50	<50	<4
Amungee Nw 2H Flowback	**Flowback**	**BET-PW003**	**01 May 2023**	<2.5	<0.0012	<1.2	<5	<0.002	<2	<2	<2	<4	<0.1	<2	<0.005	<2	<4	<4	<100	<100	<4
	Flowback		**14 May 2023**	<2.5	<0.0013	<1.3	<5	<0.002	<2	<2	<2	<4	<0.1	<2	<0.005	<2	<4	<4	<100	<100	<4
	Flowback		**22 May 2023**	<24.8	<0.0124	<12.4	<50	<0.025	<25	<25	<25	<25	<0.99	<25	<0.05	<25	<25	<25	<990	<990	<25
	Flowback		**28 May 2023**																		
	Flowback		**29 May 2023**	<24.2	<0.0121	<12.1	<48	<0.024	<24	<24	<24	<24	<0.97	<24	<0.048	<24	<24	<24	<970	<970	<24
Amungee Nw 2H Flowback - duplicate		**BET-PW003**	**01 May 2023**	<47.6	<0.0238	<23.8															
Amungee NW-2H Flowbacl	**Flowback**	**BET-PW003**	**10 Apr 2023**	<4.8	<0.0024	<2.4	<10	<0.005	<5	<5	<5	<5	<0.19	<5	<0.01	<5	<5	<5	<190	<190	<5
	Flowback		**05 Jun 2023**	<2.7	<0.0014	<1.4	<5	<0.003	<3	<3	<3	<4	<0.11	<3	<0.005	<3	<4	<4	<110	<110	<4
	Flowback																				
	Flowback		**19 Jun 2023**	<2.9	<0.0015	<1.5	<6	<0.003	<3	<3	<3	<4	<0.12	<3	<0.006	<3	<4	<4	<120	<120	<4
	Flowback		**26 Jun 2023**	<2.6	<0.0013	<1.3	6	<0.003	<3	<3	<3	<4	<0.1	<3	<0.005	<3	<4	<4	<100	<100	<4
	Flowback		**03 Jul 2023**	<2.5	<0.0012	<1.2	6	<0.002	<2	<2	<2	<4	<0.1	<2	<0.005	<2	<4	<4	<100	<100	<4
	Flowback		**10 Jul 2023**	<2.6	<0.0013	<1.3	<5	<0.002	<2	<2	<2	<4	<0.1	<2	<0.005	<2	<4	<4	<100	<100	<4
	Flowback		**15 Jul 2023**	<2.7	<0.0013	<1.3	<5	<0.003	<3	<3	<3	<4	<0.11	<3	<0.005	<3	<4	<4	<110	<110	<4
Amunge NW 2H Flowback	**Flowback**	**BET-PW003**	**12 Jun 2023**	<47.6	<0.0238	<23.8															

Statistics

	Pyrene	Benzo(a)pyrene TEQ calc (Zero)	PAHs (Sum of total)	3&4-Methylphenol (m&p-cresol)	2,3,5,6-Tetrachlorophenol	2,4,5-Trichlorophenol	2,4,6-Trichlorophenol	2,4-Dichlorophenol	2,4-Dimethylphenol	2,4-Dinitrophenol	2,6-Dichlorophenol	2,3,4,5 & 2,3,4,6-Tetrachlorophenol	2-Chlorophenol	2-Methylphenol	2-Nitrophenol	4,6-Dinitro-2-methylphenol	4,6-Dinitro-o-cyclohexyl phenol	4-chloro-3-methylphenol
Number of Results	**17**	**17**	**17**	**13**	**13**	**13**	**13**	**13**	**13**	**13**	**13**	**13**	**13**	**13**	**13**	**13**	**13**	**13**
Number of Detects	**0**	**0**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Minimum Concentration	**<1**	**<0.0005**	**<0.5**	**<4**	**<0.002**	**<2**	**<2**	**<2**	**<4**	**<0.1**	**<2**	**<0.002**	**<2**	**<4**	**<4**	**<50**	**<50**	**<4**
Minimum Detect	**ND**	**ND**	**ND**	**6**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**
Maximum Concentration	**<50**	**<0.025**	**<25**	**<50**	**<0.025**	**<25**	**<25**	**<25**	**<25**	**<0.99**	**<25**	**<0.05**	**<25**	**<25**	**<25**	**<990**	**<990**	**<25**
Maximum Detect	**ND**	**ND**	**ND**	**6**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**
Average Concentration *	**8**	**0.004**	**4**	**6.6**	**0.003**	**3**	**3**	**3**	**3.6**	**0.12**	**3**	**0.0059**	**3**	**3.6**	**3.6**	**119**	**119**	**3.6**
Geometric Average *	**3.1**	**0.0016**	**1.6**	**4.2**	**0.0018**	**1.8**	**1.8**	**1.8**	**2.7**	**0.077**	**1.8**	**0.0033**	**1.8**	**2.7**	**2.7**	**69**	**69**	**2.7**
Median Concentration *	**1.35**	**0.0007**	**0.7**	**2.5**	**0.0015**	**1.5**	**1.5**	**1.5**	**2**	**0.05**	**1.5**	**0.0025**	**1.5**	**2**	**2**	**50**	**50**	**2**
Standard Deviation *	**10**	**0.005**	**5**	**8.1**	**0.0041**	**4.1**	**4.1**	**4.1**	**3.8**	**0.16**	**4.1**	**0.0083**	**4.1**	**3.8**	**3.8**	**166**	**166**	**3.8**
Geometric Standard Deviation *	**4.2**	**4.3**	**4.3**	**2.4**	**2.5**	**2.5**	**2.5**	**2.5**	**2**	**2.3**	**2.5**	**2.7**	**2.5**	**2**	**2**	**2.5**	**2.5**	**2**
95% UCL (Student's-t) *	**12.25**	**0.00613**	**6.127**	**10.57**	**0.00504**	**5.041**	**5.041**	**5.041**	**5.512**	**0.204**	**5.041**	**0.01**	**5.041**	**5.512**	**5.512**	**200.7**	**200.7**	**5.512**
% of Detects	**0**	**0**	**0**	**15**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
% of Non-Detects	**100**	**100**	**100**	**85**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

* A Non Detect Multiplier of 0.5 has been applied.

EQL = estimated quantiation limit
ug/L = micrograms per litre
mg/L = milligrams per litre
UCL = upper confidence limit

Table A-1
Amungee NW-2H Flowback Water Analytical Data
Amungee NW-2H Flowback Water Assessment
Tamboran

				Phenols						Phthalates	Radionuclides			TPH					TRH		
				4-Nitrophenol	Cresol Total	Pentachlorophenol	Phenol	Phenols (halogenated) EPAVic	Phenols (non-halogenated) EPAVic	Bis(2-ethylhexyl) phthalate	Gross Beta Activity - K40	Gross alpha activity	Gross beta activity	C6-C9 Fraction	C10-C14 Fraction	C15-C28 Fraction	C29-C36 Fraction	C10-C36 Fraction (Sum)	C6-C10 Fraction (F1)	C6-C10 (F1 minus BTEX)	>C10-C16 Fraction (F2)
				µg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	Bq/L	-	-	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
EQL	Sample type			50	0.004	2	4	2	4	10	0.1	0	0	20	50	100	50	50	20	20	100
Field ID		**Location Code**	**Date**																		
Amungee 2H Flowback	**Flowback**	**BET-PW003**	**27 Mar 2023**	<50	<0.004	<2	<4	<2	<4	<10				90	180	700	<50	880	80	70	600
	Flowback										<0.52	<0.26	1.4								
	Flowback		**02 Apr 2023**	<50	<0.004	<2	<4	<2	<4	<10	<0.67	1.39	2.17	170	510	2,190	360	3,060	170	160	950
Amungee Nw 2H Flowback	**Flowback**	**BET-PW003**	**01 May 2023**	<100	<0.025	<5	<4	<10	<10	<10	3.73	4.14	5.82	80	511,000	202,000	180	713,000	80	80	700,000
	Flowback		**14 May 2023**	<100	<0.025	<5	<4	<10	<10	<10	2.17	4.46	5.64	50	369,000	118,000	3,150	490,000	60	60	476,000
	Flowback		**22 May 2023**	<990	<0.248	<50	<25	<99	<99	<20	6.94	12.4	11	100	242,000	63,600	50	306,000	110	110	300,000
	Flowback		**28 May 2023**																		
	Flowback		**29 May 2023**	<970	<0.242	<48	<24	<97	<97	<19	5.56	10.1	9.23	120	613,000	590,000	60	1,200,000	130	130	1,050,000
Amungee Nw 2H Flowback - duplicate		**BET-PW003**	**01 May 2023**								3.73	4	6.59	80	380,000	86,200	100	466,000	90	90	467,000
Amungee NW-2H Flowbac	**Flowback**	**BET-PW003**	**10 Apr 2023**	<190	<0.048	<10	<5	<19	<19	<10	0.9	1.85	2.96	150	418,000	71,300	170	489,000	190	190	479,000
	Flowback		**05 Jun 2023**	<110	<0.027	<5	<4	<11	<11	<10				140	626,000	163,000	<670	789,000	130	130	767,000
	Flowback										7.62	17	11.1								
	Flowback		**19 Jun 2023**	<120	<0.029	<6	19	<12	19	<10	7.64	14.3	9.88	100	258,000	53,900	<1,420	312,000	120	120	305,000
	Flowback		**26 Jun 2023**	<100	<0.026	<5	12	<10	18	<10	8.11	19.1	9.95	<100	282,000	53,600	<50	336,000	<100	<100	322,000
	Flowback		**03 Jul 2023**	<100	<0.025	<5	12	<10	18	<10	10.4	24.1	10.4	<100	604,000	63,200	<50	667,000	<100	<100	651,000
	Flowback		**10 Jul 2023**	<100	<0.026	<5	<4	<10	<10	**30**	7.1	27.9	13.4	60	549,000	303,000	160	852,000	70	70	825,000
	Flowback		**15 Jul 2023**	<110	<0.027	<5	<4	<11	<11	<10	8.89	29.6	15.2	70	175,000	69,500	<50	244,000	80	80	229,000
Amunge NW 2H Flowback	**Flowback**	**BET-PW003**	**12 Jun 2023**											200	410,000	94,100	<570	504,000	190	190	484,000
											6.03	14	8.37								

Statistics

Number of Results	**13**	**13**	**13**	**13**	**13**	**13**	**13**	**16**	**16**	**16**	**17**	**17**	**17**	**17**	**17**	**17**	**17**	**17**
Number of Detects	**0**	**0**	**0**	**3**	**0**	**3**	**1**	**14**	**15**	**16**	**15**	**17**	**17**	**9**	**17**	**15**	**15**	**17**
Minimum Concentration	**<50**	**<0.004**	**<2**	**<4**	**<2**	**<4**	**<10**	**<0.52**	**<0.26**	**0**	**50**	**180**	**700**	**50**	**880**	**60**	**60**	**600**
Minimum Detect	**ND**	**ND**	**ND**	**12**	**ND**	**18**	**30**	**0.9**	**1.39**	**1.4**	**50**	**180**	**700**	**50**	**880**	**60**	**60**	**600**
Maximum Concentration	**<990**	**<0.248**	**<50**	**<25**	**<99**	**<99**	**30**	**10.4**	**29.6**	**15.2**	**200**	**626,000**	**590,000**	**7,470**	**1,200,000**	**360**	**360**	**1,050,000**
Maximum Detect	**ND**	**ND**	**ND**	**19**	**ND**	**19**	**30**	**10.4**	**29.6**	**15.2**	**200**	**626,000**	**590,000**	**7,470**	**1,200,000**	**360**	**360**	**1,050,000**
Average Concentration *	**119**	**0.029**	**5.9**	**6.5**	**12**	**15**	**7.7**	**5.4**	**11.2**	**0**	**104**	**364,982**	**115,064**	**781**	**480,467**	**122**	**121**	**460,268**
Geometric Average *	**69**	**0.015**	**3.3**	**4.2**	**6**	**8.9**	**6.4**	**3.7**	**0**	**0**	**94**	**164,226**	**49,252**	**165**	**248,297**	**106**	**105**	**219,504**
Median Concentration *	**50**	**0.013**	**2.5**	**2**	**5**	**5.5**	**5**	**6.485**	**10.1**	**0**	**90**	**380,000**	**69,500**	**160**	**489,000**	**110**	**110**	**476,000**
Standard Deviation *	**166**	**0.042**	**8.3**	**6.1**	**17**	**16**	**6.9**	**3.5**	**0**	**0**	**48**	**204,527**	**144,998**	**1,876**	**309,932**	**76**	**76**	**285,993**
Geometric Standard Deviation *	**2.5**	**3.3**	**2.7**	**2.6**	**3.1**	**2.9**	**1.7**	**5.2**			**1.6**	**11**	**5.6**	**5.2**	**7.1**	**1.7**	**1.7**	**8.9**
95% UCL (Student's-t) *	**200.7**	**0.0498**	**9.997**	**9.457**	**19.91**	**22.87**	**11.09**	**9.507**	**0**	**0**	**124**	**451,587**	**176,462**	**1,576**	**611,704**	**154.4**	**153.2**	**581,368**
% of Detects	**0**	**0**	**0**	**23**	**0**	**23**	**8**	**88**	**94**	**100**	**88**	**100**	**100**	**53**	**100**	**88**	**88**	**100**
% of Non-Detects	**100**	**100**	**100**	**77**	**100**	**77**	**92**	**13**	**6**	**0**	**12**	**0**	**0**	**47**	**0**	**12**	**12**	**0**

* A Non Detect Multiplier of 0.5 has been applied.

EQL = estimated quantiation limit
ug/L = micrograms per litre
mg/L = milligrams per litre
UCL = upper confidence limit

Table A-1
Amungee NW-2H Flowback Water Analytical Data
Amungee NW-2H Flowback Water Assessment
Tamboran

				TRH				VOCs
				>C10-C16 Fraction (F2 minus Naphthalene)	>C16-C34 Fraction (F3)	>C34-C40 Fraction (F4)	>C10-C40 Fraction (Sum)	Acrylamide
				µg/L	µg/L	µg/L	µg/L	µg/L
EQL	Sample type			100	100	100	100	0.2
Field ID		**Location Code**	**Date**					
Amungee 2H Flowback	**Flowback**	**BET-PW003**	**27 Mar 2023**	600	290	<100	890	
	Flowback							
	Flowback		**02 Apr 2023**	950	2,030	<100	2,980	
Amungee Nw 2H Flowback	**Flowback**	**BET-PW003**	**01 May 2023**	700,000	17,700	<100	718,000	**51.5**
	Flowback		**14 May 2023**	476,000	18,400	1,270	496,000	**35.2**
	Flowback		**22 May 2023**	300,000	8,860	<100	309,000	
	Flowback		**28 May 2023**					
	Flowback		**29 May 2023**	1,050,000	160,000	<100	1,210,000	
Amungee Nw 2H Flowback - duplicate		**BET-PW003**	**01 May 2023**	467,000	12,100	<100	479,000	**57.9**
Amungee NW-2H Flowbac	**Flowback**	**BET-PW003**	**10 Apr 2023**	479,000	4,560	<100	484,000	
	Flowback		**05 Jun 2023**	767,000	30,800	<670	798,000	
	Flowback							
	Flowback		**19 Jun 2023**	305,000	4,980	<1,420	310,000	
	Flowback		**26 Jun 2023**	322,000	11,900	<100	334,000	
	Flowback		**03 Jul 2023**	651,000	19,300	<100	670,000	
	Flowback		**10 Jul 2023**	825,000	61,600	<100	887,000	
	Flowback		**15 Jul 2023**	229,000	15,800	<100	245,000	
Amunge NW 2H Flowback	**Flowback**	**BET-PW003**	**12 Jun 2023**	484,000	19,300	<570	503,000	

Statistics

Number of Results	**17**	**17**	**17**	**17**	**3**
Number of Detects	**17**	**17**	**2**	**17**	**3**
Minimum Concentration	**600**	**290**	**<100**	**890**	**35.2**
Minimum Detect	**600**	**290**	**1,270**	**890**	**35.2**
Maximum Concentration	**1,050,000**	**160,000**	**5,600**	**1,210,000**	**57.9**
Maximum Detect	**1,050,000**	**160,000**	**5,600**	**1,210,000**	**57.9**
Average Concentration *	**460,268**	**23,599**	**524**	**484,345**	**48**
Geometric Average *	**219,504**	**10,771**	**123**	**249,159**	**47**
Median Concentration *	**476,000**	**12,100**	**50**	**484,000**	**51.5**
Standard Deviation *	**285,993**	**37,957**	**1,348**	**314,982**	**12**
Geometric Standard Deviation *	**8.9**	**4**	**4.3**	**7.1**	**1.3**
95% UCL (Student's-t) *	**581,368**	**39,671**	**1,094**	**617,721**	**67.93**
% of Detects	**100**	**100**	**12**	**100**	**100**
% of Non-Detects	**0**	**0**	**88**	**0**	**0**

* A Non Detect Multiplier of 0.5 has been applied.

EQL = estimated quantiation limit
ug/L = micrograms per litre
mg/L = milligrams per litre
UCL = upper confidence limit

Table A-2
Amungee NW-1H Flowback Water Analytical Data
Amungee NW-2H Flowback Water Assessment
Tamboran

				BTEX																														
			Naphthalene (VOC)	Benzene			Toluene			Ethylbenzene			Xylene (m & p)			Xylene (o)			Xylene Total	Total BTEX	1,1,1,2-tetrachloroethane		1,1,1-trichloroethane		1,1,2,2-tetrachloroethane		1,1,2-trichloroethane		1,1-dichloroethane		1,1-dichloroethene		1,1-dichloropropene	
			mg/L	µg/L	µg/m3	ng/tube	µg/L	µg/m3	ng/tube	µg/L	µg/m3	ng/tube	µg/L	µg/m3	ng total	µg/L	µg/m3	ng total	µg/L	µg/L	µg/m3	ng/tube	µg/m3	ng/tube	µg/m3	ng/tube	µg/m3	ng/tube	µg/m3	ng/tube	µg/m3	ng/tube	µg/m3	ng/tube
EQL			0.001	1	0		1	0		1	0		1	0		1	0		1	1	5		5		5		5		5		5		5	
Field ID	**Location Code**	**Date**																																
AMUNGEE NW-1H	**BET-PW001**	**15 Nov 2016**																																
AMUNGEE NW-1H Field dup	**BET-PW001**	**15 Nov 2016**																																
AMUNGEE NW-1H Field dup Mi180121	**BET-PW001**	**15 Nov 2016**			270			170			9.5			19			11				<5		<5		<5		<5		<5		<5		<5	
AMUNGEE NW-1H Field dup SC1109	**BET-PW001**	**15 Nov 2016**																																
AMUNGEE NW-1H Mi160415	**BET-PW001**	**15 Nov 2016**			260			160			10			24			13				<5		<5		<5		<5		<5		<5		<5	
AMUNGEE NW-1H SC1119	**BET-PW001**	**15 Nov 2016**																																
BET_PW001_Fe_15.3%	**BET-PW001**	**11 Nov 2016**		**3**			2			<2			<2			<2			<2	5														
BET_PW001_Fe_15.8%	**BET-PW001**	**17 Nov 2016**		**3**			2			<2			<2			<2			<2	5														
BET_PW001_Fe_16.0%	**BET-PW001**	**20 Nov 2016**		**3**			2			<2			<2			<2			<2	5														
BET-PW001	**BET-PW001**	**08 Sep 2021**		**3**			14			3			60			14			75	95														
BET-PW001_Fe14.1%	**BET-PW001**	**30 Oct 2016**		**3**			2			<2			<2			<2			<2	5														
BET-PW001_Fe14.5%	**BET-PW001**	**02 Nov 2016**		**4**			3			<2			<2			<2			<2	7														
BET-PW001_Fe14.8%	**BET-PW001**	**05 Nov 2016**		**3**			2			<2			<2			<2			<2	5														
BET-PW001_Fe15.1%	**BET-PW001**	**08 Nov 2016**		**3**			2			<2			<2			<2			<2	5														
BET-PW001_Fe_9	**BET-PW001**	**29 Sep 2016**		**4**			3			<2			2			<2			2	9														
BET-PW001_Fe_9.4	**BET-PW001**	**05 Oct 2016**		**7**			6			<2			2			<2			2	15														
BET-PW001_Fe_10.6	**BET-PW001**	**07 Oct 2016**		**3**			3			<2			<2			<2			<2	6														
BET-PW001_Fe_11.5%	**BET-PW001**	**15 Oct 2016**		**3**			2			<2			2			<2			2	7														
BET-PW001_Fe_12.5%	**BET-PW001**	**19 Oct 2016**		**4**			3			<2			<2			<2			<2	7														
BET-PW001_Fe_12.15%	**BET-PW001**	**17 Oct 2016**		**4**			3			<2			<2			<2			<2	7														
BET-PW001_Fe_13%	**BET-PW001**	**22 Oct 2016**		**4**			3			<2			<2			<2			<2	7														
BET-PW001_Fe_13.5%	**BET-PW001**	**25 Oct 2016**		**3**			2			<2			<2			<2			<2	5														
BET-PW001_Fe_16.2	**BET-PW001**	**23 Dec 2016**		**3**			2			<2			<2			<2			<2	5														
BET-PW001_Fe_16.5%	**BET-PW001**	**28 Dec 2016**		**2**			<2			<2			<2			<2			<2	2														
BET-PW001_FE_16.4	**BET-PW001**	**26 Dec 2016**		**2**			<2			<2			<2			<2			<2	2														
BET-PW001_FE_16.6%	**BET-PW001**	**30 Dec 2016**		**2**			<2			<2			<2			<2			<2	2														
BET-PW001 2209 Sep	**BET-PW001**	**22 Sep 2021**	0.076	**5**			48			10			180			42			230	290														
Trip Blank Mi101224	**BET-PW001**	**15 Nov 2016**				<5			<5			<5			<5			<5				<5		<5		<5		<5		<5		<5		<5

Table A-2
Amungee NW-1H Flowback Water Analytical Data
Amungee NW-2H Flowback Water Assessment
Tamboran

			Chlorinated Hydrocarbons																													
			1,2,3-trichloropropane		1,2-dibromo-3-chloropropane		1,2-dichloroethane		1,2-dichloropropane		1,3-dichloropropane		2,2-dichloropropane		Bromochloromethane		Bromodichloromethane		Bromoform		Carbon tetrachloride		Chlorodibromomethane		Chloroethane		Chloroform		Chloromethane		cis-1,2-dichloroethene	
			µg/m3	ng/tube	µg/m3	ng/tube	µg/m3	ng/tube	µg/m3	ng/tube	µg/m3	ng/tube	µg/m3	ng/tube	µg/m3	ng/tube	µg/m3	ng/tube	µg/m3	ng/tube	µg/m3	ng/tube	µg/m3	ng/tube	µg/m3	ng/tube	µg/m3	ng/tube	µg/m3	ng/tube	µg/m3	ng/tube
EQL			5		5		5		5		5		5		5		5		5		5		5		5		5		5		5	
Field ID	**Location Code**	**Date**																														
AMUNGEE NW-1H	**BET-PW001**	**15 Nov 2016**																														
AMUNGEE NW-1H Field dup	**BET-PW001**	**15 Nov 2016**																														
AMUNGEE NW-1H Field dup Mi180121	**BET-PW001**	**15 Nov 2016**	<5		<5		<5		<5		<5		<5		<5		<5		<5		<5		<5		<5		<5		<5		<5	
AMUNGEE NW-1H Field dup SC1109	**BET-PW001**	**15 Nov 2016**																														
AMUNGEE NW-1H Mi160415	**BET-PW001**	**15 Nov 2016**	<5		<5		<5		<5		<5		<5		<5		<5		<5		<5		<5		<5		<5		<5		<5	
AMUNGEE NW-1H SC1119	**BET-PW001**	**15 Nov 2016**																														
BET_PW001_Fe_15.3%	**BET-PW001**	**11 Nov 2016**																														
BET_PW001_Fe_15.8%	**BET-PW001**	**17 Nov 2016**																														
BET_PW001_Fe_16.0%	**BET-PW001**	**20 Nov 2016**																														
BET-PW001	**BET-PW001**	**08 Sep 2021**																														
BET-PW001_Fe14.1%	**BET-PW001**	**30 Oct 2016**																														
BET-PW001_Fe14.5%	**BET-PW001**	**02 Nov 2016**																														
BET-PW001_Fe14.8%	**BET-PW001**	**05 Nov 2016**																														
BET-PW001_Fe15.1%	**BET-PW001**	**08 Nov 2016**																														
BET-PW001_Fe_9	**BET-PW001**	**29 Sep 2016**																														
BET-PW001_Fe_9.4	**BET-PW001**	**05 Oct 2016**																														
BET-PW001_Fe_10.6	**BET-PW001**	**07 Oct 2016**																														
BET-PW001_Fe_11.5%	**BET-PW001**	**15 Oct 2016**																														
BET-PW001_Fe_12.5%	**BET-PW001**	**19 Oct 2016**																														
BET-PW001_Fe_12.15%	**BET-PW001**	**17 Oct 2016**																														
BET-PW001_Fe_13%	**BET-PW001**	**22 Oct 2016**																														
BET-PW001_Fe_13.5%	**BET-PW001**	**25 Oct 2016**																														
BET-PW001_Fe_16.2	**BET-PW001**	**23 Dec 2016**																														
BET-PW001_Fe_16.5%	**BET-PW001**	**28 Dec 2016**																														
BET-PW001_FE_16.4	**BET-PW001**	**26 Dec 2016**																														
BET-PW001_FE_16.6%	**BET-PW001**	**30 Dec 2016**																														
BET-PW001 2209 Sep	**BET-PW001**	**22 Sep 2021**																														
Trip Blank Mi101224	**BET-PW001**	**15 Nov 2016**		<5		<5		<5		<5		<5		<5		<5		<5		<5		<5		<5		<5		<5		<5		<5

Table A-2
Amungee NW-1H Flowback Water Analytical Data
Amungee NW-2H Flowback Water Assessment
Tamboran

																			Halogenated Benzenes													
			cis-1,3-dichloropropene		Dibromomethane		Hexachlorobutadiene		Trichloroethene		Tetrachloroethene		trans-1,2-dichloroethene		trans-1,3-dichloropropene		Vinyl chloride	Vinyl chloride	1,2,3-trichlorobenzene		1,2,4-trichlorobenzene		1,2-dichlorobenzene		1,3-dichlorobenzene		1,4-dichlorobenzene		2-chlorotoluene		4-chlorotoluene	
			µg/m3	ng/tube	µg/m3	ng/tube	µg/m3	ng/tube	µg/m3	ng/tube	µg/m3	ng/tube	µg/m3	ng/tube	µg/m3	ng/tube	µg/m3	ng/tube	µg/m3	ng/tube	µg/m3	ng/tube	µg/m3	ng/tube	µg/m3	ng/tube	µg/m3	ng/tube	µg/m3	ng/tube	µg/m3	ng/tube
EQL			5		5		5		5		5		5		5		5		5		5		5		5		5		5		5	
Field ID	**Location Code**	**Date**																														
AMUNGEE NW-1H	**BET-PW001**	**15 Nov 2016**																														
AMUNGEE NW-1H Field dup	**BET-PW001**	**15 Nov 2016**																														
AMUNGEE NW-1H Field dup Mi180121	**BET-PW001**	**15 Nov 2016**	<5		<5		<5		<5		<5		<5		<5		<5		<5		<5		<5		<5		<5		<5		<5	
AMUNGEE NW-1H Field dup SC1109	**BET-PW001**	**15 Nov 2016**																														
AMUNGEE NW-1H Mi160415	**BET-PW001**	**15 Nov 2016**	<5		<5		<5		<5		<5		<5		<5		<5		<5		<5		<5		<5		<5		<5		<5	
AMUNGEE NW-1H SC1119	**BET-PW001**	**15 Nov 2016**																														
BET_PW001_Fe_15.3%	**BET-PW001**	**11 Nov 2016**																														
BET_PW001_Fe_15.8%	**BET-PW001**	**17 Nov 2016**																														
BET_PW001_Fe_16.0%	**BET-PW001**	**20 Nov 2016**																														
BET-PW001	**BET-PW001**	**08 Sep 2021**																														
BET-PW001_Fe14.1%	**BET-PW001**	**30 Oct 2016**																														
BET-PW001_Fe14.5%	**BET-PW001**	**02 Nov 2016**																														
BET-PW001_Fe14.8%	**BET-PW001**	**05 Nov 2016**																														
BET-PW001_Fe15.1%	**BET-PW001**	**08 Nov 2016**																														
BET-PW001_Fe_9	**BET-PW001**	**29 Sep 2016**																														
BET-PW001_Fe_9.4	**BET-PW001**	**05 Oct 2016**																														
BET-PW001_Fe_10.6	**BET-PW001**	**07 Oct 2016**																														
BET-PW001_Fe_11.5%	**BET-PW001**	**15 Oct 2016**																														
BET-PW001_Fe_12.5%	**BET-PW001**	**19 Oct 2016**																														
BET-PW001_Fe_12.15%	**BET-PW001**	**17 Oct 2016**																														
BET-PW001_Fe_13%	**BET-PW001**	**22 Oct 2016**																														
BET-PW001_Fe_13.5%	**BET-PW001**	**25 Oct 2016**																														
BET-PW001_Fe_16.2	**BET-PW001**	**23 Dec 2016**																														
BET-PW001_Fe_16.5%	**BET-PW001**	**28 Dec 2016**																														
BET-PW001_FE_16.4	**BET-PW001**	**26 Dec 2016**																														
BET-PW001_FE_16.6%	**BET-PW001**	**30 Dec 2016**																														
BET-PW001 2209 Sep	**BET-PW001**	**22 Sep 2021**																														
Trip Blank Mi101224	**BET-PW001**	**15 Nov 2016**		<5		<5		<5		<5		<5		<5		<5		<5		<5		<5		<5		<5		<5		<5		<5

Table A-2
Amungee NW-1H Flowback Water Analytical Data
Amungee NW-2H Flowback Water Assessment
Tamboran

							Halogenated Hydrocarbons						Herbicides																					Ino
			Bromobenzene	Bromobenzene	Chlorobenzene	Chlorobenzene	1,2-dibromoethane	1,2-dibromoethane	Dichlorodifluoromethane	Dichlorodifluoromethane	Trichlorofluoromethane	Trichlorofluoromethane	Dinoseb	Filterable Reactive Phosphorus as PO4 (filtered)	Radon	Residual Alkali	Silicon as SiO2	Silicon as SiO2 (filtered)	Alkalinity (Bicarbonate as CaCO3)	Alkalinity (Bicarbonate)	Alkalinity (Carbonate)	Alkalinity (Carbonate as CaCO3)	Alkalinity (Hydroxide) as CaCO3	Alkalinity (total) as CaCO3	Ammonia (filtered)	Ammonia as N (filtered)	Anions Total	Bromide (filtered)	Cations Total	Chloride	Chloride (filtered)	Cyanide Total	Electrical Conductivity (Lab)	Fluoride
			µg/m3	ng/tube	µg/m3	ng/tube	µg/m3	ng/tube	µg/m3	ng/tube	µg/m3	ng/tube	µg/L	mg/L	Bq/m³	meq/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	meq/L	µg/L	meq/L	mg/L	mg/L	mg/L	µS/cm	mg/L
EQL			5		5		5		5		5		1	0.01		0.1	0.05	0.05	1			1	1	1	0.01	0.01	0.01	50	0.01	1	1	0.004	1	0.1
Field ID	**Location Code**	**Date**																																
AMUNGEE NW-1H	**BET-PW001**	**15 Nov 2016**																																
															225																			
AMUNGEE NW-1H Field dup	**BET-PW001**	**15 Nov 2016**																																
AMUNGEE NW-1H Field dup Mi180121	**BET-PW001**	**15 Nov 2016**	<5		<5		<5		<5		<5																							
AMUNGEE NW-1H Field dup SC1109	**BET-PW001**	**15 Nov 2016**																																
AMUNGEE NW-1H Mi160415	**BET-PW001**	**15 Nov 2016**	<5		<5		<5		<5		<5																							
AMUNGEE NW-1H SC1119	**BET-PW001**	**15 Nov 2016**																																
BET_PW001_Fe_15.3%	**BET-PW001**	**11 Nov 2016**																	364	444.08	0.6	<1	<1	364			639		599	22,400			54,400	1.1
BET_PW001_Fe_15.8%	**BET-PW001**	**17 Nov 2016**																	364	444.08	0.6	<1	<1	364			684		612	24,000			54,800	1.1
BET_PW001_Fe_16.0%	**BET-PW001**	**20 Nov 2016**																	390	475.8	0.6	<1	<1	390			685		617	24,000			54,900	1.1
BET-PW001	**BET-PW001**	**08 Sep 2021**											<1	1.3		<0.1	33	28	140	170.8		<5	<5	140	34	28		260,000			21,000	<0.04	59,600	
BET-PW001_Fe14.1%	**BET-PW001**	**30 Oct 2016**																	498	607.56	0.6	<1	<1	498			622		640	21,700			57,300	1.2
BET-PW001_Fe14.5%	**BET-PW001**	**02 Nov 2016**																	465	567.3	0.6	<1	<1	465			633		666	22,100			57,000	1.2
BET-PW001_Fe14.8%	**BET-PW001**	**05 Nov 2016**																	441	538.02	0.6	<1	<1	441			638		688	22,300			57,300	1.2
BET-PW001_Fe15.1%	**BET-PW001**	**08 Nov 2016**																	342	417.24	0.6	<1	<1	342			644		688	22,600			58,300	1.2
BET-PW001_Fe_9	**BET-PW001**	**29 Sep 2016**																	474	578.28	0.6	<1	<1	474			408		464	14,100			40,600	1.2
BET-PW001_Fe_9.4	**BET-PW001**	**05 Oct 2016**																	716	873.52	0.6	<1	<1	716			398		446	13,600			39,000	1.2
BET-PW001_Fe_10.6	**BET-PW001**	**07 Oct 2016**																	540	658.8	0.6	<1	<1	540			443		503	15,300			44,100	1.1
BET-PW001_Fe_11.5%	**BET-PW001**	**15 Oct 2016**																	506	617.32	0.6	<1	<1	506			524		610	18,200			49,000	1.1
BET-PW001_Fe_12.5%	**BET-PW001**	**19 Oct 2016**																	472	575.84	0.6	<1	<1	472			540		627	18,800			51,100	1.1
BET-PW001_Fe_12.15%	**BET-PW001**	**17 Oct 2016**																	474	578.28	0.6	<1	<1	474			526		593	18,300			50,500	1.1
BET-PW001_Fe_13%	**BET-PW001**	**22 Oct 2016**																	566	690.52	0.6	<1	<1	566			556		555	19,300			52,600	1.1
BET-PW001_Fe_13.5%	**BET-PW001**	**25 Oct 2016**																	556	678.32	0.6	<1	<1	556			575		551	20,000			53,500	1.1
BET-PW001_Fe_16.2	**BET-PW001**	**23 Dec 2016**																	377	459.94	0.6	<1	<1	377			628		674	22,000			51,700	1.0
BET-PW001_Fe_16.5%	**BET-PW001**	**28 Dec 2016**																	367	447.74	0.6	<1	<1	367			611		718	21,400			52,800	1.1
BET-PW001_FE_16.4	**BET-PW001**	**26 Dec 2016**																	371	452.62	0.6	<1	<1	371			684		686	24,000			52,300	1.1
BET-PW001_FE_16.6%	**BET-PW001**	**30 Dec 2016**																	384	468.48	0.6	<1	<1	384			724		713	25,400			52,300	1.1
BET-PW001 2209 Sep	**BET-PW001**	**22 Sep 2021**											<1	1.1		<0.1	16	14	460	561.2		<5	<5	460	27	22		190,000			15,000	<0.004	37,400	
Trip Blank Mi101224	**BET-PW001**	**15 Nov 2016**		<5		<5		<5		<5		<5																						

Table A-2
Amungee NW-1H Flowback Water Analytical Data
Amungee NW-2H Flowback Water Assessment
Tamboran

			rganics																								LSI / RSI		M								
			Fluoride (filtered)	Hydrogen sulfide	Ionic Balance	Ionic Balance (filtered)	Kjeldahl Nitrogen Total	Nitrate (as N)	Nitrite (as N)	Organic Nitrogen as N	Nitrogen (Total Oxidised)	Nitrogen (Total)		pH (Lab)	Total Phosphorus (Organic Phosphate)	Reactive Phosphorus as P (Orthophosphate as P) (filtered)	Sodium (filtered)	Sodium Absorption Ratio (filtered)	Sulphate (filtered)	Sulphur as S	Total Dissolved Solids (Calc.)	Total Dissolved Solids (Lab)	Total Dissolved Solids (Lab) (filtered)	Hardness as CaCO3 (filtered)	Total Suspended Solids (Lab)	Langelier Index (Saturation Index) (filtered)	Ryznar Index (filtered)	1,2,4-trimethylbenzene		1,3,5-trimethylbenzene		Isopropylbenzene		n-butylbenzene		
			mg/L	ppb	%	%	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	Mol %	-	mg/L	mg/L	mg/L	-	mg/L	ppbv	mg/L	mg/L	mg/L	mg/L	mg/L	-	-	µg/m3	ng/tube	µg/m3	ng/tube	µg/m3	ng/tube	µg/m3	ng/tube	µg/m3
EQL			0.1		-100	-100	0.05	0.01	0.01	0.05	0.01	0.1		0.01	0.01	0.005	0.5	0.2	1		1	1	1	1	5	-10	-10	0		5		5		5		5
Field ID	**Location Code**	**Date**																																		
AMUNGEE NW-1H	**BET-PW001**	**15 Nov 2016**											4.9																							
AMUNGEE NW-1H Field dup	**BET-PW001**	**15 Nov 2016**											3.9																							
AMUNGEE NW-1H Field dup Mi180121	**BET-PW001**	**15 Nov 2016**																										<5		<5		<5		<5		<5
AMUNGEE NW-1H Field dup SC1109	**BET-PW001**	**15 Nov 2016**		5,000																5,000																
AMUNGEE NW-1H Mi160415	**BET-PW001**	**15 Nov 2016**																										8.1		<5		<5		<5		<5
AMUNGEE NW-1H SC1119	**BET-PW001**	**15 Nov 2016**		10,000																10,000																
BET_PW001_Fe_15.3%	**BET-PW001**	**11 Nov 2016**			3.25		55.1				<0.01	55.1		6.5	<0.05		11,700		<10		35,400		44,200	4,410												
BET_PW001_Fe_15.8%	**BET-PW001**	**17 Nov 2016**			5.54		50.1				0.04	50.1		6.4	<0.05		11,900		<10		35,600		46,600	4,660												
BET_PW001_Fe_16.0%	**BET-PW001**	**20 Nov 2016**			5.23		54.8				<0.01	54.8		6.44	0.3		12,000		<10		35,700		49,200	4,650												
BET-PW001	**BET-PW001**	**08 Sep 2021**	<0.1			-9.4	37	<0.1	<0.1	8.3	<0.1			6.0	<0.02	0.42	8,800	53	2				35,000		72	-0.4	6.8									
BET-PW001_Fe14.1%	**BET-PW001**	**30 Oct 2016**			1.46		57.3				0.02	57.3		6.47	0.16		12,700		<10		37,200		45,500	4,310												
BET-PW001_Fe14.5%	**BET-PW001**	**02 Nov 2016**			2.56		55.5				0.01	55.5		6.43	0.12		13,200		<10		37,000		45,300	4,490												
BET-PW001_Fe14.8%	**BET-PW001**	**05 Nov 2016**			3.76		56.3				0.02	56.3		6.43	0.1		13,600		<10		37,200		45,600	4,700												
BET-PW001_Fe15.1%	**BET-PW001**	**08 Nov 2016**			3.25		55.2				0.01	55.2		6.39	0.06		13,600		<10		37,900		44,300	4,700												
BET-PW001_Fe_9	**BET-PW001**	**29 Sep 2016**			6.43		52.2				0.04	52.2		6.54	0.41		9,370		20			26,400	33,600	2,740												
BET-PW001_Fe_9.4	**BET-PW001**	**05 Oct 2016**			5.65		51.6				0.26	51.9		6.74	1.07		9,080		17			25,400	30,400	2,480												
BET-PW001_Fe_10.6	**BET-PW001**	**07 Oct 2016**			6.35		50.6				0.17	50.8		6.63	0.47		10,100		42			28,700	32,300	3,130												
BET-PW001_Fe_11.5%	**BET-PW001**	**15 Oct 2016**			7.62		45.1				0.03	45.1		6.47	0.22		12,100		<10		31,800		38,800	4,090												
BET-PW001_Fe_12.5%	**BET-PW001**	**19 Oct 2016**			7.40		48.0				0.12	48.1		6.45	0.12		12,300		38		33,200		39,000	4,500												
BET-PW001_Fe_12.15%	**BET-PW001**	**17 Oct 2016**			5.95		65.6				0.02	65.6		6.50	0.16		11,700		26		32,800		37,400	4,110												
BET-PW001_Fe_13%	**BET-PW001**	**22 Oct 2016**			0.08		61.3				<0.01	61.3		6.51	<0.1		10,900		<1		34,200		37,700	3,960												
BET-PW001_Fe_13.5%	**BET-PW001**	**25 Oct 2016**			2.14		59.4				<0.01	59.4		6.55	0.15		10,800		<1		34,800		31,800	3,990												
BET-PW001_Fe_16.2	**BET-PW001**	**23 Dec 2016**			3.51		58.0				<0.01	58.0		6.56	<0.05		13,100		<10		33,600		42,000	5,120												
BET-PW001_Fe_16.5%	**BET-PW001**	**28 Dec 2016**			8.02		61.5				<0.01	61.5		6.50	0.10		13,900		<10		34,300		44,800	5,560												
BET-PW001_FE_16.4	**BET-PW001**	**26 Dec 2016**			0.10		60.0				<0.01	60.0		6.50	<0.05		13,300		<10		34,000		44,200	5,280												
BET-PW001_FE_16.6%	**BET-PW001**	**30 Dec 2016**			0.77		62.1				<0.01	62.1		6.50	<0.05		13,800		<10		34,000		44,500	5,560												
BET-PW001 2209 Sep	**BET-PW001**	**22 Sep 2021**	0.1			-8.6	32	<0.1	<0.1	10	<0.1			6.3	<0.02	0.37	6,200	44	1				29,000		28	0.2	5.9									
Trip Blank Mi101224	**BET-PW001**	**15 Nov 2016**																											<5		<5		<5		<5	

Table A-2
Amungee NW-1H Flowback Water Analytical Data
Amungee NW-2H Flowback Water Assessment
Tamboran

Field ID	Location Code	Date	AH: n-propylbenzene (ng/tube)	p-isopropyltoluene (µg/m3)	p-isopropyltoluene (ng/tube)	sec-butylbenzene (µg/m3)	sec-butylbenzene (ng/tube)	Styrene (µg/m3)	Styrene (ng/tube)	tert-butylbenzene (µg/m3)	tert-butylbenzene (ng/tube)
EQL				5		5		5		5	
AMUNGEE NW-1H	**BET-PW001**	**15 Nov 2016**									
AMUNGEE NW-1H Field dup	**BET-PW001**	**15 Nov 2016**									
AMUNGEE NW-1H Field dup Mi180121	**BET-PW001**	**15 Nov 2016**		<5		<5		<5		<5	
AMUNGEE NW-1H Field dup SC1109	**BET-PW001**	**15 Nov 2016**									
AMUNGEE NW-1H Mi160415	**BET-PW001**	**15 Nov 2016**		<5		<5		<5		<5	
AMUNGEE NW-1H SC1119	**BET-PW001**	**15 Nov 2016**									
BET_PW001_Fe_15.3%	**BET-PW001**	**11 Nov 2016**									
BET_PW001_Fe_15.8%	**BET-PW001**	**17 Nov 2016**									
BET_PW001_Fe_16.0%	**BET-PW001**	**20 Nov 2016**									
BET-PW001	**BET-PW001**	**08 Sep 2021**									
BET-PW001_Fe14.1%	**BET-PW001**	**30 Oct 2016**									
BET-PW001_Fe14.5%	**BET-PW001**	**02 Nov 2016**									
BET-PW001_Fe14.8%	**BET-PW001**	**05 Nov 2016**									
BET-PW001_Fe15.1%	**BET-PW001**	**08 Nov 2016**									
BET-PW001_Fe_9	**BET-PW001**	**29 Sep 2016**									
BET-PW001_Fe_9.4	**BET-PW001**	**05 Oct 2016**									
BET-PW001_Fe_10.6	**BET-PW001**	**07 Oct 2016**									
BET-PW001_Fe_11.5%	**BET-PW001**	**15 Oct 2016**									
BET-PW001_Fe_12.5%	**BET-PW001**	**19 Oct 2016**									
BET-PW001_Fe_12.15%	**BET-PW001**	**17 Oct 2016**									
BET-PW001_Fe_13%	**BET-PW001**	**22 Oct 2016**									
BET-PW001_Fe_13.5%	**BET-PW001**	**25 Oct 2016**									
BET-PW001_Fe_16.2	**BET-PW001**	**23 Dec 2016**									
BET-PW001_Fe_16.5%	**BET-PW001**	**28 Dec 2016**									
BET-PW001_FE_16.4	**BET-PW001**	**26 Dec 2016**									
BET-PW001_FE_16.6%	**BET-PW001**	**30 Dec 2016**									
BET-PW001 2209 Sep	**BET-PW001**	**22 Sep 2021**									
Trip Blank Mi101224	**BET-PW001**	**15 Nov 2016**	<5		<5		<5		<5		<5

Field ID	Location Code	Date	Aluminium (mg/L)	Aluminium (filtered) (mg/L)	Antimony (mg/L)	Antimony (filtered) (mg/L)	Arsenic (mg/L)	Arsenic (filtered) (mg/L)	Barium (mg/L)	Barium (filtered) (mg/L)	Beryllium (mg/L)	Beryllium (filtered) (mg/L)	Boron (mg/L)	Boron (filtered) (mg/L)	Cadmium (mg/L)	Cadmium (filtered) (mg/L)	Calcium (filtered) (mg/L)	Chromium (III+VI) (mg/L)	Chromium (III+VI) (filtered) (mg/L)	Cobalt (mg/L)	Cobalt (filtered) (mg/L)	Copper (mg/L)	Copper (filtered) (mg/L)	Iron (mg/L)	Iron (filtered) (mg/L)	Lead (mg/L)	Lead (filtered) (mg/L)
EQL			0.001	0.001	0.001	0.001	0.0005	0.0005	0.001	0.001	0.001	0.001	0.001	0.001	0.00005	0.00005	0.2	0.0005	0.0005	0.0002	0.0002	0.001	0.001	0.001	0.001	0.0002	0.0002
AMUNGEE NW-1H	**BET-PW001**	**15 Nov 2016**																									
AMUNGEE NW-1H Field dup	**BET-PW001**	**15 Nov 2016**																									
AMUNGEE NW-1H Field dup Mi180121	**BET-PW001**	**15 Nov 2016**																									
AMUNGEE NW-1H Field dup SC1109	**BET-PW001**	**15 Nov 2016**																									
AMUNGEE NW-1H Mi160415	**BET-PW001**	**15 Nov 2016**																									
AMUNGEE NW-1H SC1119	**BET-PW001**	**15 Nov 2016**																									
BET_PW001_Fe_15.3%	**BET-PW001**	**11 Nov 2016**						<0.01		**60.7**		<0.01		***34.6***		<0.001	1,320		0.01		0.01		<0.01				<0.01
BET_PW001_Fe_15.8%	**BET-PW001**	**17 Nov 2016**						<0.01		**65.7**		<0.01		***33.1***		<0.001	1,400		0.015		<0.01		<0.01				<0.01
BET_PW001_Fe_16.0%	**BET-PW001**	**20 Nov 2016**						<0.01		**66.5**		<0.01		***34.8***		<0.001	1,410		0.013		<0.01		<0.01				<0.01
BET-PW001	**BET-PW001**	**08 Sep 2021**	0.30	<0.25	<0.05	<0.05	**0.033**	<0.025	**120**	**110**	<0.05	<0.05	***13***	***12***	<0.005	<0.005	1,500	<0.025	<0.025	0.024	0.014	<0.05	<0.05	79	55	<0.01	<0.01
BET-PW001_Fe14.1%	**BET-PW001**	**30 Oct 2016**						<0.01		**68.8**		<0.01		***45.4***		<0.001	1,270		0.031		<0.01		<0.01				<0.01
BET-PW001_Fe14.5%	**BET-PW001**	**02 Nov 2016**						**0.011**		**74.8**		<0.01		***44***		<0.001	1,330		0.032		<0.01		<0.01				<0.01
BET-PW001_Fe14.8%	**BET-PW001**	**05 Nov 2016**						<0.01		**77.8**		<0.01		***43.9***		<0.001	1,380		0.033		<0.01		<0.01				<0.01
BET-PW001_Fe15.1%	**BET-PW001**	**08 Nov 2016**						<0.01		**68.5**		<0.01		***45.4***		<0.001	1,380		0.031		<0.01		<0.01				<0.01
BET-PW001_Fe_9	**BET-PW001**	**29 Sep 2016**						**0.084**		**35.6**		<0.01		***50.9***		<0.001	853		0.035		0.011		<0.01				<0.01
BET-PW001_Fe_9.4	**BET-PW001**	**05 Oct 2016**						**0.011**		**30.5**		<0.01		***54.5***		<0.001	774		0.048		<0.01		<0.01				<0.01
BET-PW001_Fe_10.6	**BET-PW001**	**07 Oct 2016**						<0.01		**42**		<0.01		***49.4***		<0.001	980		0.034		<0.01		<0.01				<0.01
BET-PW001_Fe_11.5%	**BET-PW001**	**15 Oct 2016**						<0.010		**51.9**		<0.010		***45.9***		<0.0010	1,220		0.042		<0.010		<0.010				<0.010
BET-PW001_Fe_12.5%	**BET-PW001**	**19 Oct 2016**						<0.010		**59.1**		<0.010		***43.5***		<0.0010	1,360		0.033		<0.010		<0.010				<0.010
BET-PW001_Fe_12.15%	**BET-PW001**	**17 Oct 2016**						<0.010		**53.9**		<0.010		***44.5***		<0.0010	1,230		0.030		<0.010		<0.010				<0.010
BET-PW001_Fe_13%	**BET-PW001**	**22 Oct 2016**						<0.01		**63.5**		<0.01		***40***		<0.001	1,200		0.032		<0.01		<0.01				<0.01
BET-PW001_Fe_13.5%	**BET-PW001**	**25 Oct 2016**						<0.01		**68.4**		<0.01		***41.1***		<0.001	1,210		0.03		<0.01		<0.01				<0.01
BET-PW001_Fe_16.2	**BET-PW001**	**23 Dec 2016**						<0.010		**66.2**		<0.010		***35.1***		<0.0010	1,600		0.025		<0.010		<0.010				<0.010
BET-PW001_Fe_16.5%	**BET-PW001**	**28 Dec 2016**						<0.010		**77.8**		<0.010		***31.0***		<0.0010	1,740		0.031		<0.010		<0.010				<0.010
BET-PW001_FE_16.4	**BET-PW001**	**26 Dec 2016**						<0.010		**71.6**		<0.010		***34.2***		<0.0010	1,650		0.028		<0.010		<0.010				<0.010
BET-PW001_FE_16.6%	**BET-PW001**	**30 Dec 2016**						<0.010		**80.1**		<0.010		***34.0***		<0.0010	1,740		0.029		<0.010		<0.010				<0.010
BET-PW001 2209 Sep	**BET-PW001**	**22 Sep 2021**	<0.05	<0.05	<0.01	<0.01	0.0065	<0.005	**97**	**90**	<0.01	<0.01	***9.0***	***8.2***	<0.001	<0.001	1,100	0.0079	<0.005	0.0032	<0.002	<0.01	<0.01	97	80	<0.002	<0.002
Trip Blank Mi101224	**BET-PW001**	**15 Nov 2016**																									

Table A-2
Amungee NW-1H Flowback Water Analytical Data
Amungee NW-2H Flowback Water Assessment
Tamboran

			Metals																																			
Field ID	Location Code	Date	Magnesium (filtered)	Manganese	Manganese (filtered)	Mercury	Mercury (filtered)	Molybdenum	Molybdenum (filtered)	Nickel	Nickel (filtered)	Potassium	Potassium (filtered)	Selenium	Selenium (filtered)	Silicon	Silicon (filtered)	Silver	Silver (filtered)	Strontium	Strontium (filtered)	Thorium	Thorium (filtered)	Tin	Tin (filtered)	Uranium	Uranium (filtered)	Vanadium	Vanadium (filtered)	Zinc	Zinc (filtered)	Butane	Average Molecular Weight	Gross beta activity (including K-40) (filtered)	Hexanes (Mol %)	n-Butane (mol %)	n-Pentane (mol %)	Radium-223 (filtered)	Thorium 227 (filtered)
			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L	µg/L	mg/L	mg/L	mg/L	mg/L	µg/L	µg/L	mg/L	mg/L	µg/L	µg/L	mg/L	mg/L	mg/L	mg/L	mg/L	g/mol	-	Mol %	Mol %	Mol %	-	-
EQL			0.1	0.0005	0.0005	0.0001	0.0001	0.001	0.001	0.0005	0.0005	0.01	0.01	0.001	0.001	20	20	0.001	0.001	0.001	0.001	1	1	0.001	0.001	1	1	0.001	0.001	0.001	0.001	0.001		0				0	0
AMUNGEE NW-1H	BET-PW001	15 Nov 2016										73																											<0
																																	18.4		<0.01	<0.01	<0.01		
AMUNGEE NW-1H Field dup	BET-PW001	15 Nov 2016																															18.2		<0.01	<0.01	<0.01		
AMUNGEE NW-1H Field dup Mi180121	BET-PW001	15 Nov 2016																																					
AMUNGEE NW-1H Field dup SC1109	BET-PW001	15 Nov 2016																																					
AMUNGEE NW-1H Mi160415	BET-PW001	15 Nov 2016																																					
AMUNGEE NW-1H SC1119	BET-PW001	15 Nov 2016																																					
BET_PW001_Fe_15.3%	BET-PW001	11 Nov 2016	271		2.26		<0.0001				0.018		70		<0.1														<0.1		<0.05	<0.001							
BET_PW001_Fe_15.8%	BET-PW001	17 Nov 2016	282		2.42		<0.0001				<0.01		70		<0.1														<0.1		<0.05	<0.001							
BET_PW001_Fe_16.0%	BET-PW001	20 Nov 2016	275		2.53		<0.0001				0.028		69		<0.1														<0.1		<0.05	<0.001							
BET-PW001	BET-PW001	08 Sep 2021	370	1.9	1.7	0.026	<0.005	<0.05	<0.05	0.050	0.030		53	<0.05	<0.05	16,000	13,000	<0.05	<0.05	170	170	<50	<50	<0.05	<0.05	<50	<50	<0.05	<0.05	0.13	0.11			0.00					
BET-PW001_Fe14.1%	BET-PW001	30 Oct 2016	277		2.74		<0.0001				0.018		76		<0.1														<0.1		<0.05	<0.001							
BET-PW001_Fe14.5%	BET-PW001	02 Nov 2016	284		2.9		<0.0001				0.014		80		<0.1														<0.1		<0.05	<0.001							
BET-PW001_Fe14.8%	BET-PW001	05 Nov 2016	306		3.09		<0.0001				<0.01		83		<0.1														<0.1		<0.05	<0.001							
BET-PW001_Fe15.1%	BET-PW001	08 Nov 2016	305		2.4		<0.0001				0.012		83		<0.1														<0.1		<0.05	<0.001							
BET-PW001_Fe_9	BET-PW001	29 Sep 2016	147		1.82		<0.0001				0.04		55		<0.1														<0.1		<0.05	<0.001							
BET-PW001_Fe_9.4	BET-PW001	05 Oct 2016	133		1.95		<0.0001				0.012		58		<0.1														<0.1		<0.05	<0.001							
BET-PW001_Fe_10.6	BET-PW001	07 Oct 2016	165		1.8		<0.0001				0.01		60		<0.1														<0.1		<0.05	<0.001							
BET-PW001_Fe_11.5%	BET-PW001	15 Oct 2016	253		2.38		<0.0001				<0.010		72		<0.10														<0.10		<0.050	<0.001							
BET-PW001_Fe_12.5%	BET-PW001	19 Oct 2016	269		2.43		<0.0001				<0.010		74		<0.10														<0.10		<0.050	<0.001							
BET-PW001_Fe_12.15%	BET-PW001	17 Oct 2016	252		2.24		<0.0001				<0.010		70		<0.10														<0.10		<0.050	<0.001							
BET-PW001_Fe_13%	BET-PW001	22 Oct 2016	233		2.34		<0.0001				0.014		64		<0.1														<0.1		<0.05	0.002							
BET-PW001_Fe_13.5%	BET-PW001	25 Oct 2016	235		2.44		<0.0001				0.018		65		<0.1														<0.1		<0.05	<0.001							
BET-PW001_Fe_16.2	BET-PW001	23 Dec 2016	272		2.31		<0.0001				0.021		68		<0.10														<0.10		<0.050	<0.001							
BET-PW001_Fe_16.5%	BET-PW001	28 Dec 2016	295		2.64		<0.0001				<0.010		70		<0.10														<0.10		<0.050	<0.001							
BET-PW001_FE_16.4	BET-PW001	26 Dec 2016	283		2.56		<0.0001				0.017		67		<0.10														<0.10		<0.050	<0.001							
BET-PW001_FE_16.6%	BET-PW001	30 Dec 2016	295		2.75		<0.0001				<0.010		70		<0.10														<0.10		<0.050	<0.001							
BET-PW001 2209 Sep	BET-PW001	22 Sep 2021	270	1.9	1.8	0.0025	<0.001	<0.01	<0.01	0.0060	<0.005		39	<0.01	<0.01	7,300	6,800	<0.01	<0.01	150	140	<10	<10	<0.01	<0.01	<10	<10	<0.01	<0.01	0.097	0.070			0.0				<0.0	<0.0
Trip Blank Mi101224	BET-PW001	15 Nov 2016																																					

EHS Support

Table A-2
Amungee NW-1H Flowback Water Analytical Data
Amungee NW-2H Flowback Water Assessment
Tamboran

			NA											Organic							Other																					
			Total PAHs - assumes <LOR results = 0.5xLOR	Total PAHs Vic EPA - assumes <LOR results = 0	Total PAHs Vic EPA - assumes <LOR results = 0.5LOR	1-Butyl mercaptan	1-Propanethiol	Formaldehyde	Methyl Mercaptan	Propane		Propene	tetrahydrothiophene	Dissolved Organic Carbon	Ethane		Ethene	Methane		Total Organic Carbon	Helium	Carbonyl Sulphide	Carbon Dioxide	Carbon Monoxide	Dimethyl Sulfide	Ethyl Mercaptan	Hydrogen	Thiophene	Benzo(b+j+k)fluoranthene	2-methylnaphthalene	3-methylcholanthrene	7,12-dimethylbenz(a)anthracene	Acenaphthene	Acenaphthylene	Anthracene	Coronene	Benzo(a)anthracene	Benzo(a) pyrene	Benzo(b)fluoranthene	Benzo(b+j)fluoranthene	Benzo(e)pyrene	Benzo(g,h,i)perylene
			µg/L	µg/L	µg/L	ppb	ppb	mg/L	ppb	mg/L	Mol %	µg/L	ppb	mg/L	µg/L	Mol %	µg/L	mg/L	Mol %	mg/L	Mol %	ppb	Mol %	Mol %	ppb	ppb	Mol %	ppb	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	µg/L	µg/L
EQL			10	8	8			0.05		0.001		1		1	1		1	0.001		1									0.002	1	1	1	1	1	1	1	1	0.5	1	0.001	1	1
Field ID	**Location Code**	**Date**																																								
AMUNGEE NW-1H	**BET-PW001**	**15 Nov 2016**																																								
											0.11					2.7			86.95		0.09		4.2	<0.01			0.01															
AMUNGEE NW-1H Field dup	**BET-PW001**	**15 Nov 2016**									0.11					2.7			88.24		0.1		4.2	<0.01			0.01															
AMUNGEE NW-1H Field dup Mi180121	**BET-PW001**	**15 Nov 2016**																																								
AMUNGEE NW-1H Field dup SC1109	**BET-PW001**	**15 Nov 2016**				<50	<50		<50				<50									<50			<50	<50		<50														
AMUNGEE NW-1H Mi160415	**BET-PW001**	**15 Nov 2016**																																								
AMUNGEE NW-1H SC1119	**BET-PW001**	**15 Nov 2016**				<50	<50		<50				<50									<50			<50	<50		<50														
BET_PW001_Fe_15.3%	**BET-PW001**	**11 Nov 2016**								0.015		<1			510		<1	4.76															<1	<1	<1		<1	<0.5		<0.001		<1
BET_PW001_Fe_15.8%	**BET-PW001**	**17 Nov 2016**								0.018		<1			479		<1	5.22															<1	<1	<1		<1	<0.5		<0.001		<1
BET_PW001_Fe_16.0%	**BET-PW001**	**20 Nov 2016**								0.02		<1			518		<1	6.48															<1	<1	<1		<1	<0.5		<0.001		<1
BET-PW001	**BET-PW001**	**08 Sep 2021**	120					<0.05						72						76									<0.002	46	<1	<1	<1	<1	<1	<1	<1	<1	<1		<1	<1
BET-PW001_Fe14.1%	**BET-PW001**	**30 Oct 2016**								0.014		<1			493		<1	3.99															<1	<1	<1		<1	<0.5		<0.001		<1
BET-PW001_Fe14.5%	**BET-PW001**	**02 Nov 2016**								0.016		<1			557		<1	4.29															<1	<1	<1		<1	<0.5		<0.001		<1
BET-PW001_Fe14.8%	**BET-PW001**	**05 Nov 2016**								0.019		<1			611		<1	5.41															<1	<1	<1		<1	<0.5		<0.001		<1
BET-PW001_Fe15.1%	**BET-PW001**	**08 Nov 2016**								0.017		<1			595		<1	5.27															<1	<1	<1		<1	<0.5		<0.001		<1
BET-PW001_Fe_9	**BET-PW001**	**29 Sep 2016**								0.001		<1			169		<1	1.2															<1	<1	<1		<1	<0.5		<0.001		<1
BET-PW001_Fe_9.4	**BET-PW001**	**05 Oct 2016**								0.029		<1			814		<1	6.29															<1	<1	<1		<1	<0.5		<0.001		<1
BET-PW001_Fe_10.6	**BET-PW001**	**07 Oct 2016**								0.016		<1			544		<1	5.39															<1	<1	<1		<1	<0.5		<0.001		<1
BET-PW001_Fe_11.5%	**BET-PW001**	**15 Oct 2016**								0.016		<1			581		<1	5.46															<1.0	<1.0	<1.0		<1.0	<0.5		<0.0010		<1.0
BET-PW001_Fe_12.5%	**BET-PW001**	**19 Oct 2016**								0.013		<1			575		<1	5.5															<1.0	<1.0	<1.0		<1.0	<0.5		<0.0010		<1.0
BET-PW001_Fe_12.15%	**BET-PW001**	**17 Oct 2016**								0.017		<1			657		<1	7.09															<1.0	<1.0	<1.0		<1.0	<0.5		<0.0010		<1.0
BET-PW001_Fe_13%	**BET-PW001**	**22 Oct 2016**								0.033		<1			925		<1	6.5															<1	<1	<1		<1	<0.5		<0.001		<1
BET-PW001_Fe_13.5%	**BET-PW001**	**25 Oct 2016**								0.02		<1			757		<1	6.49															<1	<1	<1		<1	<0.5		<0.001		<1
BET-PW001_Fe_16.2	**BET-PW001**	**23 Dec 2016**								0.023		<1			798		<1	7.35															<1.0	<1.0	<1.0		<1.0	<0.5		<0.0010		<1.0
BET-PW001_Fe_16.5%	**BET-PW001**	**28 Dec 2016**								0.018		<1			614		<1	7.75															<1.0	<1.0	<1.0		<1.0	<0.5		<0.0010		<1.0
BET-PW001_FE_16.4	**BET-PW001**	**26 Dec 2016**								0.023		<1			781		<1	8.37															<1.0	<1.0	<1.0		<1.0	<0.5		<0.0010		<1.0
BET-PW001_FE_16.6%	**BET-PW001**	**30 Dec 2016**								0.018		<1			467		<1	7.72															<1.0	<1.0	<1.0		<1.0	<0.5		<0.0010		<1.0
BET-PW001 2209 Sep	**BET-PW001**	**22 Sep 2021**	<10	<8	<8			<0.05						58						64									<0.002	42	<1	<1	<1	<1	<1	<1	<1	<1	<1		<1	<1
Trip Blank Mi101224	**BET-PW001**	**15 Nov 2016**																																								

Table A-2
Amungee NW-1H Flowback Water Analytical Data
Amungee NW-2H Flowback Water Assessment
Tamboran

PAH

Field ID	Location Code	Date	Benzo(k)fluoranthene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	Naphthalene	Naphthalene	Naphthalene	Phenanthrene	Perylene	Pyrene	Benzo(a)pyrene TEQ calc (Half)	Benzo(a)pyrene TEQ (LOR)	Benzo(a)pyrene TEQ calc (Zero)	PAHs (Sum of total)	PAHs (Vic EPA List)
			µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/m3	ng/tube	µg/L	µg/L	µg/L	mg/L	mg/L	mg/L	µg/L	µg/L
EQL			1	1	1	1	1	1	1	5		1	1	1	0.0014	0.0027	0.0005	9	0.5
AMUNGEE NW-1H	BET-PW001	15 Nov 2016																	
AMUNGEE NW-1H Field dup	BET-PW001	15 Nov 2016																	
AMUNGEE NW-1H Field dup Mi180121	BET-PW001	15 Nov 2016								<5									
AMUNGEE NW-1H Field dup SC1109	BET-PW001	15 Nov 2016																	
AMUNGEE NW-1H Mi160415	BET-PW001	15 Nov 2016								<5									
AMUNGEE NW-1H SC1119	BET-PW001	15 Nov 2016																	
BET_PW001_Fe_15.3%	BET-PW001	11 Nov 2016	<1	<1	<1	<1	<1	<1	<1			<1		<1			<0.0005		<0.5
BET_PW001_Fe_15.8%	BET-PW001	17 Nov 2016	<1	<1	<1	<1	<1	<1	<1			<1		<1			<0.0005		<0.5
BET_PW001_Fe_16.0%	BET-PW001	20 Nov 2016	<1	<1	<1	<1	<1	<1	<1			<1		<1			<0.0005		<0.5
BET-PW001	BET-PW001	08 Sep 2021	<1	<1	<1	<1	2	<1	22			1	<1	<1	<0.0014	<0.0027	<0.0013	120	
									43										
BET-PW001_Fe14.1%	BET-PW001	30 Oct 2016	<1	<1	<1	<1	<1	<1	<1			<1		<1			<0.0005		<0.5
BET-PW001_Fe14.5%	BET-PW001	02 Nov 2016	<1	<1	<1	<1	<1	<1	<1			<1		<1			<0.0005		<0.5
BET-PW001_Fe14.8%	BET-PW001	05 Nov 2016	<1	<1	<1	<1	<1	<1	<1			<1		<1			<0.0005		<0.5
BET-PW001_Fe15.1%	BET-PW001	08 Nov 2016	<1	<1	<1	<1	<1	<1	<1			<1		<1			<0.0005		<0.5
BET-PW001_Fe_9	BET-PW001	29 Sep 2016	<1	<1	<1	<1	<1	<1	<1			<1		<1			<0.0005		<0.5
BET-PW001_Fe_9.4	BET-PW001	05 Oct 2016	<1	<1	<1	<1	<1	<1	<1			<1		<1			<0.0005		<0.5
BET-PW001_Fe_10.6	BET-PW001	07 Oct 2016	<1	<1	<1	<1	<1	<1	<1			<1		<1			<0.0005		<0.5
BET-PW001_Fe_11.5%	BET-PW001	15 Oct 2016	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0			<1.0		<1.0			<0.0005		<0.5
BET-PW001_Fe_12.5%	BET-PW001	19 Oct 2016	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0			<1.0		<1.0			<0.0005		<0.5
BET-PW001_Fe_12.15%	BET-PW001	17 Oct 2016	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0			<1.0		<1.0			<0.0005		<0.5
BET-PW001_Fe_13%	BET-PW001	22 Oct 2016	<1	<1	<1	<1	<1	<1	<1			<1		<1			<0.0005		<0.5
BET-PW001_Fe_13.5%	BET-PW001	25 Oct 2016	<1	<1	<1	<1	<1	<1	<1			<1		<1			<0.0005		<0.5
BET-PW001_Fe_16.2	BET-PW001	23 Dec 2016	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0			<1.0		<1.0			<0.0005		<0.5
BET-PW001_Fe_16.5%	BET-PW001	28 Dec 2016	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0			<1.0		<1.0			<0.0005		<0.5
BET-PW001_FE_16.4	BET-PW001	26 Dec 2016	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0			<1.0		<1.0			<0.0005		<0.5
BET-PW001_FE_16.6%	BET-PW001	30 Dec 2016	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0			<1.0		<1.0			<0.0005		<0.5
BET-PW001 2209 Sep	BET-PW001	22 Sep 2021	<1	<1	<1	<1	3	<1	38			2	<1	<1	<0.0014	<0.0027	<0.0013	43	
Trip Blank Mi101224	BET-PW001	15 Nov 2016									<5								

Phenols

Field ID	Location Code	Date	3&4-Methylphenol (m&p-cresol)	2,3,4,6-Tetrachlorophenol	2,4,5-Trichlorophenol	2,4,6-Trichlorophenol	2,4-Dichlorophenol	2,4-Dimethylphenol	2,4-Dinitrophenol	2,6-Dichlorophenol	2-Chlorophenol	2-Methylphenol	2-Nitrophenol	4,6-Dinitro-2-methylphenol	4-chloro-3-methylphenol	4-Nitrophenol	Pentachlorophenol	Phenol	Gross Beta Activity - K40	Gross Beta Activity - K40 (filtered)	Gross alpha activity	Gross alpha activity (filtered)	Lead-210 (filtered)	Polonium-210 (filtered)
			µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	Bq/L	Bq/L	-	-	Bq/L	Bq/L
EQL			1	1	1	1	1	1	0.001	1	1	1	1	1	1	1	1	1	0	0	0	0	0.17	0.002
AMUNGEE NW-1H	BET-PW001	15 Nov 2016																		5.22		0	<0.25	0.0083
AMUNGEE NW-1H Field dup	BET-PW001	15 Nov 2016																						
AMUNGEE NW-1H Field dup Mi180121	BET-PW001	15 Nov 2016																						
AMUNGEE NW-1H Field dup SC1109	BET-PW001	15 Nov 2016																						
AMUNGEE NW-1H Mi160415	BET-PW001	15 Nov 2016																						
AMUNGEE NW-1H SC1119	BET-PW001	15 Nov 2016																						
BET_PW001_Fe_15.3%	BET-PW001	11 Nov 2016	5.2		<1	<1	<1	<1		<1	<1	<1	<1		<1		<2	2.8	5.32		0			
BET_PW001_Fe_15.8%	BET-PW001	17 Nov 2016	5.6		<1	<1	<1	<1		<1	<1	<1	<1		<1		<2	2.1	5.08		0			
BET_PW001_Fe_16.0%	BET-PW001	20 Nov 2016	10.3		<1	<1	<1	<1		<1	<1	<1	<1		<1		<2	3.5	4.8		0			
BET-PW001	BET-PW001	08 Sep 2021	<1	<1	<1	<1	<1	<1	<0.001	<1	<1		<1	<1	<1	<1	<1	2		8.8		0		
BET-PW001_Fe14.1%	BET-PW001	30 Oct 2016	6.8		<1	<1	<1	<1		<1	<1	<1	<1		<1		<2	2.8	17.2		0			
BET-PW001_Fe14.5%	BET-PW001	02 Nov 2016	4.4		<1	<1	<1	<1		<1	<1	<1	<1		<1		<2	2	17.8		0			
BET-PW001_Fe14.8%	BET-PW001	05 Nov 2016	4.3		<1	<1	<1	<1		<1	<1	<1	<1		<1		<2	2.1	18.3		0			
BET-PW001_Fe15.1%	BET-PW001	08 Nov 2016	4.7		<1	<1	<1	<1		<1	<1	<1	<1		<1		<2	2.6	15.9		0			
BET-PW001_Fe_9	BET-PW001	29 Sep 2016	<2		<1	<1	<1	<1		<1	<1	<1	<1		<1		<2	1.5	<1.25		<0			
BET-PW001_Fe_9.4	BET-PW001	05 Oct 2016	<2		<1	<1	<1	<1		<1	<1	<1	<1		<1		<2	<1						
BET-PW001_Fe_10.6	BET-PW001	07 Oct 2016	<2		<1	<1	<1	<1		<1	<1	<1	<1		<1		<2	<1	5.99		0			
BET-PW001_Fe_11.5%	BET-PW001	15 Oct 2016	2.6		<1.0	<1.0	<1.0	<1.0		<1.0	<1.0	<1.0	<1.0		<1.0		<2.0	2.3	15.4		0			
BET-PW001_Fe_12.5%	BET-PW001	19 Oct 2016	2.9		<1.0	<1.0	<1.0	<1.0		<1.0	<1.0	<1.0	<1.0		<1.0		<2.0	2.2	8.31		0			
BET-PW001_Fe_12.15%	BET-PW001	17 Oct 2016	2.1		<1.0	<1.0	<1.0	<1.0		<1.0	<1.0	<1.0	<1.0		<1.0		<2.0	2.2	7.55		0			
BET-PW001_Fe_13%	BET-PW001	22 Oct 2016	2.7		<1	<1	<1	<1		<1	<1	<1	<1		<1		<2	1.6	9.76		0			
BET-PW001_Fe_13.5%	BET-PW001	25 Oct 2016	7		<1	<1	<1	<1		<1	<1	<1	<1		<1		<2	1.7	12.7		0			
BET-PW001_Fe_16.2	BET-PW001	23 Dec 2016	2.5		<1.0	<1.0	<1.0	<1.0		<1.0	<1.0	<1.0	<1.0		<1.0		<2.0	2.8						
BET-PW001_Fe_16.5%	BET-PW001	28 Dec 2016	5.8		<1.0	<1.0	<1.0	<1.0		<1.0	<1.0	<1.0	<1.0		<1.0		<2.0	3.1						
BET-PW001_FE_16.4	BET-PW001	26 Dec 2016	3.3		<1.0	<1.0	<1.0	<1.0		<1.0	<1.0	<1.0	<1.0		<1.0		<2.0	2.5						
BET-PW001_FE_16.6%	BET-PW001	30 Dec 2016	11.3		<1.0	<1.0	<1.0	<1.0		<1.0	<1.0	<1.0	<1.0		<1.0		<2.0	4						
BET-PW001 2209 Sep	BET-PW001	22 Sep 2021	<1	<1	<1	<1	<1	<1	<0.001	<1	<1		<1	<1	<1	<1	<1	2		5.2		0	<0.44	
Trip Blank Mi101224	BET-PW001	15 Nov 2016																						

EHS Support

			Radionuclides															Surfactants		SVOCs	TPH						TRH								VOCs
			Potassium-40 (filtered)	Radium-226 (filtered)	Radium-228 (filtered)	Thorium-228 (filtered)	Thorium-230	Thorium-230 (filtered)	Thorium-232	Thorium-232 (filtered)	Thorium-234 (filtered)	Uranium-234	Uranium-234 (filtered)	Uranium-235	Uranium-235 (filtered)	Uranium-238	Uranium-238 (filtered)	Anionic Surfactants as MBAS	Nonionic Surfactants as CTAS	Hexachlorophene	C6-C9 Fraction	C10-C14 Fraction	C15-C28 Fraction	C29-C36 Fraction	C10-C36 Fraction (Sum)	C6-C36 Fraction	C6-C10 Fraction (F1)	C6-C10 (F1 minus BTEX)	>C10-C16 Fraction (F2)	>C10-C16 Fraction (F2 minus Naphthalene)	>C16-C34 Fraction (F3)	>C34-C40 Fraction (F4)	>C10-C40 Fraction (Sum)	C6-C40 Fraction	Butene
			Bq/L	Bq/L	Bq/L	Bq/L	Bq/L	Bq/L	Bq/L	Bq/L	Bq/L	Bq/L	Bq/L	Bq/L	Bq/L	Bq/L	Bq/L	mg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
EQL				0	0	0.01	0.004	0.004	0	0	0.17	0.004	0.004	0.001	0.001	0.001	0.001	0.1	5	1	10	10	50	50	50	50	10	10	10	10	50	50	50	50	1
Field ID	**Location Code**	**Date**																																	
AMUNGEE NW-1H	**BET-PW001**	**15 Nov 2016**	2.3	8.74	1.67	<0.033		<0.27		<0.026			<0.01		<0.0077		<0.0046																		
						0.088																													
AMUNGEE NW-1H Field dup	**BET-PW001**	**15 Nov 2016**																																	
AMUNGEE NW-1H Field dup Mi180121	**BET-PW001**	**15 Nov 2016**																																	
AMUNGEE NW-1H Field dup SC1109	**BET-PW001**	**15 Nov 2016**																																	
AMUNGEE NW-1H Mi160415	**BET-PW001**	**15 Nov 2016**																																	
AMUNGEE NW-1H SC1119	**BET-PW001**	**15 Nov 2016**																																	
BET_PW001_Fe_15.3%	**BET-PW001**	**11 Nov 2016**																0.2	<5		50	<50	1,080	<50	1,080		40	40	<100	<100	1,020	<100	1,020		<1
BET_PW001_Fe_15.8%	**BET-PW001**	**17 Nov 2016**																0.1	<5		100	60	410	<50	470		90	80	<100	<100	410	<100	410		<1
BET_PW001_Fe_16.0%	**BET-PW001**	**20 Nov 2016**																0.2	<5		110	80	200	<50	280		90	80	<100	<100	220	<100	220		<1
BET-PW001	**BET-PW001**	**08 Sep 2021**	1.68							<0.21							<0.62			<1	220	380	320	<50	700	920	260	170	420	400	160	<50	580	840	
BET-PW001_Fe14.1%	**BET-PW001**	**30 Oct 2016**																0.2	<5		80	70	610	<50	680		80	80	<100	<100	620	<100	620		<1
BET-PW001_Fe14.5%	**BET-PW001**	**02 Nov 2016**																<0.1	<5		130	120	130	<50	250		130	120	100	100	<100	<100	100		<1
BET-PW001_Fe14.8%	**BET-PW001**	**05 Nov 2016**																0.2	<5		60	<50	530	<50	530		50	40	<100	<100	490	<100	490		<1
BET-PW001_Fe15.1%	**BET-PW001**	**08 Nov 2016**																0.2	<5		60	130	1,180	<50	1,310		60	60	160	160	1,160	<100	1,320		<1
BET-PW001_Fe_9	**BET-PW001**	**29 Sep 2016**																<0.1	<5		50	110	430	120	660		60	50	120	120	490	<100	610		<1
BET-PW001_Fe_9.4	**BET-PW001**	**05 Oct 2016**																<0.1	<5		100	90	3,070	1,720	4,880		100	80	130	130	4,160	650	4,940		<1
BET-PW001_Fe_10.6	**BET-PW001**	**07 Oct 2016**																<0.1	<5		50	180	240	60	480		50	40	190	190	260	<100	450		<1
BET-PW001_Fe_11.5%	**BET-PW001**	**15 Oct 2016**																<0.1	<5		60	110	470	200	780		60	50	<100	<100	600	<100	600		<1
BET-PW001_Fe_12.5%	**BET-PW001**	**19 Oct 2016**																<0.1	<5		80	240	100	<50	340		80	70	120	120	110	<100	230		<1
BET-PW001_Fe_12.15%	**BET-PW001**	**17 Oct 2016**																0.1	<5		80	160	<100	<50	160		80	70	<100	<100	110	<100	110		<1
BET-PW001_Fe_13%	**BET-PW001**	**22 Oct 2016**																<0.1	<5		90	270	170	<50	440		90	80	240	240	210	<100	450		<1
BET-PW001_Fe_13.5%	**BET-PW001**	**25 Oct 2016**																<0.1	<5		80	190	180	150	520		80	80	140	140	280	130	550		<1
BET-PW001_Fe_16.2	**BET-PW001**	**23 Dec 2016**					<0.004		<0.001			<0.004		<0.001		<0.001		0.1	<5		110	<50	490	120	610		110	100	<100	<100	570	<100	570		<1
BET-PW001_Fe_16.5%	**BET-PW001**	**28 Dec 2016**					<0.004		<0.001			<0.004		<0.001		<0.001		<0.1	<5		200	<50	450	70	520		200	200	<100	<100	470	<100	470		<1
BET-PW001_FE_16.4	**BET-PW001**	**26 Dec 2016**					<0.004		<0.001			<0.004		<0.001		<0.001		0.2	<5		130	<50	470	<50	470		130	130	<100	<100	440	<100	440		<1
BET-PW001_FE_16.6%	**BET-PW001**	**30 Dec 2016**					<0.004		<0.001			<0.004		<0.001		<0.001		0.2	<5		70	<50	610	90	700		70	70	<100	<100	640	<100	640		<1
BET-PW001 2209 Sep	**BET-PW001**	**22 Sep 2021**	1.24	12.1	2.6	<0.067		<6.4		<0.041	<0.6				<0.07		<0.13			<1	310	930	<50	<50	930	1,200	390	100	630	550	<50	<50	630	1,000	
Trip Blank Mi101224	**BET-PW001**	**15 Nov 2016**																																	

Attachment B Human Health Risk Assessment – Amungee NW-2H Flowback Water

Table B-1
Human Health Tier 1 Screening Assessment
Amungee NW-2H Flowback Water
Tamboran

	BTEX								Explosives		Glycols							Halogenated Benzenes	Herbicides				
	Naphthalene (VOC)	Benzene	Toluene	Ethylbenzene	Xylene (m & p)	Xylene (o)	Xylene Total	Total BTEX	2,4-Dinitrotoluene	Nitrobenzene	2-butoxyethanol	2-Ethoxyethanol acetate	Diethylene glycol	Diethylene glycol, monobutyl ether	Ethylene glycol	Propylene glycol	Triethylene Glycol	Hexachlorobenzene	Dinoseb	Total Phosphorus as P (Organic Phosphate as P)	Sulfate as SO4 - Turbidimetric (filtered)	Silicon as SiO2	Silicon as SiO2 (filtered)
	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	µg/L	µg/L	mg/L	mg/L	mg/L	mg/L
EQL	0.005	1	2	2	2	2	2	1	4	2	2	2,000	2,000	2,000	2,000	2,000	2	0.5	50	0.01	1	0.1	0.1
ADWG 2022 Aesthetic			25	3			20																
ADWG 2022 Health		**1**	**800**	**300**	**600**	**600**	**600**																
WHO (2022) Drinking Water Guidelines[1]																							
USEPA RSLs	**0.00012**								**0.24**	**0.14**		**120**		**600**	**16000**	**400000**	**40000**	**0.0098**	**15**				
Field ID																							
Amungee 2H Flowback	<0.005	3	4	<2	<2	<2	<2	7	<4	<2								<0.5	<50	2.04	<1	179	
	<0.005	4	6	<2	<2	<2	<2	10	<4	<2								<0.5	<50	1.48	141	186	
Amungee Nw 2H Flowback	<0.005	<1	<2	<2	<2	<2	<2	<1	<4	<2								<2.5	<100	0.79	38	198	
	<0.005	<1	<2	<2	<2	<2	<2	<1	<4	<2								<2.5	<100	0.45	32	200	
	<0.005	<1	<2	<2	<2	<2	<2	<1	<25	<25								<24.8	<990	0.29	23	192	166
																							177
	<0.005	1	<2	<2	<2	<2	<2	1	<24	<24								<24.2	<970	0.31	87	205	178
Amungee Nw 2H Flowback	<0.005	<1	<2	<2	<2	<2	<2	<1			<2	<2,000	<2,000	<2,000	80,000	4,000	<2			0.67	36	197	
Amungee NW-2H Flowbac	<0.005	<5	<5	<5	<5	<5	<2	<2	<5	<5								<4.8	<190	0.77	63	188	
	<0.005	<1	<2	<2	<2	<2	<2	<1	<4	<3								<2.7	<110	0.52	12	220	
	<0.005	1	<2	<2	<2	<2	<2	1	<4	<3								<2.9	<120	0.2	4	190	
	<0.005	<5	<5	<5	<5	<5	<2	<2	<4	<3								<2.6	<100	0.36	5	203	
	<0.005	<5	<5	<5	<5	<5	<2	<2	<4	<2								<2.5	<100	0.37	3	202	
	<0.005	<1	<2	<2	<2	<2	<2	<1	<4	<2								<2.6	<100	0.38	1	164	
	<0.005	<1	<2	<2	<2	<2	<2	<1	<4	<3								<2.7	<110	0.32	<1	257	
Amunge NW 2H Flowback	<0.005	1	<2	<2	<2	<2	<2	1												0.37	25	183	
Statistics																							
Number of Results	**17**	**17**	**17**	**17**	**17**	**17**	**17**	**17**	**13**	**13**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**13**	**13**	**15**	**15**	**15**	**3**
Number of Detects	**0**	**5**	**2**	**0**	**1**	**0**	**1**	**6**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**1**	**0**	**0**	**0**	**15**	**13**	**15**	**3**
Minimum Concentration	**<0.005**	**1**	**<2**	**<2**	**<2**	**<2**	**<2**	**1**	**<4**	**<2**	**<2**	**<2,000**	**<2,000**	**<2,000**	**80,000**	**4,000**	**<2**	**<0.5**	**<50**	**0.2**	**1**	**164**	**166**
Minimum Detect	**ND**	**1**	**4**	**ND**	**3**	**ND**	**3**	**1**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**80,000**	**4,000**	**ND**	**ND**	**ND**	**0.2**	**1**	**164**	**166**
Maximum Concentration	**<0.005**	**<5**	**6**	**<5**	**<5**	**<5**	**3**	**10**	**<25**	**<25**	**<2**	**<2,000**	**<2,000**	**<2,000**	**80,000**	**4,000**	**<2**	**<24.8**	**<990**	**2.04**	**141**	**257**	**178**
Maximum Detect	**ND**	**4**	**6**	**ND**	**3**	**ND**	**3**	**10**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**80,000**	**4,000**	**ND**	**ND**	**ND**	**2.04**	**141**	**257**	**178**
Average Concentration *	**0.0025**	**1.3**	**1.7**	**1.3**	**1.4**	**1.3**	**1.1**	**1.8**	**3.6**	**3**								**2.9**	**119**	**0.62**	**31**	**198**	**174**
Geometric Average *	**0.0025**	**0.94**	**1.4**	**1.2**	**1.3**	**1.2**	**1.1**	**0.99**	**2.7**	**1.8**	**1**	**1,000**	**1,000**	**1,000**	**80,000**	**4,000**	**1**	**1.5**	**69**	**0.5**	**11**	**197**	**174**
Median Concentration *	**0.0025**	**0.5**	**1**	**1**	**1**	**1**	**1**	**1**	**2**	**1.5**	**1**	**1,000**	**1,000**	**1,000**	**80,000**	**4,000**	**1**	**1.3**	**50**	**0.38**	**23**	**197**	**177**
Standard Deviation *	**0**	**1.1**	**1.4**	**0.59**	**0.72**	**0.59**	**0.49**	**2.7**	**3.8**	**4.1**								**4.2**	**166**	**0.51**	**39**	**21**	**6.7**
Geometric Standard Devia	**1**	**2.2**	**1.8**	**1.4**	**1.5**	**1.4**	**1.3**	**2.6**	**2**	**2.5**								**3.1**	**2.5**	**1.9**	**6.3**	**1.1**	**1**
95% UCL (Student's-t) *	**0.0025**	**1.774**	**2.33**	**1.514**	**1.687**	**1.514**	**1.323**	**2.89**	**5.512**	**5.041**								**4.98**	**200.7**	**0.851**	**49.32**	**207.1**	**184.9**
% of Detects	**0**	**29**	**12**	**0**	**6**	**0**	**6**	**35**	**0**	**0**	**0**	**0**	**0**	**0**	**100**	**100**	**0**	**0**	**0**	**100**	**87**	**100**	**100**
% of Non-Detects	**100**	**71**	**88**	**100**	**94**	**100**	**94**	**65**	**100**	**100**	**100**	**100**	**100**	**100**	**0**	**0**	**100**	**100**	**100**	**0**	**13**	**0**	**0**

* A Non Detect Multiplier of 0.5 has been applied.

Table B-1
Human Health Tier 1 Screening Assessment
Amungee NW-2H Flowback Water
Tamboran

Inorganics

	Nitrite + Nitrate as N	Reactive Silica	Alkalinity (Bicarbonate as CaCO3)	Alkalinity (Carbonate as CaCO3)	Alkalinity (Hydroxide) as CaCO3	Alkalinity (total) as CaCO3	Ammonia as N	Anions Total	Bromide	Bromine	Bromine (filtered)	Cations Total	Chloride	Fluoride	Ionic Balance	Kjeldahl Nitrogen Total	Nitrate (as N)	Nitrite (as N)	Nitrogen (Total)	Reactive Phosphorus as P (Orthophosphate as P)	Sodium	Sodium (filtered)	Sodium Absorption Ratio (filtered)	Total Dissolved Solids (Lab)
	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	meq/L	µg/L	µg/L	µg/L	meq/L	mg/L	mg/L	%	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	-	mg/L
EQL	0.01	0.05	1	1	1	1	0.01	0.01	10	100	100	0.01	1	0.1	0.01	0.1	0.01	0.01	0.1	0.01	1	1	0.01	10
ADWG 2022 Aesthetic													250								180	180		600
ADWG 2022 Health														**1.5**										
WHO (2022) Drinking Wate																	**50**	**3**						
USEPA RSLs																								
Field ID																								
Amungee 2H Flowback	0.07		881	<1	<1	881	26.2	174	83,200	53,400	40,000	156	5,540	**2**	5.27	57.8	0.07	<0.01	57.9	0.14		3,310	60.3	10,100
	<0.01		856	<1	<1	856	26.9	210	143,000	61,600	63,300	201	6,730	1.3	2.13	62.9	<0.01	<0.01	62.9	<0.01		4,230	65.4	12,400
Amungee Nw 2H Flowback	0.03		430	<1	<1	430	34.4	387	121,000	146,000	145,000	421	13,400	**6**	4.17	60.7	0.03	<0.01	60.7	0.09		8,570	77.6	23,800
	<0.01		362	<1	<1	362	34.2	397	170,000	129,000	164,000	432	13,800	0.9	4.15	50.3	<0.01	<0.01	50.3	<0.10		8,660	73.5	28,700
	<0.01	173	325	<1	<1	325	31.4		712,000	189,000	180,000		16,400	0.8		65.5	<0.01	<0.01	65.5	<0.01		9,420	76.9	31,900
		177																						
	<0.01	196	246	<1	<1	246	32.6		182,000	202,000	202,000		17,100	1		60.9	<0.01	<0.01	60.9	0.01		10,400	80	35,000
Amungee Nw 2H Flowback	<0.01		435	<1	<1	435	34.4	393	125,000	143,000	143,000	418	13,600	1	3.02	62.1	<0.01	<0.01	62.1	0.02	8,280	8,500	77.3	23,600
Amungee NW-2H Flowbacl	0.02		508	<1	<1	508	30.6		108,000	112,000	103,000		10,300	1.4		56.5	0.02	<0.01	56.5	0.02		6,070	72.6	19,500
	<0.01		339	<1	<1	339	45.1		318,000	207,000	222,000		21,000	0.9		73.2	<0.01	<0.01	73.2	<0.01		11,100	78.9	34,200
	<0.01		262	<1	<1	262	25.6		178,000	196,000	202,000		18,600	0.9		44.9	<0.01	<0.01	44.9	<0.01		10,700	81	32,100
	<0.01		266	<1	<1	266	37.3		142,000	185,000	222,000		21,400	0.6		67.3	<0.01	<0.01	67.3	<0.01		10,900	71.1	33,500
	0.06		259	<1	<1	259	35		162,000	193,000	249,000		20,100	0.8		65.6	0.06	<0.01	65.7	<0.01		10,500	68.4	36,100
	<0.01		271	<1	<1	271	1.6		274,000	205,000	242,000		22,200	0.8		64.4	<0.01	<0.01	64.4	<0.01		13,400	94.1	41,600
	<0.01		274	<1	<1	274	1.67		321,000	227,000	274,000		24,000	1		67.3	<0.01	<0.01	67.3	<0.01		14,900	93.1	44,300
Amunge NW 2H Flowback	0.02		244	<1	<1	244	1.81	490	215,000	170,000	197,000	548	17,200	0.8	5.53	57.9	0.02	<0.01	57.9	<0.01		10,700	73.4	31,200
Statistics																								
Number of Results	**15**	**3**	**15**	**15**	**15**	**15**	**15**	**6**	**15**	**15**	**15**	**6**	**15**	**15**	**6**	**15**	**15**	**15**	**15**	**15**	**1**	**15**	**15**	**15**
Number of Detects	**5**	**3**	**15**	**0**	**0**	**15**	**15**	**6**	**15**	**15**	**15**	**6**	**15**	**15**	**6**	**15**	**5**	**0**	**15**	**5**	**1**	**15**	**15**	**15**
Minimum Concentration	**<0.01**	**173**	**244**	**<1**	**<1**	**244**	**1.6**	**174**	**83,200**	**53,400**	**40,000**	**156**	**5,540**	**0.6**	**2.13**	**44.9**	**<0.01**	**<0.01**	**44.9**	**0.01**	**8,280**	**3,310**	**60.3**	**10,100**
Minimum Detect	**0.02**	**173**	**244**	**ND**	**ND**	**244**	**1.6**	**174**	**83,200**	**53,400**	**40,000**	**156**	**5,540**	**0.6**	**2.13**	**44.9**	**0.02**	**ND**	**44.9**	**0.01**	**8,280**	**3,310**	**60.3**	**10,100**
Maximum Concentration	**0.07**	**196**	**881**	**<1**	**<1**	**881**	**45.1**	**490**	**712,000**	**227,000**	**274,000**	**548**	**24,000**	**6**	**5.53**	**73.2**	**0.07**	**<0.01**	**73.2**	**0.14**	**8,280**	**14,900**	**94.1**	**44,300**
Maximum Detect	**0.07**	**196**	**881**	**ND**	**ND**	**881**	**45.1**	**490**	**712,000**	**227,000**	**274,000**	**548**	**24,000**	**6**	**5.53**	**73.2**	**0.07**	**ND**	**73.2**	**0.14**	**8,280**	**14,900**	**94.1**	**44,300**
Average Concentration *	**0.017**	**182**	**397**	**0.5**	**0.5**	**397**	**27**	**342**	**216,947**	**161,267**	**176,553**	**363**	**16,091**	**1.3**	**4**	**61**	**0.017**	**0.005**	**61**	**0.025**		**9,424**	**76**	**29,200**
Geometric Average *	**0.0095**	**182**	**361**	**0.5**	**0.5**	**361**	**18**	**320**	**185,436**	**149,914**	**158,946**	**331**	**14,951**	**1.1**	**3.8**	**61**	**0.0095**	**0.005**	**61**	**0.011**	**8,280**	**8,822**	**76**	**27,230**
Median Concentration *	**0.005**	**177**	**325**	**0.5**	**0.5**	**325**	**31.4**	**390**	**170,000**	**185,000**	**197,000**	**419.5**	**17,100**	**0.9**	**4.16**	**62.1**	**0.005**	**0.005**	**62.1**	**0.005**	**8,280**	**10,400**	**76.9**	**31,900**
Standard Deviation *	**0.021**	**12**	**207**	**0**	**0**	**207**	**14**	**123**	**154,882**	**52,922**	**67,636**	**151**	**5,529**	**1.3**	**1.3**	**7.1**	**0.021**	**0**	**7.1**	**0.04**		**3,093**	**9**	**9,740**
Geometric Standard Devia	**2.7**	**1.1**	**1.5**	**1**	**1**	**1.5**	**3.4**	**1.5**	**1.7**	**1.5**	**1.7**	**1.6**	**1.5**	**1.7**	**1.4**	**1.1**	**2.7**	**1**	**1.1**	**3.3**		**1.5**	**1.1**	**1.5**
95% UCL (Student's-t) *	**0.0263**	**202.7**	**491.4**	**0.5**	**0.5**	**491.4**	**32.84**	**442.7**	**287,382**	**185,334**	**207,312**	**487.1**	**18,606**	**1.952**	**5.114**	**64.37**	**0.0263**	**0.005**	**64.38**	**0.043**		**10,831**	**80.34**	**33,629**
% of Detects	**33**	**100**	**100**	**0**	**0**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**33**	**0**	**100**	**33**	**100**	**100**	**100**	**100**
% of Non-Detects	**67**	**0**	**0**	**100**	**100**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**67**	**100**	**0**	**67**	**0**	**0**	**0**	**0**

* A Non Detect Multiplier o

Table B-1
Human Health Tier 1 Screening Assessment
Amungee NW-2H Flowback Water
Tamboran

	Total Suspended Solids (Lab)	Aluminium	Aluminium (filtered)	Antimony	Antimony (filtered)	Arsenic	Arsenic (filtered)	Barium	Barium (filtered)	Beryllium	Beryllium (filtered)	Boron	Boron (filtered)	Cadmium	Cadmium (filtered)	Calcium	Calcium (filtered)	Chromium (III+VI)	Chromium (III+VI) (filtered)	Copper	Copper (filtered)	Iron	Iron (filtered)	Lead
	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
EQL	5	0.01	0.01	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.05	0.05	0.0001	0.0001	1	1	0.001	0.001	0.001	0.001	0.05	0.05	0.001
ADWG 2022 Aesthetic																				1	1	0.3	0.3	
ADWG 2022 Health				0.003	0.003	0.01	0.01	2	2	0.06	0.06	4	4	0.002	0.002			0.05		2	2			0.01
WHO (2022) Drinking Wate																								
USEPA RSLs		20																				14		

Field ID

Amungee 2H Flowback	19	0.11	0.08	0.012	0.002	0.043	0.038	4.38	4.17	<0.001	<0.001	12.3	11.6	<0.0001	<0.0001		161	0.012	0.002	<0.001	<0.001	20.5	15.2	<0.001
	82	0.16	0.02	0.113	0.07	0.012	0.005	7.63	6.9	<0.001	<0.001	14	14.2	<0.0001	<0.0001		226	0.031	0.007	0.001	<0.001	40.2	7.08	<0.001
Amungee Nw 2H Flowback	39	0.36	<0.10	<0.010	<0.010	0.011	<0.010	25	25.3	<0.010	<0.010	18.2	18.5	<0.0010	<0.0010		676	<0.010	<0.010	<0.010	<0.010	16.2	3.3	<0.010
	115	0.22	<0.10	<0.010	<0.010	<0.010	<0.010	19.4	30.8	<0.010	<0.010	18	20.6	<0.0010	<0.0010		787	0.13	<0.010	0.059	<0.010	20.4	4.35	0.026
	98	0.11	<0.10	<0.010	<0.010	<0.010	<0.010	18.8	37.3	<0.010	<0.010	21.9	20.9	0.0017	<0.0010		822	<0.010	<0.010	<0.010	<0.010	22.1	1.26	<0.010
	102	0.24	<0.10	<0.010	<0.010	0.012	<0.010	40.6	12	<0.010	<0.010	23.5	21.7	<0.0010	<0.0010		929	0.011	<0.010	0.042	<0.010	27	2.41	0.03
Amungee Nw 2H Flowback	8	0.26	<0.10	<0.010	<0.010	0.014	<0.010	25.8	25.1	<0.010	<0.010	19	19.8	<0.0010	<0.0010	657	663	<0.010	<0.010	<0.010	<0.010	16.8	2.45	<0.010
Amungee NW-2H Flowbacl	135	0.27	<0.10	<0.010	<0.010	0.04	0.01	14.3	13	<0.010	<0.010	16.9	16.8	<0.0010	<0.0010		372	0.039	<0.010	0.015	<0.010	38	1.18	<0.010
	176	0.29	<0.10	<0.010	<0.010	<0.010	<0.010	52.4	54.4	<0.010	<0.010	24.8	23.3	<0.0010	<0.0010		1,150	<0.010	<0.010	0.029	<0.010	31.8	1.04	0.012
	104	<0.10	<0.10	<0.010	<0.010	<0.010	<0.010	51	46.1	<0.010	<0.010	20.6	18.9	<0.0010	<0.0010		968	<0.010	<0.010	<0.010	<0.010	30.1	28.8	<0.010
	126	<0.10	<0.10	<0.010	<0.010	<0.010	<0.010	64.1	62.8	<0.010	<0.010	21.7	21.1	<0.0010	<0.0010		1,410	0.011	<0.010	0.072	0.023	39.2	0.83	0.114
	130	<0.10	<0.10	<0.010	<0.010	<0.010	<0.010	64.8	62.7	<0.010	<0.010	22.8	21.8	<0.0010	<0.0010		1,410	<0.010	<0.010	<0.010	<0.010	37.6	2.45	<0.010
	156	<0.10	<0.10	<0.010	<0.010	<0.010	<0.010	65	71.1	<0.010	<0.010	20.9	22.5	<0.0010	<0.0010		1,070	0.018	<0.010	0.038	<0.010	42	0.63	<0.010
	168	<0.10	<0.10	<0.010	<0.010	<0.010	<0.010	77.3	80.3	<0.010	<0.010	23.6	25	<0.0010	<0.0010		1,410	<0.010	<0.010	0.011	<0.010	45.9	4.05	<0.010
Amunge NW 2H Flowback	80	0.17	<0.10	0.025	<0.010	<0.010	<0.010	48.2	55.4	<0.010	<0.010	20.2	19.7	<0.0010	<0.0010		1,260	0.014	<0.010	0.013	<0.010	30.1	4.54	<0.010

Statistics

Number of Results	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	1	15	15	15	15	15	15	15	15
Number of Detects	15	10	2	3	2	6	3	15	15	0	0	15	15	1	0	1	15	8	2	9	1	15	15	4
Minimum Concentration	8	<0.1	0.02	<0.01	0.002	<0.01	0.005	4.38	4.17	<0.001	<0.001	12.3	11.6	<0.0001	<0.0001	657	161	<0.01	0.002	0.001	<0.001	16.2	0.63	<0.001
Minimum Detect	8	0.11	0.02	0.012	0.002	0.011	0.005	4.38	4.17	ND	ND	12.3	11.6	0.0017	ND	657	161	0.011	0.002	0.001	0.023	16.2	0.63	0.012
Maximum Concentration	176	0.36	<0.1	0.113	0.07	0.043	0.038	77.3	80.3	<0.01	<0.01	24.8	25	0.0017	<0.001	657	1,410	0.13	<0.01	0.072	0.023	45.9	28.8	0.114
Maximum Detect	176	0.36	0.08	0.113	0.07	0.043	0.038	77.3	80.3	ND	ND	24.8	25	0.0017	ND	657	1,410	0.13	0.007	0.072	0.023	45.9	28.8	0.114
Average Concentration *	103	0.16	0.05	0.014	0.0091	0.012	0.0075	39	39	0.0044	0.0044	20	20	0.00052	0.00044		888	0.02	0.0049	0.02	0.0056	31	5.3	0.015
Geometric Average *	82	0.13	0.049	0.0073	0.0056	0.0084	0.006	30	29	0.0037	0.0037	20	19	0.0004	0.00037	657	757	0.011	0.0048	0.0097	0.0041	29	2.9	0.006
Median Concentration *	104	0.16	0.05	0.005	0.005	0.005	0.005	40.6	37.3	0.005	0.005	20.6	20.6	0.0005	0.0005	657	929	0.011	0.005	0.011	0.005	30.1	2.45	0.005
Standard Deviation *	51	0.11	0.011	0.028	0.017	0.013	0.0085	24	25	0.0016	0.0016	3.6	3.5	0.00036	0.00016		415	0.032	0.00096	0.023	0.0051	9.7	7.5	0.029
Geometric Standard Devia	2.4	2.1	1.3	2.4	2.1	2.1	1.7	2.3	2.5	2.2	2.2	1.2	1.2	2.5	2.2		1.9	2.7	1.3	4.2	2.6	1.4	2.9	4
95% UCL (Student's-t) *	125.6	0.21	0.0552	0.0267	0.0168	0.0175	0.0114	49.32	50.38	0.00512	0.00512	21.51	21.33	0.00068482	0.00051201		1,076	0.0347	0.00537	0.0306	0.0079	34.95	8.695	0.0282
% of Detects	100	67	13	20	13	40	20	100	100	0	0	100	100	7	0	100	100	53	13	60	7	100	100	27
% of Non-Detects	0	33	87	80	87	60	80	0	0	100	100	0	0	93	100	0	0	47	87	40	93	0	0	73

* A Non Detect Multiplier o

Table B-1
Human Health Tier 1 Screening Assessment
Amungee NW-2H Flowback Water
Tamboran

Metals

	Lead (filtered)	Magnesium	Magnesium (filtered)	Manganese	Manganese (filtered)	Mercury	Mercury (filtered)	Molybdenum	Nickel	Nickel (filtered)	Potassium	Potassium (filtered)	Selenium	Selenium (filtered)	Silver	Silver (filtered)	Strontium	Strontium (filtered)	Thorium	Thorium (filtered)	Tin	Tin (filtered)	Uranium	Uranium (filtered)
	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L	µg/L	mg/L	mg/L	µg/L	µg/L
EQL	0.001	1	1	0.001	0.001	0.0001	0.0001	0.001	0.001	0.001	1	1	0.01	0.01	0.001	0.001	0.001	0.001	1	1	0.001	0.001	1	1
ADWG 2022 Aesthetic				0.1	0.1																			
ADWG 2022 Health	0.01			0.5	0.5	0.001	0.001	0.05	0.02	0.02			0.01	0.01	0.1	0.1							20	20
WHO (2022) Drinking Wate																								
USEPA RSLs																	12				12			

Field ID

Field ID	Lead (filtered)	Magnesium	Magnesium (filtered)	Manganese	Manganese (filtered)	Mercury	Mercury (filtered)	Molybdenum	Nickel	Nickel (filtered)	Potassium	Potassium (filtered)	Selenium	Selenium (filtered)	Silver	Silver (filtered)	Strontium	Strontium (filtered)	Thorium	Thorium (filtered)	Tin	Tin (filtered)	Uranium	Uranium (filtered)
Amungee 2H Flowback	<0.001		41	0.841	0.823	<0.0001	<0.0001	0.049	0.003	0.003		42	<0.01	<0.01	0.002	<0.001	8.05	7.81	17	<1	0.006	<0.001	<1	<1
	<0.001		55	1.35	1.23	<0.0001	<0.0001	0.049	0.003	0.002		52	<0.01	<0.01	<0.001	<0.001	12.6	9.68	4	<1	0.002	<0.001	<1	<1
Amungee Nw 2H Flowback	<0.010		151	2.03	2.03	<0.0001	<0.0001	0.019	<0.010	<0.010		85	<0.10	<0.10	<0.010	<0.010	43.8	43.1	<10	<10	<0.010	<0.010	<10	<10
	<0.010		161	2.16	2.2	<0.0001	<0.0001	0.016	<0.010	<0.010		92	<0.10	<0.10	<0.010	<0.010	49.7	49.2	<10	<10	<0.010	<0.010	<10	<10
	<0.010		191	2.77	2.75	<0.0001	<0.0001	0.011	<0.010	<0.010		93	<0.10	<0.10	<0.010	<0.010	62.9	62.6	<10	<10	<0.010	<0.010	<10	<10
	<0.010		214	3.26	3.14	<0.0001	<0.0001	0.014	<0.010	<0.010		102	<0.10	<0.10	<0.010	<0.010	74.3	72.5	<10	<10	<0.010	<0.010	<10	<10
Amungee Nw 2H Flowback	<0.010	154	154	2.09	2.03	<0.0001	<0.0001	0.02	<0.010	<0.010	82	83	<0.10	<0.10	<0.010	<0.010	44.5	42.1	<10	<10	<0.010	<0.010	<10	<10
Amungee NW-2H Flowbac	<0.010		96	1.74	1.67	<0.0001	<0.0001	0.039	0.025	0.016		63	<0.10	<0.10	<0.010	<0.010	26.3	24.2	<10	<10	<0.010	<0.010	<10	<10
	<0.010		211	3.64	3.2	0.0001	<0.0001	0.014	<0.010	<0.010		92	<0.10	<0.10	<0.010	<0.010	87.7	86.8	<10	<10	<0.010	<0.010	<10	<10
	<0.010		215	3.39	3	<0.0001	<0.0001	0.014	<0.010	<0.010		95	<0.10	<0.10	<0.010	<0.010	83.7	76.9	<10	<10	<0.010	<0.010	<10	<10
	<0.010		226	3.63	3.58	0.0002	<0.0001	0.014	<0.010	<0.010		88	<0.10	<0.10	<0.010	<0.010	104	104	<10	<10	<0.010	<0.010	<10	<10
	<0.010		228	3.62	3.54	<0.0001	<0.0001	0.011	<0.010	<0.010		88	<0.10	<0.10	<0.010	<0.010	103	110	<10	<10	<0.010	<0.010	<10	<10
	<0.010		283	3.86	3.54	0.0002	<0.0001	0.016	0.014	<0.010		110	<0.10	<0.10	<0.010	<0.010	103	121	<10	<10	<0.010	<0.010	<10	<10
	<0.010		321	4.36	4.02	0.0002	<0.0001	<0.010	<0.010	<0.010		120	<0.10	<0.10	<0.010	<0.010	125	138	<10	<10	<0.010	<0.010	<10	<10
Amunge NW 2H Flowback	<0.010		212	3.13	3.14	<0.0001	<0.0001	0.014	0.014	<0.010		88	<0.10	<0.10	<0.010	<0.010	83.4	91.8	<10	<10	<0.010	<0.010	<10	<10

Statistics

Statistics	Lead (filtered)	Magnesium	Magnesium (filtered)	Manganese	Manganese (filtered)	Mercury	Mercury (filtered)	Molybdenum	Nickel	Nickel (filtered)	Potassium	Potassium (filtered)	Selenium	Selenium (filtered)	Silver	Silver (filtered)	Strontium	Strontium (filtered)	Thorium	Thorium (filtered)	Tin	Tin (filtered)	Uranium	Uranium (filtered)
Number of Results	15	1	15	15	15	17	15	15	15	15	1	15	15	15	15	15	15	15	15	15	15	15	15	15
Number of Detects	0	1	15	15	15	4	0	14	5	3	1	15	0	0	1	0	15	15	2	0	2	0	0	0
Minimum Concentration	<0.001	154	41	0.841	0.823	0.0001	<0.0001	<0.01	0.003	0.002	82	42	<0.01	<0.01	<0.001	<0.001	8.05	7.81	4	<1	0.002	<0.001	<1	<1
Minimum Detect	ND	154	41	0.841	0.823	0.0001	ND	0.011	0.003	0.002	82	42	ND	ND	0.002	ND	8.05	7.81	4	ND	0.002	ND	ND	ND
Maximum Concentration	<0.01	154	321	4.36	4.02	<0.0005	<0.0001	0.049	0.025	0.016	82	120	<0.1	<0.1	<0.01	<0.01	125	138	17	<10	<0.01	<0.01	<10	<10
Maximum Detect	ND	154	321	4.36	4.02	0.0002	ND	0.049	0.025	0.016	82	120	ND	ND	0.002	ND	125	138	17	ND	0.006	ND	ND	ND
Average Concentration *	0.0044		184	2.8	2.7	0.000091	0.00005	0.02	0.0073	0.0054		86	0.044	0.044	0.0045	0.0044	67	69	5.7	4.4	0.0049	0.0044	4.4	4.4
Geometric Average *	0.0037	154	163	2.6	2.5	0.000073	0.00005	0.017	0.006	0.0049	82	83	0.037	0.037	0.004	0.0037	54	54	5.3	3.7	0.0048	0.0037	3.7	3.7
Median Concentration *	0.005	154	211	3.13	3	0.00005	0.00005	0.014	0.005	0.005	82	88	0.05	0.05	0.005	0.005	74.3	72.5	5	5	0.005	0.005	5	5
Standard Deviation *	0.0016		77	1	0.95	0.000071	0	0.014	0.0059	0.0031		20	0.016	0.016	0.0013	0.0016	36	40	3.1	1.6	0.00083	0.0016	1.6	1.6
Geometric Standard Devia	2.2		1.8	1.6	1.6	1.9	1	1.8	1.8	1.5		1.3	2.2	2.2	1.9	2.2	2.2	2.4	1.4	2.2	1.3	2.2	2.2	2.2
95% UCL (Student's-t) *	0.00512		219	3.26	3.09	0.00012134	0.00005	0.0266	0.00997	0.00679		95.48	0.0512	0.0512	0.00511	0.00512	83.68	87.49	7.156	5.12	0.00525	0.00512	5.12	5.12
% of Detects	0	100	100	100	100	24	0	93	33	20	100	100	0	0	7	0	100	100	13	0	13	0	0	0
% of Non-Detects	100	0	0	0	0	76	100	7	67	80	0	0	100	100	93	100	0	0	87	100	87	100	100	100

* A Non Detect Multiplier o

Table B-1
Human Health Tier 1 Screening Assessment
Amungee NW-2H Flowback Water
Tamboran

					NA		Organic				Organochlorine Pesticides													
	Vanadium	Vanadium (filtered)	Zinc	Zinc (filtered)	Formaldehyde	Propane	Dissolved Organic Carbon	Ethane	Methane	Total Organic Carbon	Other organochlorine pesticides EPAVic	4,4-DDE	a-BHC	Aldrin	Aldrin + Dieldrin	b-BHC	Chlordane	Chlordane (cis)	Chlordane (trans)	d-BHC	DDD	DDT	DDT+DDE+DDD	Dieldrin
	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L	mg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
EQL	0.01	0.01	0.005	0.005	0.1	0.01	1	10	0.01	1	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	2	0.5	0.5
ADWG 2022 Aesthetic			3	3																				
ADWG 2022 Health					**0.5**										**0.3**		**2**					**9**		
WHO (2022) Drinking Wate														**0.03**										**0.03**
USEPA RSLs	**0.086**		**6**																		**0.032**			

Field ID

Field ID	Vanadium	Vanadium (filtered)	Zinc	Zinc (filtered)	Formaldehyde	Propane	Dissolved Organic Carbon	Ethane	Methane	Total Organic Carbon	Other organochlorine pesticides EPAVic	4,4-DDE	a-BHC	Aldrin	Aldrin + Dieldrin	b-BHC	Chlordane	Chlordane (cis)	Chlordane (trans)	d-BHC	DDD	DDT	DDT+DDE+DDD	Dieldrin
Amungee 2H Flowback	<0.01	<0.01	0.013	0.012	1.9		302			356	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2.0	<0.5	<0.5
	0.01	<0.01	0.146	0.038	3.3		307			311	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2.0	<0.5	<0.5
Amungee Nw 2H Flowback	<0.10	<0.10	<0.052	<0.050	1.7		293			398	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5
	<0.10	<0.10	<0.052	<0.050	4.4		220			309	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5
	<0.10	<0.10	<0.052	<0.050	1.2		258			357	<24.8	<24.8	<24.8	<24.8	<24.8	<24.8	<24.8	<24.8	<24.8	<24.8	<24.8	<24.8	<24.8	<24.8
	<0.10	<0.10	<0.052	<0.050	5.8		280			283	<24.2	<24.2	<24.2	<24.2	<24.2	<24.2	<24.2	<24.2	<24.2	<24.2	<24.2	<24.2	<24.2	<24.2
Amungee Nw 2H Flowback	<0.10	<0.10	<0.052	<0.050	1		283			388														
Amungee NW-2H Flowbac	<0.10	<0.10	<0.052	<0.050	5.4		283			345	<4.8	<4.8	<4.8	<4.8	<4.8	<4.8	<4.8	<4.8	<4.8	<4.8	<4.8	<4.8	<4.8	<4.8
	<0.10	<0.10	0.069	<0.050	4.6		358			386	<2.7	<2.7	<2.7	<2.7	<2.7	<2.7	<2.7	<2.7	<2.7	<2.7	<2.7	<2.7	<2.7	<2.7
	<0.10	<0.10	<0.052	<0.050	5.2		188			234	<2.9	<2.9	<2.9	<2.9	<2.9	<2.9	<2.9	<2.9	<2.9	<2.9	<2.9	<2.9	<2.9	<2.9
	<0.10	<0.10	<0.052	<0.050	5.4		260			391	<2.6	<2.6	<2.6	<2.6	<2.6	<2.6	<2.6	<2.6	<2.6	<2.6	<2.6	<2.6	<2.6	<2.6
	<0.10	<0.10	<0.052	<0.050	5.4		219			210	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5
	<0.10	<0.10	<0.052	<0.050	2.8		221			322	<2.6	<2.6	<2.6	<2.6	<2.6	<2.6	<2.6	<2.6	<2.6	<2.6	<2.6	<2.6	<2.6	<2.6
	<0.10	<0.10	<0.052	<0.050	4.5		212			327	<2.7	<2.7	<2.7	<2.7	<2.7	<2.7	<2.7	<2.7	<2.7	<2.7	<2.7	<2.7	<2.7	<2.7
Amunge NW 2H Flowback	<0.10	<0.10	<0.052	<0.050	5.2		195			255														

Statistics

Statistics	Vanadium	Vanadium (filtered)	Zinc	Zinc (filtered)	Formaldehyde	Propane	Dissolved Organic Carbon	Ethane	Methane	Total Organic Carbon	Other organochlorine pesticides EPAVic	4,4-DDE	a-BHC	Aldrin	Aldrin + Dieldrin	b-BHC	Chlordane	Chlordane (cis)	Chlordane (trans)	d-BHC	DDD	DDT	DDT+DDE+DDD	Dieldrin
Number of Results	15	15	15	15	15	2	15	2	2	15	13	13	13	13	13	13	13	13	13	13	13	13	13	13
Number of Detects	1	0	3	2	15	0	15	0	0	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Minimum Concentration	0.01	<0.01	0.013	0.012	1	<0.01	188	<10	<0.01	210	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5
Minimum Detect	0.01	ND	0.013	0.012	1	ND	188	ND	ND	210	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Maximum Concentration	<0.1	<0.1	0.146	<0.05	5.8	<0.01	358	<10	<0.01	398	<24.8	<24.8	<24.8	<24.8	<24.8	<24.8	<24.8	<24.8	<24.8	<24.8	<24.8	<24.8	<24.8	<24.8
Maximum Detect	0.01	ND	0.146	0.038	5.8	ND	358	ND	ND	398	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Average Concentration *	0.044	0.044	0.036	0.025	3.9	0.005	259	5	0.005	325	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	3	2.9	2.9
Geometric Average *	0.039	0.037	0.03	0.024	3.4	0.005	254	5	0.005	319	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.9	1.5	1.5
Median Concentration *	0.05	0.05	0.026	0.025	4.5	0.005	260	5	0.005	327	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3
Standard Deviation *	0.015	0.016	0.033	0.0049	1.7	0	48	0	0	59	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.1	4.2	4.2
Geometric Standard Devia	2	2.2	1.7	1.3	1.8	1	1.2	1	1	1.2	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	2.4	3.1	3.1
95% UCL (Student's-t) *	0.0511	0.0512	0.0508	0.0272	4.631	0.005	280.5	5	0.005	351.5	4.98	4.98	4.98	4.98	4.98	4.98	4.98	4.98	4.98	4.98	4.98	5.061	4.98	4.98
% of Detects	7	0	20	13	100	0	100	0	0	100	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% of Non-Detects	93	100	80	87	0	100	0	100	100	0	100	100	100	100	100	100	100	100	100	100	100	100	100	100

* A Non Detect Multiplier o

Table B-1
Human Health Tier 1 Screening Assessment
Amungee NW-2H Flowback Water
Tamboran

										PAH														
	Endosulfan I	Endosulfan II	Endosulfan sulphate	Endrin	Endrin aldehyde	g-BHC (Lindane)	Heptachlor	Heptachlor epoxide	Methoxychlor	Benzo(b+j+k)fluoranthene	Acenaphthene	Acenaphthylene	Anthracene	Benzo(a)anthracene	Benzo(a) pyrene	Benzo(b+j)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	Naphthalene
	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
EQL	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	2	0.001	1	1	1	1	0.5	0.001	1	1	1	1	1	1	1	1
ADWG 2022 Aesthetic																								
ADWG 2022 Health						10	0.3								0.01									
WHO (2022) Drinking Wate				0.6					20															
USEPA RSLs	100		110				0.0014	0.0014			530		1800	0.03				2.5	25	0.025	800	290	0.25	

Field ID

Amungee 2H Flowback	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2.0	<0.0010	<1.0	<1.0	<1.0	<1.0	<0.5	<0.0010	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2.0	<0.0010	<1.0	<1.0	<1.0	<1.0	<0.5	<0.0010	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Amungee Nw 2H Flowback	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<0.0050	<2.5	<2.5	<2.5	<2.5	<2.5	<0.0476	<2.5	<47.6	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5
	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<0.0051	<2.5	<2.5	<2.5	<2.0	<2.5	<0.0472	<2.0	<47.2	<2.0	<2.0	<2.5	<2.5	<2.0	<2.5
	<24.8	<24.8	<24.8	<24.8	<24.8	<24.8	<24.8	<24.8	<24.8	<0.0496	<24.8	<24.8	<24.8	<19.8	<24.8	<0.0476	<19.8	<47.6	<19.8	<19.8	<24.8	<24.8	<19.8	<24.8
	<24.2	<24.2	<24.2	<24.2	<24.2	<24.2	<24.2	<24.2	<24.2	<0.0484	<24.2	<24.2	<24.2	<19.4	<24.2	<0.0476	<19.4	<47.6	<19.4	<19.4	<24.2	<24.2	<19.4	<24.2
Amungee Nw 2H Flowback											<47.6	<47.6	<47.6	<47.6	<47.6	<0.0476	<47.6	<47.6	<47.6	<47.6	<47.6	<47.6	<47.6	<47.6
Amungee NW-2H Flowbacl	<4.8	<4.8	<4.8	<4.8	<4.8	<4.8	<4.8	<4.8	<4.8	<0.0096	<4.8	<4.8	<4.8	<3.8	<4.8	<0.0472	<3.8	<47.2	<3.8	<3.8	<4.8	<4.8	<3.8	<4.8
	<2.7	<2.7	<2.7	<2.7	<2.7	<2.7	<2.7	<2.7	<2.7	<0.0054	<2.7	<2.7	<2.7	<2.2	<2.7	<0.0556	<2.2	<55.6	<2.2	<2.2	<2.7	<2.7	<2.2	<2.7
	<2.9	<2.9	<2.9	<2.9	<2.9	<2.9	<2.9	<2.9	<2.9	<0.0059	<2.9	<2.9	<2.9	<2.9	<2.9	<0.0472	<2.9	<47.2	<2.9	<2.9	<2.9	<2.9	<2.9	<2.9
	<2.6	<2.6	<2.6	<2.6	<2.6	<2.6	<2.6	<2.6	<2.6	<0.0053	<2.6	<2.6	<2.6	<2.6	<2.6	<0.0490	<2.6	<49.0	<2.6	<2.6	<2.6	<2.6	<2.6	<2.6
	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<0.0050	<2.5	<2.5	<2.5	<2.5	<2.5	<0.0490	<2.5	<49.0	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5
	<2.6	<2.6	<2.6	<2.6	<2.6	<2.6	<2.6	<2.6	<2.6	<0.0051	<2.6	<2.6	<2.6	<2.6	<2.6	<0.0476	<2.6	<47.6	<2.6	<2.6	<2.6	<2.6	<2.6	<2.6
	<2.7	<2.7	<2.7	<2.7	<2.7	<2.7	<2.7	<2.7	<2.7	<0.0053	<2.7	<2.7	<2.7	<2.7	<2.7	<0.0476	<2.7	<47.6	<2.7	<2.7	<2.7	<2.7	<2.7	<2.7
Amunge NW 2H Flowback											<47.6	<47.6	<47.6	<47.6	<47.6	<0.0476	<47.6	<47.6	<47.6	<47.6	<47.6	<47.6	<47.6	<47.6

Statistics

Number of Results	13	13	13	13	13	13	13	13	13	13	17	17	17	17	17	17	17	17	17	17	17	17	17	17
Number of Detects	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Minimum Concentration	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.001	<1	<1	<1	<1	<0.5	<0.001	<1	<1	<1	<1	<1	<1	<1	<1
Minimum Detect	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Maximum Concentration	<24.8	<24.8	<24.8	<24.8	<24.8	<24.8	<24.8	<24.8	<24.8	<0.0496	<50	<50	<50	<50	<50	<0.0556	<50	<55.6	<50	<50	<50	<50	<50	<50
Maximum Detect	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Average Concentration *	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	3	0.0058	8	8	8	7.7	8	0.021	7.7	21	7.7	7.7	8	8	7.7	8
Geometric Average *	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.9	0.003	3.1	3.1	3.1	2.9	2.9	0.015	2.9	15	2.9	2.9	3.1	3.1	2.9	3.1
Median Concentration *	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	0.00265	1.35	1.35	1.35	1.35	1.35	0.0238	1.35	23.8	1.35	1.35	1.35	1.35	1.35	1.35
Standard Deviation *	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.1	0.0084	10	10	10	10	10	0.008	10	8	10	10	10	10	10	10
Geometric Standard Devia	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	2.4	3.1	4.2	4.2	4.2	4.2	4.8	3.6	4.2	3.6	4.2	4.2	4.2	4.2	4.2	4.2
95% UCL (Student's-t) *	4.98	4.98	4.98	4.98	4.98	4.98	4.98	4.98	5.061	0.00996	12.25	12.25	12.25	11.88	12.23	0.0249	11.88	24.85	11.88	11.88	12.25	12.25	11.88	12.25
% of Detects	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% of Non-Detects	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100

* A Non Detect Multiplier o

Table B-1
Human Health Tier 1 Screening Assessment
Amungee NW-2H Flowback Water
Tamboran

					Phenols																			
	Phenanthrene	Pyrene	Benzo(a)pyrene TEQ calc (Zero)	PAHs (Sum of total)	3&4-Methylphenol (m&p-cresol)	2,3,5,6-Tetrachlorophenol	2,4,5-Trichlorophenol	2,4,6-Trichlorophenol	2,4-Dichlorophenol	2,4-Dimethylphenol	2,4-Dinitrophenol	2,6-Dichlorophenol	2,3,4,5 & 2,3,4,6-Tetrachlorophenol	2-Chlorophenol	2-Methylphenol	2-Nitrophenol	4,6-Dinitro-2-methylphenol	4,6-Dinitro-o-cyclohexyl phenol	4-chloro-3-methylphenol	4-Nitrophenol	Cresol Total	Pentachlorophenol	Phenol	Phenols (halogenated) EPAVic
	µg/L	µg/L	mg/L	µg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L	mg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	µg/L	µg/L	µg/L
EQL	1	1	0.0005	0.5	4	0.002	2	2	2	4	0.1	2	0.002	2	4	4	50	50	4	50	0.004	2	4	2
ADWG 2022 Aesthetic								2	0.3					0.1										
ADWG 2022 Health								**20**	**200**					**300**								**10**		
WHO (2022) Drinking Wate																								
USEPA RSLs	**0.12**	**120**			**1400**		**1200**			**360**	**0.039**		**0.24**	**91**							**1.5**	**0.041**	**5800**	

Field ID

Amungee 2H Flowback	<1.0	<1.0	<0.0005	<0.5	<4	<0.002	<2	<2	<2	<4	<0.1	<2	<0.002	<2	<4	<4	<50	<50	<4	<50	<0.004	<2	<4	<2
	<1.0	<1.0	<0.0005	<0.5	<4	<0.002	<2	<2	<2	<4	<0.1	<2	<0.002	<2	<4	<4	<50	<50	<4	<50	<0.004	<2	<4	<2
Amungee Nw 2H Flowback	<2.5	<2.5	<0.0012	<1.2	<5	<0.002	<2	<2	<2	<4	<0.1	<2	<0.005	<2	<4	<4	<100	<100	<4	<100	<0.025	<5	<4	<10
	<2.5	<2.5	<0.0013	<1.3	<5	<0.002	<2	<2	<2	<4	<0.1	<2	<0.005	<2	<4	<4	<100	<100	<4	<100	<0.025	<5	<4	<10
	<24.8	<24.8	<0.0124	<12.4	<50	<0.025	<25	<25	<25	<25	<0.99	<25	<0.05	<25	<25	<25	<990	<990	<25	<990	<0.248	<50	<25	<99
	<24.2	<24.2	<0.0121	<12.1	<48	<0.024	<24	<24	<24	<24	<0.97	<24	<0.048	<24	<24	<24	<970	<970	<24	<970	<0.242	<48	<24	<97
Amungee Nw 2H Flowback	<47.6	<47.6	<0.0238	<23.8																				
Amungee NW-2H Flowbac	<4.8	<4.8	<0.0024	<2.4	<10	<0.005	<5	<5	<5	<5	<0.19	<5	<0.01	<5	<5	<5	<190	<190	<5	<190	<0.048	<10	<5	<19
	<2.7	<2.7	<0.0014	<1.4	<5	<0.003	<3	<3	<3	<4	<0.11	<3	<0.005	<3	<4	<4	<110	<110	<4	<110	<0.027	<5	<4	<11
	<2.9	<2.9	<0.0015	<1.5	<6	<0.003	<3	<3	<3	<4	<0.12	<3	<0.006	<3	<4	<4	<120	<120	<4	<120	<0.029	<6	19	<12
	<2.6	<2.6	<0.0013	<1.3	6	<0.003	<3	<3	<3	<4	<0.1	<3	<0.005	<3	<4	<4	<100	<100	<4	<100	<0.026	<5	12	<10
	<2.5	<2.5	<0.0012	<1.2	6	<0.002	<2	<2	<2	<4	<0.1	<2	<0.005	<2	<4	<4	<100	<100	<4	<100	<0.025	<5	12	<10
	<2.6	<2.6	<0.0013	<1.3	<5	<0.002	<2	<2	<2	<4	<0.1	<2	<0.005	<2	<4	<4	<100	<100	<4	<100	<0.026	<5	<4	<10
	<2.7	<2.7	<0.0013	<1.3	<5	<0.003	<3	<3	<3	<4	<0.11	<3	<0.005	<3	<4	<4	<110	<110	<4	<110	<0.027	<5	<4	<11
Amunge NW 2H Flowback	<47.6	<47.6	<0.0238	<23.8																				

Statistics

Number of Results	**17**	**17**	**17**	**17**	**13**	**13**	**13**	**13**	**13**	**13**	**13**	**13**	**13**	**13**	**13**	**13**	**13**	**13**	**13**	**13**	**13**	**13**	**13**	**13**
Number of Detects	**0**	**0**	**0**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**3**	**0**
Minimum Concentration	**<1**	**<1**	**<0.0005**	**<0.5**	**<4**	**<0.002**	**<2**	**<2**	**<2**	**<4**	**<0.1**	**<2**	**<0.002**	**<2**	**<4**	**<4**	**<50**	**<50**	**<4**	**<50**	**<0.004**	**<2**	**<4**	**<2**
Minimum Detect	**ND**	**ND**	**ND**	**ND**	**6**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**12**	**ND**
Maximum Concentration	**<50**	**<50**	**<0.025**	**<25**	**<50**	**<0.025**	**<25**	**<25**	**<25**	**<25**	**<0.99**	**<25**	**<0.05**	**<25**	**<25**	**<25**	**<990**	**<990**	**<25**	**<990**	**<0.248**	**<50**	**<25**	**<99**
Maximum Detect	**ND**	**ND**	**ND**	**ND**	**6**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**19**	**ND**
Average Concentration *	**8**	**8**	**0.004**	**4**	**6.6**	**0.003**	**3**	**3**	**3**	**3.6**	**0.12**	**3**	**0.0059**	**3**	**3.6**	**3.6**	**119**	**119**	**3.6**	**119**	**0.029**	**5.9**	**6.5**	**12**
Geometric Average *	**3.1**	**3.1**	**0.0016**	**1.6**	**4.2**	**0.0018**	**1.8**	**1.8**	**1.8**	**2.7**	**0.077**	**1.8**	**0.0033**	**1.8**	**2.7**	**2.7**	**69**	**69**	**2.7**	**69**	**0.015**	**3.3**	**4.2**	**6**
Median Concentration *	**1.35**	**1.35**	**0.0007**	**0.7**	**2.5**	**0.0015**	**1.5**	**1.5**	**1.5**	**2**	**0.05**	**1.5**	**0.0025**	**1.5**	**2**	**2**	**50**	**50**	**2**	**50**	**0.013**	**2.5**	**2**	**5**
Standard Deviation *	**10**	**10**	**0.005**	**5**	**8.1**	**0.0041**	**4.1**	**4.1**	**4.1**	**3.8**	**0.16**	**4.1**	**0.0083**	**4.1**	**3.8**	**3.8**	**166**	**166**	**3.8**	**166**	**0.042**	**8.3**	**6.1**	**17**
Geometric Standard Devia	**4.2**	**4.2**	**4.3**	**4.3**	**2.4**	**2.5**	**2.5**	**2.5**	**2.5**	**2**	**2.3**	**2.5**	**2.7**	**2.5**	**2**	**2**	**2.5**	**2.5**	**2**	**2.5**	**3.3**	**2.7**	**2.6**	**3.1**
95% UCL (Student's-t) *	**12.25**	**12.25**	**0.00613**	**6.127**	**10.57**	**0.00504**	**5.041**	**5.041**	**5.041**	**5.512**	**0.204**	**5.041**	**0.01**	**5.041**	**5.512**	**5.512**	**200.7**	**200.7**	**5.512**	**200.7**	**0.0498**	**9.997**	**9.457**	**19.91**
% of Detects	**0**	**0**	**0**	**0**	**15**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**23**	**0**
% of Non-Detects	**100**	**100**	**100**	**100**	**85**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**77**	**100**

* A Non Detect Multiplier o

Table B-1
Human Health Tier 1 Screening Assessment
Amungee NW-2H Flowback Water
Tamboran

		Phthalates	Radionuclides			TPH					TRH							VOCs
	Phenols (non-halogenated) EPAVic	Bis(2-ethylhexyl) phthalate	Gross Beta Activity - K40	Gross alpha activity	Gross beta activity	C6-C9 Fraction	C10-C14 Fraction	C15-C28 Fraction	C29-C36 Fraction	C10-C36 Fraction (Sum)	C6-C10 Fraction (F1)	C6-C10 (F1 minus BTEX)	>C10-C16 Fraction (F2)	>C10-C16 Fraction (F2 minus Naphthalene)	>C16-C34 Fraction (F3)	>C34-C40 Fraction (F4)	>C10-C40 Fraction (Sum)	Acrylamide
	µg/L	µg/L	Bq/L	Bq/L	Bq/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
EQL	4	10	0.1	0	0	20	50	100	50	50	20	20	100	100	100	100	100	0.2
ADWG 2022 Aesthetic			0.5	0.5														
ADWG 2022 Health		10																0.2
WHO (2022) Drinking Wate											15,000 aliphatic	15,000 aliphatic	90 aromatic 300 aliphatic	90 aromatic 300 aliphatic	90 aromatic 300 aliphatic			
USEPA RSLs																		0.05
Field ID																		
Amungee 2H Flowback	<4	<10				90	180	700	<50	880	80	70	600	600	290	<100	890	
			<0.52	<0.26	1.40													
	<4	<10	<0.67	1.39	2.17	170	510	2,190	360	3,060	170	160	950	950	2,030	<100	2,980	
Amungee Nw 2H Flowback	<10	<10	3.73	4.14	5.82	80	511,000	202,000	180	713,000	80	80	700,000	700,000	17,700	<100	718,000	51.5
	<10	<10	2.17	4.46	5.64	50	369,000	118,000	3,150	490,000	60	60	476,000	476,000	18,400	1,270	496,000	35.2
	<99	<20	6.94	12.4	11.00	100	242,000	63,600	50	306,000	110	110	300,000	300,000	8,860	<100	309,000	
	<97	<19	5.56	10.1	9.23	120	613,000	590,000	60	1,200,000	130	130	1,050,000	1,050,000	160,000	<100	1,210,000	
Amungee Nw 2H Flowback			3.73	4	6.59	80	380,000	86,200	100	466,000	90	90	467,000	467,000	12,100	<100	479,000	57.9
Amungee NW-2H Flowbacl	<19	<10	0.9	1.85	2.96	150	418,000	71,300	170	489,000	190	190	479,000	479,000	4,560	<100	484,000	
	<11	<10				140	626,000	163,000	<670	789,000	130	130	767,000	767,000	30,800	<670	798,000	
			7.62	17	11.10													
	19	<10	7.64	14.3	9.88	100	258,000	53,900	<1,420	312,000	120	120	305,000	305,000	4,980	<1,420	310,000	
	18	<10	8.11	19.1	9.95	<100	282,000	53,600	<50	336,000	<100	<100	322,000	322,000	11,900	<100	334,000	
	18	<10	10.4	24.1	10.40	<100	604,000	63,200	<50	667,000	<100	<100	651,000	651,000	19,300	<100	670,000	
	<10	30	7.1	27.9	13.40	60	549,000	303,000	160	852,000	70	70	825,000	825,000	61,600	<100	887,000	
	<11	<10	8.89	29.6	15.20	70	175,000	69,500	<50	244,000	80	80	229,000	229,000	15,800	<100	245,000	
Amunge NW 2H Flowback						200	410,000	94,100	<570	504,000	190	190	484,000	484,000	19,300	<570	503,000	
			6.03	14	8.37													
Statistics																		
Number of Results	13	13	4	4	4	17	17	17	17	17	17	17	17	17	17	17	17	3
Number of Detects	3	1	3	3	4	15	17	17	9	17	15	15	17	17	17	2	17	3
Minimum Concentration	<4	<10	<0.52	0	0	50	180	700	50	880	60	60	600	600	290	<100	890	35.2
Minimum Detect	18	30	6.03	0	0	50	180	700	50	880	60	60	600	600	290	1,270	890	35.2
Maximum Concentration	<99	30	7.64	0	0	200	626,000	590,000	7,470	1,200,000	360	360	1,050,000	1,050,000	160,000	5,600	1,210,000	57.9
Maximum Detect	19	30	7.64	0	0	200	626,000	590,000	7,470	1,200,000	360	360	1,050,000	1,050,000	160,000	5,600	1,210,000	57.9
Average Concentration *	15	7.7	5.4	0	0	104	364,982	115,064	781	480,467	122	121	460,268	460,268	23,599	524	484,345	48
Geometric Average *	8.9	6.4	3.1	0	0	94	164,226	49,252	165	248,297	106	105	219,504	219,504	10,771	123	249,159	47
Median Concentration *	5.5	5	6.825	0	0	90	380,000	69,500	160	489,000	110	110	476,000	476,000	12,100	50	484,000	51.5
Standard Deviation *	16	6.9	3.5	0	0	48	204,527	144,998	1,876	309,932	76	76	285,993	285,993	37,957	1,348	314,982	12
Geometric Standard Devia	2.9	1.7	5.2			1.6	11	5.6	5.2	7.1	1.7	1.7	8.9	8.9	4	4.3	7.1	1.3
95% UCL (Student's-t) *	22.87	11.09	9.507	0	0	124	451,587	176,462	1,576	611,704	154.4	153.2	581,368	581,368	39,671	1,094	617,721	67.93
% of Detects	23	8	75	75	100	88	100	100	53	100	88	88	100	100	100	12	100	100
% of Non-Detects	77	92	25	25	0	12	0	0	47	0	12	12	0	0	0	88	0	0

* A Non Detect Multiplier o

Environmental Standards

NHMRC, May 2022, ADWG 2022 Aesthetic
NHMRC, May 2022, ADWG 2022 Health

USEPA. 2023. Regional Screening Levels. May
WHO. 2022. Guidelines for Drinking Water Quality. Fourth edition incorporating th first and second addenda.
1/ WHO Guidelines for TPH fractions are not established because taste and odor thresholds are lower than health-based values.
However, WHO developed health-based group values providing guidance as to tolerable levels of aromatic and aliphatic hydrocarbon fractions in drinkng water (WHO, 2008).
Analysis of aliphatic and aromatic fractions for petroleum hydrocarbon was not performed. Therefore, the following application of levels was followed:
- TPH C6-C10 (F1) aromatic - assumed to be total BTEX concentration
- TPH C6-C10 (F1) minus BTEX - assumed to be aliphatic portion of TPH fraction
-Consistent with NEPM guidance, concentrations of higher TPH fractions were assumed to be 80 percent aliphatic and 20 percent aromatic fractions.

Table B-2
Radionuclide Annual Dose Calculations
Tamboran
Amungee NW-1H, NT Australia

Radionuclide	Dose/unit (mSv/Bq)	Max Conc[1] (Bq/L)	Drinking Water Exposure Scenario: Ing/year (L/year)	Drinking Water Exposure Scenario: Dose/year (mSv/year)	Worker Exposure Scenario: Ing/year (L/year)	Worker Exposure Scenario: Dose/year (mSv/year)
Radium 226	2.8E-04	40	750	8.4E+00	0.00208	2.3E-05
			Total dose/year	8.4E+00	**Total dose/year**	2.3E-05

Notes:
Bq/L = becquerel per litre
L = litre
L/year = litre per year
mSv/Bq = millisievert per becquerel
mSv/year = millisievert per year
1/ Radium-226 assumed to be source of gross beta and gross alpha activity in Amungee NW-2H.
Radium 226 calculated by summing maximum activity of gross alpha and gross beta.

Table B-3
Human Receptor Exposure Assumptions
Amungee NW-2H Flowback Water
Tamboran

Media	Exposure Route	Parameter Code	Parameter Definition	Units (a)	Parameter Value - Agricultural Worker	Source (b)
Water	Ingestion	IR	Ingestion rate	mL/day	0.005	Origin, 2022
		EF	Exposure frequency	day/yr	20	Origin, 2022
		ED	Exposure duration	yr	0.083	Origin, 2022
		RBA	Relative bioavailability factor	unitless	chemical-specific	(f) enHealth, 2012
		BW	Body weight	kg	78	enHealth, 2012
		LT	Lifetime	yr	79	(f) enHealth, 2012
		AT-NC	Averaging time - noncancer	days	30	enHealth, 2012
		AT-C	Averaging time - cancer	days	25,550	enHealth, 2012
		CF	Conversion factor	kg/mg	1.0E-06	enHealth, 2012
	Dermal	SA	Surface area for contact (exposed)	cm^2/day	2,300	Origin, 2022
		EF	Exposure frequency	day/yr	20	Origin, 2022
		ED	Exposure duration	yr	0.083	Origin, 2022
		BW	Body weight	kg	78	(f) enHealth, 2012
		LT	Lifetime	yr	79	enHealth, 2012
		AT-NC	Averaging time - noncancer	days	30	enHealth, 2012
		AT-C	Averaging time - cancer	days	25,550	enHealth, 2012
		ET	Exposure Time	hr/day	1	Origin, 2022
		CF	Conversion factor	kg/mg	1.0E-06	enHealth, 2012
	Inhalation	EF	Exposure frequency	day/yr	120	Origin, 2022
		ED	Exposure duration	yr	1	Origin, 2022
		AT-NC	Averaging time - noncancer	days	365	enHealth, 2012
		AT-C	Averaging time - cancer	days	25550	enHealth, 2012
		ET	Exposure Time	hr/day	1	Origin, 2022
		EMF	Driftable aerosol emission factor	L/m3	2.5E-03	Origin, 2022
		AAF	Aerosol Inhalation bioavailability	unitless	1.0E+00	Origin, 2022

Notes:
a/ Units:
l/hr = litres per hour
hr/day = hours per day
day/yr = days per year
yr = year
kg = kilogram
cm^2 = square centimetre
cm/h = centimetre per hour
l/cm^3 = litre per cubic centimetre
cm^2/day = square centimetre per day
mg soil/cm^2 skin = milligrams soil per square centimetre skin
kg/mg = kilogram per milligram

b/ References:
enHealth. (2012). Australian Exposure Factor Guidance. enHealth Subcommetee of the Australian Health Protection Principal Committee, Canberra, Australia.
BPJ: Best Professional Judgment
Origin. 2022. ORI10-3: Beetaloo Sub-basin Multi-well Drilling, Stimulation and Well Testing Program Exploration Permit (EP) 98 & 76 Environment Management Plan. 17 May 2022.
USEPA. (2016). EPA-Expo-Box (A Toolbox for Exposure Assessors). Available at http://www.epa.gov/expobox

d/ Exposed body surface area is the time weighted average of head, forearms, hands, lower legs, and feet.
Forearms are considered 45% of arm surface area; lower leg is considered 40% of leg surface area (USEPA, 2016).
e/ Adherence factor calculated for exposed body part surface area is the time weighted average of head, forearms, hands, lower legs, and feet.
f/ Male exposure factor used based on enHealth recommendation.

Table B-4
Risk Estimates for Flowback Worker During Re-Use
Amungee NW-2H Flowback Water
Tamboran

Exposure to Flowback Water														
Constituent Name	**CAS No.**	**EPC [1] Flowback Water**	**Toxicity [2]**			**Oral Intake**	**Oral Intake**	**DAevent**	**Dermal Intake**		**Excess Cancer Lifetime Risk**		**Hazard Quotient**	
		CW (mg/L)	**CSFo 1/(mg/kg-day)**	**RfDo mg/kg-day**	**ABS[3]**	**LADDoral**	**CADDoral**	**(ug/cm2-event)**	**LADDderm**	**CADDderm**	**Incidental Ingestion**	**Dermal**	**Incidental Ingestion**	**Dermal**
Benzene	71-43-2	0.0013	1.5E-02	4.0E-03	1	5.4E-12	4.6E-09	2.9E-05	5.5E-11	4.6E-08	8.1E-14	8.3E-13	1.1E-06	1.2E-05
Ethylene glycol	107-21-1	80	NA	8.0E-01	1	3.3E-07	2.8E-04	9.4E-03	1.8E-08	1.5E-05	NA	NA	3.5E-04	1.9E-05
Fluoride	16984-48-8	1.3	NA	4.0E-02	1	5.4E-09	4.6E-06	1.3E-03	2.5E-09	2.1E-06	NA	NA	1.1E-04	5.3E-05
Antimony	7440-36-0	0.014	NA	4.0E-04	1	5.8E-11	4.9E-08	1.4E-05	2.7E-11	2.3E-08	NA	NA	1.2E-04	5.7E-05
Arsenic	7440-38-2	0.012	1.5E+00	3.0E-04	1	5.0E-11	4.2E-08	1.2E-05	2.3E-11	1.9E-08	7.5E-11	3.4E-11	1.4E-04	6.5E-05
Barium	7440-39-3	39	NA	2.0E-01	1	1.6E-07	1.4E-04	3.9E-02	7.5E-08	6.3E-05	NA	NA	6.8E-04	3.2E-04
Boron	7440-42-8	20	NA	2.0E-01	1	8.3E-08	7.0E-05	2.0E-02	3.8E-08	3.2E-05	NA	NA	3.5E-04	1.6E-04
Chromium	18540-29-9	0.02	5.0E-01	3.0E-03	1	8.3E-11	7.0E-08	4.0E-05	7.7E-11	6.5E-08	4.2E-11	3.8E-11	2.3E-05	2.2E-05
Iron	7439-89-6	31	NA	7.0E-01	1	1.3E-07	1.1E-04	3.1E-02	5.9E-08	5.0E-05	NA	NA	1.6E-04	7.2E-05
Manganese	7439-96-5	2.8	NA	2.4E-02	1	1.2E-08	9.8E-06	2.8E-03	5.4E-09	4.5E-06	NA	NA	4.1E-04	1.9E-04
Nickel	7440-02-0	0.0073	NA	2.0E-02	1	3.0E-11	2.6E-08	1.5E-06	2.8E-12	2.4E-09	NA	NA	1.3E-06	1.2E-07
Strontium	7440-24-6	67	NA	6.0E-01	1	2.8E-07	2.4E-04	6.7E-02	1.3E-07	1.1E-04	NA	NA	3.9E-04	1.8E-04
bis (2-ethylhexyl) phthalate	117-81-7	0.0077	1.4E-02	2.0E-02	1	3.2E-11	2.7E-08	NA	NA	NA	4.5E-13	NA	1.4E-06	NA
Acrylamide	79-06-1	0.048	5.0E-01	2.0E-03	1	2.0E-10	1.7E-07	1.5E-05	2.9E-11	2.5E-08	1.0E-10	1.5E-11	8.4E-05	1.2E-05
>C10-C16 Fraction (F2 minus Naphthalene) Aromatic	E1790674	210	NA	4.0E-02	1	8.7E-07	7.4E-04	3.2E+01	6.2E-05	5.2E-02	NA	NA	1.8E-02	1.3E+00
>C10-C16 Fraction (F2 minus Naphthalene) Aliphatic	E1790668	840	NA	1.0E-01	1	3.5E-06	3.0E-03	NA	NA	NA	NA	NA	3.0E-02	NA
>C16-C34 Fraction (F3) Aromatic	E1790676	32	NA	3.0E-02	1	1.3E-07	1.1E-04	NA	NA	NA	NA	NA	3.7E-03	NA
>C16-C34 Fraction (F3) Aliphatic	E1790670	128	NA	2.0E+00	1	5.3E-07	4.5E-04	NA	NA	NA	NA	NA	2.2E-04	NA
											Total Risk	**3E-10**	**Total HI**	**1E+00**

Notes:
1/ EPC is average concentration in flowback samples. For petroleym hydrocarbon fractions, concentrations were assumed to be 80-percent aliphatic and 20 percent aromatic fractions.
2/ Sources of toxicity values:
Friebel, E & Nadebaum, P 2011, Health screening levels for petroleum hydrocarbons n soil and groundwater. Part 1: Technical development document, CRC CARE Technical Report no. 10, CRC for Contamination Assessment and Remediation of the Environment, Adelaide, Australia.
NHMRC, NRMMC. (2011). Australian Drinking Water Guidelines Paper 6 National Water Quality Management Strategy. National Health and Medical Research Council, National Resource Management Ministerial Council, Commonwealth of Australia, Canberra. Updated January 2022
USEPA. 2023. Regional Screening Levels. May. Toxicity sources. Available online at:https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables
Including IRIS, ATSDR, PPRTV toxicological profiles and databases.
WHO. 2022. Guidelines for drinking-water quality. Fourth edition incorporating the first and second addenda
Toxicity data for chromium VI used to calculate potential cancer risk and noncancer hazard for total chromium.
3/ Consistent with enHealth guidance a default value of 1 used for the ABS values.

$$Oral\ Intake = \frac{EPC\ x\ IR\ x\ EF\ x\ ED\ x\ \ CFwater}{BW\ \times AT}$$

$$Dermal\ Intake = \frac{DAevent\ x\ EV\ x\ EF\ x\ ED\ x\ SAexp\ x\ Kp\ x\ ET\ x\ CFwater}{BW\ \times AT}$$

CAS = Chemical Abstracts Service
CW = concentration in water
CADD = chronic average daily dose
EPC = exposure point concentration
mg/l = milligrams per litre
mg/kg/day = milligrams per kilograms per day
NA = not applicable
RfDo = oral reference dose

Table B-5
Risk Estimates for Worker During Mechanical Evaporation
Amungee NW-2H Flowback Water
Tamboran

Exposure to Flowback Water								
Constituent Name	CAS No.	EPC [1] Flowback Water	Toxicity		Inhalation Intake		Excess Cancer Lifetime Risk	Hazard Quotient
		CW (mg/L)	IUR 1/(ug/m3)	RfCi (mg/m3)	LADDinh	CADDinh	Inhalation	Inhahlation
Benzene	71-43-2	0.0013	7.8E-06	3.0E-02	6.4E-07	4.5E-08	5.0E-12	1.5E-06
Ethylene glycol	107-21-1	80	NA	4.0E-01	3.9E-02	2.7E-03	NA	6.8E-03
Fluoride	16984-48-8	1.3	NA	1.3E-02	6.4E-04	4.5E-05	NA	3.4E-03
Antimony	7440-36-0	0.014	NA	3.0E-04	6.8E-06	4.8E-07	NA	1.6E-03
Arsenic	7440-38-2	0.012	4.3E-03	1.5E-05	5.9E-06	4.1E-07	2.5E-08	2.7E-02
Barium	7440-39-3	39	NA	5.0E-04	1.9E-02	1.3E-03	NA	2.7E+00
Boron	7440-42-8	20	NA	2.0E-02	9.8E-03	6.8E-04	NA	3.4E-02
Chromium [2]	18540-29-9	0.02	8.4E-02	1.0E-04	9.8E-06	6.8E-07	8.2E-07	6.8E-03
Iron	7439-89-6	31	NA	NA	1.5E-02	1.1E-03	NA	NA
Manganese	7439-96-5	2.8	NA	1.5E-04	1.4E-03	9.6E-05	NA	6.4E-01
Nickel	7440-02-0	0.0073	2.6E-04	9.0E-05	3.6E-06	2.5E-07	9.3E-10	2.8E-03
Strontium	7440-24-6	67	NA	NA	3.3E-02	2.3E-03	NA	NA
bis (2-ethylhexyl) phthalate	117-81-7	0.0077	2.4E-06	NA	3.8E-06	2.6E-07	9.0E-12	NA
Acrylamide	79-06-1	0.048	1.0E-04	6.0E-03	2.3E-05	1.6E-06	2.3E-09	2.7E-04
>C10-C16 Fraction (F2 minus Naphthalene) Aromatic	E1790674	210	NA	2.0E-01	1.0E-01	7.2E-03	NA	3.6E-02
>C10-C16 Fraction (F2 minus Naphthalene) Aliphatic	E1790668	840	NA	1.0E+00	4.1E-01	2.9E-02	NA	2.9E-02
>C16-C34 Fraction (F3) Aromatic	E1790676	32	NA	2.0E-01	1.6E-02	1.1E-03	NA	5.5E-03
>C16-C34 Fraction (F3) Aliphatic	E1790670	128	NA	1.0E+00	6.3E-02	4.4E-03	NA	4.4E-03
						Total Risk/HI	**9E-07**	**3E+00**

Notes:
CADD = chronic average daily dose
CAS = Chemical Abstracts Service
CW = concentration in water
EPC = exposure point concentration
IUR = inhalation unit risk
LADD = lifetime average daily dose
mg/L = milligrams per litre
mg/m3 = milligram per cubic metre
NA = not applicable
RfCi = inhalation reference concentration

$$Inhalation\ Intake = \frac{EPC\ x\ \ x\ EF\ x\ ED\ x\ ET\ x\ EMF \times AAF}{AT \times 24}$$

1/ EPC is average concentration in flowback samples. For petroleym hydrocarbon fractions, concentrations were assumed to be 80-percent aliphatic and 20 percent aromatic fractions.
2/ Sources of toxicity values:
Friebel, E & Nadebaum, P 2011, Health screening levels for petroleum hydrocarbons n soil and groundwater. Part 1: Technical development document, CRC CARE Technical Report no. 10, CRC for Contamination Assessment and Remediation of the Environment, Adelaide, Australia.
NHMRC, NRMMC. (2011). Australian Drinking Water Guidelines Paper 6 National Water Quality Management Strategy. National Health and Medical Research Council, National Resource Management Ministerial Council, Commonwealth of Australia, Canberra. Updated January 2022
USEPA. 2023. Regional Screening Levels. May. Toxicity sources.
Available online at:https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables.
Including IRIS, ATSDR, PPRTV toxicological profiles and databases.
WHO. 2022. Guidelines for drinking-water quality. Fourth edition incorporating the first and second addenda
Toxicity data for chromium VI used to calculate potential cancer risk and noncancer hazard.

Attachment C Avian Risk Assessment – Amungee NW-2H Flowback Water

Table C-1
Tier 1 Avian Screening Assessment
Amungee NW-2H Flowback Water
Tamboran

Field ID		Amungee 2H Flowback			Amungee Nw 2H Flowback					Amungee Nw 2H Flowback - duplicate	Amungee NW-2H Flowback								
		Flowback	Flowback	Flowback	Flowback	Flowback	Flowback	Flowback	Flowback		Flowback	Flowback	Flowback	Flowback	Flowback	Flowback	Flowback	Flowback	Flowback
Location Code		BET-PW003			BET-PW003					BET-PW003	BET-PW003								
Date		27-03-23		02-04-23	01-05-23	14-05-23	22-05-23	28-05-23	29-05-23	01-05-23	10-04-23	05-06-23		19-06-23	21-06-23	26-06-23	03-07-23	10-07-23	15-07-23
Chemical	**Unit**																		
Benzene	µg/L	3		4	<1	<1	<1		1	<1	<5	<1		1		<5	<5	<1	<1
Toluene	µg/L	4		6	<2	<2	<2		<2	<2	<5	<2		<2		<5	<5	<2	<2
Ethylene glycol	µg/L									80,000									
Propylene glycol	µg/L									4,000									
Total Phosphorus as P (Organic Phosphate as P)	mg/L	2.04		1.48	0.79	0.45	0.29		0.31	0.67	0.77	0.52		0.2		0.36	0.37	0.38	0.32
Sulfate as SO4 - Turbidimetric (filtered)	mg/L	<1		141	38	32	23		87	36	63	12		4		5	3	1	<1
Silicon as SiO2	mg/L	179		186	198	200	192		205	197	188	220		190		203	202	164	257
Silicon as SiO2 (filtered)	mg/L						166	177	178										
Nitrite + Nitrate as N	mg/L	0.07		<0.01	0.03	<0.01	<0.01		<0.01	<0.01	0.02	<0.01		<0.01		<0.01	0.06	<0.01	<0.01
Ammonia as N	mg/L	26.2		26.9	34.4	34.2	31.4		32.6	34.4	30.6	45.1		25.6		37.3	35	1.6	1.67
Anions Total	meq/L	174		210	387	397				393									
Bromide	µg/L	83,200		143,000	121,000	170,000	712,000		182,000	125,000	108,000	318,000		178,000		142,000	162,000	274,000	321,000
Bromine	µg/L	53,400		61,600	146,000	129,000	189,000		202,000	143,000	112,000	207,000		196,000		185,000	193,000	205,000	227,000
Bromine (filtered)	µg/L	40,000		63,300	145,000	164,000	180,000		202,000	143,000	103,000	222,000		202,000		222,000	249,000	242,000	274,000
Cations Total	meq/L	156		201	421	432				418									
Chloride	mg/L	5,540		6,730	13,400	13,800	16,400		17,100	13,600	10,300	21,000		18,600		21,400	20,100	22,200	24,000
Fluoride	mg/L	2		1.3	6	0.9	0.8		1	1	1.4	0.9		0.9		0.6	0.8	0.8	1
Ionic Balance	%	5.27		2.13	4.17	4.15				3.02									
Kjeldahl Nitrogen Total	mg/L	57.8		62.9	60.7	50.3	65.5		60.9	62.1	56.5	73.2		44.9		67.3	65.6	64.4	67.3
Nitrate (as N)	mg/L	0.07		<0.01	0.03	<0.01	<0.01		<0.01	<0.01	0.02	<0.01		<0.01		<0.01	0.06	<0.01	<0.01
Nitrogen (Total)	mg/L	57.9		62.9	60.7	50.3	65.5		60.9	62.1	56.5	73.2		44.9		67.3	65.7	64.4	67.3
Reactive Phosphorus as P (Orthophosphate as P)	mg/L	0.14		<0.01	0.09	<0.10	<0.01		0.01	0.02	0.02	<0.01		<0.01		<0.01	<0.01	<0.01	<0.01
Sodium	mg/L									8,280									
Sodium (filtered)	mg/L	3,310		4,230	8,570	8,660	9,420		10,400	8,500	6,070	11,100		10,700		10,900	10,500	13,400	14,900
Sodium Absorption Ratio (filtered)	-	60.3		65.4	77.6	73.5	76.9		80	77.3	72.6	78.9		81		71.1	68.4	94.1	93.1
Total Dissolved Solids (Lab)	mg/L	10,100		12,400	23,800	28,700	31,900		35,000	23,600	19,500	34,200		32,100		33,500	36,100	41,600	44,300
Total Suspended Solids (Lab)	mg/L	19		82	39	115	98		102	8	135	176		104		126	130	156	168
Aluminium	mg/L	0.11		0.16	0.36	0.22	0.11		0.24	0.26	0.27	0.29		<0.10		<0.10	<0.10	<0.10	<0.10
Antimony	mg/L	0.012		0.113	<0.010	<0.010	<0.010		<0.010	<0.010	<0.010	<0.010		<0.010		<0.010	<0.010	<0.010	<0.010
Arsenic	mg/L	0.043		0.012	0.011	<0.010	<0.010		0.012	0.014	0.04	<0.010		<0.010		<0.010	<0.010	<0.010	<0.010
Barium	mg/L	4.38		7.63	25	19.4	18.8		40.6	25.8	14.3	52.4		51		64.1	64.8	65	77.3
Boron	mg/L	12.3		14	18.2	18	21.9		23.5	19	16.9	24.8		20.6		21.7	22.8	20.9	23.6
Cadmium	mg/L	<0.0001		<0.0001	<0.0010	<0.0010	0.0017		<0.0010	<0.0010	<0.0010	<0.0010		<0.0010		<0.0010	<0.0010	<0.0010	<0.0010
Calcium	mg/L									657									
Chromium (III+VI)	mg/L	0.012		0.031	<0.010	0.13	<0.010		0.011	<0.010	0.039	<0.010		<0.010		0.011	<0.010	0.018	<0.010
Copper	mg/L	<0.001		0.001	<0.010	0.059	<0.010		0.042	<0.010	0.015	0.029		<0.010		0.072	<0.010	0.038	0.011
Iron	mg/L	20.5		40.2	16.2	20.4	22.1		27	16.8	38	31.8		30.1		39.2	37.6	42	45.9
Lead	mg/L	<0.001		<0.001	<0.010	0.026	<0.010		0.03	<0.010	<0.010	0.012		<0.010		0.114	<0.010	<0.010	<0.010
Magnesium	mg/L									154									
Manganese	mg/L	0.841		1.35	2.03	2.16	2.77		3.26	2.09	1.74	3.64		3.39		3.63	3.62	3.86	4.36
Mercury	mg/L	<0.0001		<0.0001	<0.0001	<0.0001	<0.0001		<0.0001	<0.0001	<0.0001	0.0001		<0.0001		0.0002	<0.0001	0.0002	0.0002
Molybdenum	mg/L	0.049		0.049	0.019	0.016	0.011		0.014	0.02	0.039	0.014		0.014		0.014	0.011	0.016	<0.010
Nickel	mg/L	0.003		0.003	<0.010	<0.010	<0.010		<0.010	<0.010	0.025	<0.010		<0.010		<0.010	<0.010	0.014	<0.010
Potassium	mg/L									82									
Silver	mg/L	0.002		<0.001	<0.010	<0.010	<0.010		<0.010	<0.010	<0.010	<0.010		<0.010		<0.010	<0.010	<0.010	<0.010
Strontium	mg/L	8.05		12.6	43.8	49.7	62.9		74.3	44.5	26.3	87.7		83.7		104	103	103	125
Thorium	µg/L	17		4	<10	<10	<10		<10	<10	<10	<10		<10		<10	<10	<10	<10
Tin	mg/L	0.006		0.002	<0.010	<0.010	<0.010		<0.010	<0.010	<0.010	<0.010		<0.010		<0.010	<0.010	<0.010	<0.010
Vanadium	mg/L	<0.01		0.01	<0.10	<0.10	<0.10		<0.10	<0.10	<0.10	<0.10		<0.10		<0.10	<0.10	<0.10	<0.10
Zinc	mg/L	0.013		0.146	<0.052	<0.052	<0.052		<0.052	<0.052	<0.052	0.069		<0.052		<0.052	<0.052	<0.052	<0.052
Formaldehyde	mg/L	1.9		3.3	1.7	4.4	1.2		5.8	1	5.4	4.6		5.2		5.4	5.4	2.8	4.5

Table C-1
Tier 1 Avian Screening Assessment
Amungee NW-2H Flowback Water
Tamboran

Field ID		Amungee 2H Flowback			Amungee Nw 2H Flowback					Amungee Nw 2H Flowback - duplicate	Amungee NW-2H Flowback								
		Flowback	Flowback	Flowback	Flowback	Flowback	Flowback	Flowback	Flowback		Flowback	Flowback	Flowback	Flowback	Flowback	Flowback	Flowback	Flowback	Flowback
Location Code		BET-PW003			BET-PW003					BET-PW003	BET-PW003								
Date		27-03-23		02-04-23	01-05-23	14-05-23	22-05-23	28-05-23	29-05-23	01-05-23	10-04-23	05-06-23		19-06-23	21-06-23	26-06-23	03-07-23	10-07-23	15-07-23
Chemical	**Unit**																		
3&4-Methylphenol (m&p-cresol)	µg/L	<4		<4	<5	<5	<50		<48		<10	<5		<6		6	6	<5	<5
Phenol	µg/L	<4		<4	<4	<4	<25		<24		<5	<4		19		12	12	<4	<4
Phenols (non-halogenated) EPAVic	µg/L	<4		<4	<10	<10	<99		<97		<19	<11		19		18	18	<10	<11
Bis(2-ethylhexyl) phthalate	µg/L	<10		<10	<10	<10	<20		<19		<10	<10		<10		<10	<10	30	<10
Gross Beta Activity -K40	Bq/L		<0.52										7.62		7.64				
Gross alpha activity	-		<0.0										0		0				
Gross beta activity	-		0										0		0				
C6-C9 Fraction	µg/L	90		170	80	50	100		120	80	150	140		100		<100	<100	60	70
C10-C14 Fraction	µg/L	180		510	511,000	369,000	242,000		613,000	380,000	418,000	626,000		258,000		282,000	604,000	549,000	175,000
C15-C28 Fraction	µg/L	700		2,190	202,000	118,000	63,600		590,000	86,200	71,300	163,000		53,900		53,600	63,200	303,000	69,500
C29-C36 Fraction	µg/L	<50		360	180	3,150	50		60	100	170	<670		<1,420		<50	<50	160	<50
C6-C10 (F1 minus BTEX)	µg/L	70		160	80	60	110		130	90	190	130		120		<100	<100	70	80
>C10-C16 Fraction (F2 minus Naphthalene)	µg/L	600		950	700,000	476,000	300,000		1,050,000	467,000	479,000	767,000		305,000		322,000	651,000	825,000	229,000
>C16-C34 Fraction (F3)	µg/L	290		2,030	17,700	18,400	8,860		160,000	12,100	4,560	30,800		4,980		11,900	19,300	61,600	15,800
>C34-C40 Fraction (F4)	µg/L	<100		<100	<100	1,270	<100		<100	<100	<100	<670		<1,420		<100	<100	<100	<100
Acrylamide	µg/L				51.5	35.2				57.9									

Table C-1
Tier 1 Avian Screening Assessment
Amungee NW-2H Flowback Water
Tamboran

Field ID		Amunge NW 2H Flowback							
		Flowback		Freshwater Trigger Value				Alternative SW Screening Criteria	Reference
Location Code		BET-PW003		by Protection Level (% Species)					
Date		12 Jun 2023		99%	95%	90%	80%		
Chemical	Unit								
Benzene	µg/L	1		600	950	1300	2000		
Toluene	µg/L	<2		110	180	230	330		
Ethylene glycol	µg/L			NC	NC	NC	NC		
Propylene glycol	µg/L			NC	NC	NC	NC		
Total Phosphorus as P (Organic Phosphate as P)	mg/L	0.37		NC	NC	NC	NC	0.01	
Sulfate as SO4 - Turbidimetric (filtered)	mg/L	25		NC	NC	NC	NC	2000	
Silicon as SiO2	mg/L	183		NC	NC	NC	NC		
Silicon as SiO2 (filtered)	mg/L			NC	NC	NC	NC		
Nitrite + Nitrate as N	mg/L	0.02		NC	NC	NC	NC		
Ammonia as N	mg/L	*1.81*		0.32	0.9	1.43	2.3	0.01	b
Anions Total	meq/L	490		NC	NC	NC	NC	NC	
Bromide	µg/L	215,000		NC	NC	NC	NC	NC	
Bromine	µg/L	170,000		NC	NC	NC	NC		
Bromine (filtered)	µg/L	197,000		NC	NC	NC	NC		
Cations Total	meq/L	548		NC	NC	NC	NC	NC	
Chloride	mg/L	17,200		NC	NC	NC	NC	NC	
Fluoride	mg/L	0.8		1300	3100	4800	8200		
Ionic Balance	%	5.53		NC	NC	NC	NC	NC	
Kjeldahl Nitrogen Total	mg/L	57.9		350	350	350	350		
Nitrate (as N)	mg/L	0.02		NC	NC	NC	NC	NC	
Nitrogen (Total)	mg/L	57.9		NC	NC	NC	NC	0.35	b
Reactive Phosphorus as P (Orthophosphate as P)	mg/L	<0.01		NC	NC	NC	NC	NC	
Sodium	mg/L			NC	NC	NC	NC	NC	
Sodium (filtered)	mg/L	10,700		NC	NC	NC	NC	NC	
Sodium Absorption Ratio (filtered)	-	73.4		NC	NC	NC	NC		
Total Dissolved Solids (Lab)	mg/L	31,200		NC	NC	NC	NC	NC	
Total Suspended Solids (Lab)	mg/L	80		NC	NC	NC	NC	NC	
Aluminium	mg/L	*0.17*		0.027	0.055	0.08	0.15		
Antimony	mg/L	0.025		NC	NC	NC	NC	0.009	h
Arsenic	mg/L	<0.010		0.0008	0.013	0.042	0.14		
Barium	mg/L	*48.2*		4	4	4	4		
Boron	mg/L	*20.2*		340	940	1500	2500		
Cadmium	mg/L	<0.0010		0.00006	0.0002	0.0004	0.0008		
Calcium	mg/L			NC	NC	NC	NC	NC	
Chromium (III+VI)	mg/L	*0.014*		0.00001	0.001	0.006	0.04		
Copper	mg/L	*0.013*		0.001	0.0014	0.0018	0.0025		
Iron	mg/L	30.1		300	300	300	300		
Lead	mg/L	<0.010		1	3.4	5.6	9.4		
Magnesium	mg/L			NC	NC	NC	NC	2000	a
Manganese	mg/L	3.13		1200	1900	2500	3600		
Mercury	mg/L	<0.0001		0.00006	0.0006	0.0019	0.0054		
Molybdenum	mg/L	0.014		NC	NC	NC	NC		h
Nickel	mg/L	*0.014*		0.008	0.011	0.013	0.017		
Potassium	mg/L			NC	NC	NC	NC	NC	
Silver	mg/L	<0.010		0.00002	0.00005	0.0001	0.0002		
Strontium	mg/L	83.4		NC	NC	NC	NC	1500	d
Thorium	µg/L	<10		NC	NC	NC	NC	NC	
Tin	mg/L	<0.010		73	73	73	73		
Vanadium	mg/L	<0.10		NC	NC	NC	NC	0.006	h
Zinc	mg/L	<0.052		2.4	8	15	31		
Formaldehyde	mg/L	5.2		NC	NC	NC	NC	1610	c

Field ID		Amunge NW 2H Flowback							
		Flowback		Freshwater Trigger Value					
Location Code		BET-PW003		by Protection Level (% Species)				Alternative SW Screening Criteria	Reference
Date		12 Jun 2023							
Chemical	Unit			99%	95%	90%	80%		
3&4-Methylphenol (m&p-cresol)	µg/L			NC	NC	NC	NC	100	g
Phenol	µg/L			85	320	600	1200		1
Phenols (non-halogenated) EPAVic	µg/L			NC	NC	NC	NC		
Bis(2-ethylhexyl) phthalate	µg/L			NC	NC	NC	NC		
Gross Beta Activity -K40	Bq/L		6.03	NC	NC	NC	NC	0.5	
Gross alpha activity	-		0	NC	NC	NC	NC	0.5	d
Gross beta activity	-		0	NC	NC	NC	NC		
C6-C9 Fraction	µg/L	200		NC	NC	NC	NC		
C10-C14 Fraction	µg/L	410,000		NC	NC	NC	NC		
C15-C28 Fraction	µg/L	94,100		NC	NC	NC	NC		
C29-C36 Fraction	µg/L	<570		NC	NC	NC	NC		
C6-C10 (F1 minus BTEX)	µg/L	190		NC	NC	NC	NC	500	f
>C10-C16 Fraction (F2 minus Naphthalene)	µg/L	484,000		NC	NC	NC	NC	500	f
>C16-C34 Fraction (F3)	µg/L	19,300		NC	NC	NC	NC	640	f
>C34-C40 Fraction (F4)	µg/L	<570		NC	NC	NC	NC	NC	
Acrylamide	µg/L			NC	NC	NC	NC		

Table C-1
Tier 1 Avian Screening Assessment
Amungee NW-2H Flowback Water
Tamboran

Notes	
BLANK CELL	Information not available
FRACTION	T - Total
	D - Dissolved
	N - Null
SAMPLE TYPE	N - Normal Grab Sample
	TB - Trip Blank
	NST - No Sample Taken
	FD - Field Duplicate
WORKORDER (Empty)	Field measurement only

< less than limit of reporting
°C = degrees Celsius
µg/L = micrograms per liter
µS/cm = microsiemen per centimetre
Bq/L = becquerel per litre
BTEX = benzene, toluene, ethylbenzene, xylene
CaCO3 = calcium carbonate
LOR = limit of reporting
meq/L = milliequivalents per litre
mg/L = milligrams per litre

NC = no criteria
PAH = polycyclic aromatic hydrocarbons
SO4 2- = sulfate
TEQ = toxic equivalence quotient
USEPA = United States Environmental Protection Agency

WATER QUALIY SCREENING CRITERIA EXCEEDANCE KEY

Results underlined exceeds Freshwater Trigger Value 80%
Results in italic exceeds Freshwater Trigger Value 90%
Results shaded exceeds Freshwater Trigger Value 95%
Results in bold red exceeds Freshwater Trigger Value 99%
Bold Green exceeds alternative screening criterion

ALTERNATIVE WATER SCREENING CRITERIA NOTES

NC - No appropriate screening criterion
1 - API Publication 4709 September 2001. Frequently Asked Questions About TPH Analytical Methods for Crude Oil
a - Major ions of concern for livestock drinking water quality - https://www.waterquality.gov.au/sites/default/files/documents/anzecc-armcanz-2000-guidelines-vol1.pdf
b - Default trigger values for physical and chemical stressors for Tropical Australia for slightly disturbed ecosystems(Table 3.3.4). FW Lakes and Reservoirs. https://www.waterquality.gov.au/sites/default/files/documents/anzecc-armcanz-2000-guidelines-vol1.pdf
c - Chronic aquatic life water quality criterion from Hohreiter DW1, Rigg DK.Derivation of ambient water quality criteria for formaldehyde. Chemosphere. 2001. Chemosphere. Nov;45(4-5):471-86. https://www.ncbi.nlm.nih.gov/pubmed/11680743
d - Trigger values for radioactive contaminants for irrigation water. Australian and New Zealand Guidelines for Fresh and Marine Water Quality. https://www.waterquality.gov.au/sites/default/files/documents/anzecc-armcanz-2000-guidelines-vol1.pdf
e -Australian and New Zealand Guidelines for Fresh and Marine Water Quality Screening Benchmarks (October 2000) from (From Oak Ridge National Laboratory - Risk Assessment Information System) https://rais.ornl.gov/tools/eco_search.php
with Contaminated Soil and Groundwater. California Regional Water Quality Control Board. INTERIM FINAL - November 2007. Table F4-b, Freshwater Criterion Region 2 Basin Plan
g - Guidelines for chemical compounds in water found to cause tainting of fish flesh and other aquatic organisms - https://www.waterquality.gov.au/sites/default/files/documents/anzecc-armcanz-2000-guidelines-vol1.pdf
h - Freshwater trigger value with unknown level of species protection.
i - Default short-term trigger value for irrigation (Table 4.2.10). https://www.waterquality.gov.au/sites/default/files/documents/anzecc-armcanz-2000-guidelines-vol1.pdf

Attachment C - Table C-2
Avian Receptor Summary
Amungee NW-2H Flowback Water - Avian Risk Assessment
Tamboran

Common Name	Scientific Name	Body Mass								Drinking WIR (L/day)[3,4]
		Sex[1]	N	Mean (kg)	Standard Deviation (kg)	Min (kg)	Max (kg)	Location	Source ID[2]	Mean
Crested Pigeon	*Ocyphaps lophotes*	**B**	**21**	**0.204**	---	**0.142**	**0.26**	**Australia**	**515a**	**0.020**
Willie Wagtail	*Rhipidura leucophrys picata*	**B**	**13**	**0.0201**	---	**0.0145**	**0.0255**	**Australia**	**518a**	**0.004**
Peaceful Dove	*Geopelia placida*	**B**	**38**	**0.0478**	---	**0.035**	**0.065**	**Australia**	**515a**	**0.008**
Cattle Egret	*Bubulcus ibis*	M	27	0.372	---	0.296	0.46	FL, USA	1207	0.0304
Cattle Egret	*Bubulcus ibis*	**F**	**59**	**0.36**	---	**0.27**	**0.512**	**FL, USA**	**1207**	**0.0298**
Brown Honeyeater	*Lichmera indistincta*	M	37	0.0118	0.0015	0.009	0.015	Australia	517	0.0030
Brown Honeyeater	*Lichmera indistincta*	**F**	**15**	**0.0106**	**0.0021**	**0.008**	**0.014**	**Australia**	**517**	**0.0028**

Notes:

1 Sex: M, Male; F, Female; B, Both

2 Body mass statistics compiled in Dunning (2008); Original source documents based on Source ID in Dunning (2008) include: Dunning. J. 2008. CRC Handbook of Avian Body Masses 2nd Edition. CRC Press; 2 edition Boca Raton : CRC Press, [2008].

515a. Higgins, P.J. and S.J.J.F. Davies. 1996. *Handbook of Australian, New Zealand and Antarctic birds.* Oxford University Press, Melbourne, Australia. Volume 3.

518a. Higgins, P.J. , J.M. Peter, and S.J. Cowling. 2006. *Handbook of Australian, New Zealand and Antarctic birds.* Oxford University Press, Melbourne, Australia. Volume 7.

1207. Telfair, R.C. 1994. *Cattle Egret (Bubulcus ibis) In The Birds of North America.* A. Poole and F. Gill (editors). The Birds of North America, Inc , Philadelphia, PA, and The American Ornithologists' Union, Washington, DC. Number 113.

517. Higgins, P.J., J.M. Peter, and W.K. Steele. 2001. *Handbook of Australian, New Zealand and Antarctic birds.* Oxford University Press, Melbourne, Australia. Volume 5.

3 Drinking WIR based on the allometric relationship developed by Calder and Braun (1983). *Scaling of osmotic regulation in mammals and birds.* Am J Physiol. 1983 May;244(5): R601-6., where WIR (L/day) = 0.059 x BW (Kg)$^{0.67}$

4 Proposed WIR shown in bold, estimated based on the arithmetic mean of female or combined body mass; WIR may be estimated based on other body mass statistics depending on the appropriate exposure scenario.

--- = no data
BW = body weight
N = number
kg = kilogram
L = litre
WIR = water ingestion rate

Attachment C - Table C-3
Crested Pigeon
Amungee NW-2H Flowback Water - Avian Risk Assessment
Tamboran

Constituent Name	CAS No.	Mammal NOAEL (mg/kg-day)	Mammal NOAEL Test Animal		Avian NOAEL [1] (mg/kg-day)	Avian NOAEL Test Animal			Avian Receptor Crested Pigeon	
			Animal	Body Weight (kg)		Animal	Body Weight (kg)		Body Weight (kg)	Derived TRV
Aluminium (ECHA - as aluminium citrate)	7429-90-5	200	Rat	0.35	NA	NA	NA		0.204	2.3E+02
Antimony (ADWG)	7440-36-0	0.43	Rat	0.35	NA	NA	NA		0.204	4.9E-01
Arsenic (ECHA)	7440-38-2	NA	NA	NA	2.24	Mallard Duck	1.58	a	0.204	3.74E+00
Barium	7440-39-3	45	Rat	0.35	NA	NA	NA		0.204	5.2E+01
Cadmium	7440-43-9	0.20	Rat	0.35	NA	NA	NA		0.204	2.3E-01
Chromium (ECHA - as chromium III)	7440-47-3	1368.0	Rat	0.35	NA	NA	NA		0.204	1.6E+03
Copper (ECHA - copper sulphate pentahydrate)	7440-50-8	4.2	Mouse	0.012	NA	NA	NA		0.204	2.1E+00
Nickel (ADWG)	7440-02-0	5.0	Rat	0.35	NA	NA	NA		0.204	5.7E+00
Silver	7440-22-4	30	Rat	0.35	NA	NA	NA		0.204	3.4E+01
Vanadium	7440-62-2	NA	NA	NA	1	Chicken	2		0.204	2.1E+00
Ammonia (ECHA - Ammonia, anhydrous)	7664-41-7	250	Rat	0.35	NA	NA	NA		0.204	2.9E+02
Total Phosphorus as P (Organic Phosphate as P)	7723-14-0	1000	Rat	0.35	NA	NA	NA		0.204	1.1E+03
Nitrogen (Total)	7727-37-9	6.7	Rat	0.35	NA	NA	NA		0.204	7.7E+00
>C10 - C16 Fraction minus Naphthalene (ECHA: Surrogate as hydrocarbons, C9-16, hydrotreated, dearomatized))	93763-35-0	750	Rat	0.35	NA	NA	NA		0.204	8.6E+02
>C16 - C34 Fraction F3 (ECHA: Surrogate hydrocarbons, C18-C24, iso-alkanes <2% aromatics)	EC 940-734-7	50	Rat	0.35	NA	NA	NA		0.204	5.7E+01

Notes:

[1] - If an avian NOAEL was not available, the mammal NOAEL was used to derive the TRV for the avian receptor.
a -Oak Ridge National Laboratory. 1996. Toxicological Benchmarks for Wildlife: 1996 Revision. Risk Assessment Program Health Sciences Research Division Oak Ridge, Tennessee 37831
ADWG = Australian Drinking Water Guidelines
CAS = Chemical Abstracts Service
ECHA = European Chemical Agency
kg = kilogram
mg = milligram
NA = not applicable
ND = no data available
NOAEL = No observed adverse effect level
NOAELtest = No observed adverse effect level test animal - mg/kg/day
TRV = toxicity reference value

$$Derived\ TRV = NOAEL_{test} * \left(\frac{Body\ Weighttest}{Body\ WeightAvian}\right)^{(1/4)}$$

Exposure Route	Parameter Code	Parameter Definition	Units (a)	Parameter Value	Source (b)
Ingestion	IR	Ingestion rate	L/day	0.020	Table B-1
	$EF_{shortterm}$	Exposure frequency	day/yr	21	BPJ
	$EF_{longterm}$	Exposure frequency	day/yr	365	BPJ
	ED	Exposure duration	yr	1	BPJ
	BW	Body weight	kg	0.204	Table B-1
	AT-NC	Averaging time - noncancer	days	365	BPJ

Notes:
a/ Units:
L/day = litres per day
day/yr = days per year
yr = year
kg = kilogram
b/ Source:

EHS Support

BPJ = Best Professional Judgement

Constituent Name	CAS No.	EPC[1]	Toxicity	Short-Term Storage (21 days)		Long-Term Storage (1 year)	
				Total Intake (mg/kg/day)	Hazard Quotient	Total Intake (mg/kg/day)	Hazard Quotient
		Average CW (mg/L)	TRVs		Ingestion		Ingestion
Aluminium (ECHA - as aluminium citrate)	7429-90-5	0.160	2.29E+02	9.2E-04	4.0E-06	1.60E-02	7.0E-05
Antimony (ADWG)	7440-36-0	0.014	4.92E-01	8.0E-05	1.6E-04	1.40E-03	2.8E-03
Arsenic (ECHA)	7440-38-2	0.012	3.74E+00	6.9E-05	1.8E-05	1.20E-03	3.2E-04
Barium	7440-39-3	39	5.15E+01	2.2E-01	4.3E-03	3.89E+00	7.5E-02
Cadmium	7440-43-9	0.0005	2.29E-01	3.0E-06	1.3E-05	5.18E-05	2.3E-04
Chromium (ECHA - as chromium III)	7440-47-3	0.020	1.57E+03	1.1E-04	7.3E-08	1.99E-03	1.3E-06
Copper (ECHA - copper sulphate pentahydrate)	7440-50-8	0.020	2.07E+00	1.1E-04	5.5E-05	1.99E-03	9.6E-04
Nickel (ADWG)	7440-02-0	0.0073	5.72E+00	4.2E-05	7.3E-06	7.28E-04	1.3E-04
Silver	7440-22-4	0.0045	3.43E+01	2.6E-05	7.5E-07	4.49E-04	1.3E-05
Vanadium	7440-62-2	0.044	2.11E+00	2.5E-04	1.2E-04	4.39E-03	2.1E-03
Ammonia (ECHA - Ammonia, anhydrous)	7664-41-7	27	2.86E+02	1.5E-01	5.4E-04	2.69E+00	9.4E-03
Total Phosphorus as P (Organic Phosphate as P)	7723-14-0	0.62	1.14E+03	3.6E-03	3.1E-06	6.18E-02	5.4E-05
Nitrogen (Total)	7727-37-9	61	7.67E+00	3.5E-01	4.6E-02	6.08E+00	7.9E-01
>C10 - C16 Fraction minus Naphthalene (ECHA: Surrogate as hydrocarbons, C9-16, hydrotreated, dearomatized))	93763-35-0	460.268	8.58E+02	2.6E+00	3.1E-03	4.59E+01	5.3E-02
>C16 - C34 Fraction F3 (ECHA: Surrogate hydrocarbons, C18-C24, iso-alkanes <2% aromatics)	EC 940-734-7	23.599	5.72E+01	1.4E-01	2.4E-03	2.35E+00	4.1E-02
				Cumulative:	**6E-02**	**Cumulative:**	**1E+00**

Notes:
ADWG = Australian Drinking Water Guidelines
BW = body weight
CAS = Chemical Abstracts Service
CW = concentration in water
ECHA = European Chemical Agency
ED = exposure duration
EF = exposure frequency
EPC = exposure point concentration
IR = ingestion rate
mg/kg/day = milligrams per kilograms per day
mg/L = milligrams per litre
NA = not available/applicable
TRV = toxicity reference value
1 - EPC is average concentration presented in Attachment A. If constituent was not detected, 1/2 the detection limit was used to calculate the average.

$$Total\ Intake = \frac{EPC\ \times IR\ \times EF\ \times ED}{BW\ \times ED\ x\ 365^{days}/_{year}}$$

$$Hazard\ Quotient = \frac{Total\ Intake\ \left(\frac{mg}{kg-day}\right)}{TRV\ \left(\frac{mg}{kg-day}\right)}$$

Attachment C - Table C-4
Willie Wagtail
Amungee NW-2H Flowback Water - Avian Risk Assessment
Tamboran

Constituent Name	CAS No.	Mammal NOAEL (mg/kg-day)	Mammal NOAEL Test Animal		Avian NOAEL[1] (mg/kg-day)	Avian NOAEL Test Animal		Avian Receptor Willie Wagtail	
			Animal	Body Weight (kg)		Animal	Body Weight (kg)	Body Weight (kg)	Derived TRV
Aluminium (ECHA - as aluminium citrate)	7429-90-5	200	Rat	0.35	NA	NA	NA	0.0201	4.09E+02
Antimony (ADWG)	7440-36-0	0.43	Rat	0.35	NA	NA	NA	0.0201	8.78E-01
Arsenic (ECHA)	7440-38-2	NA	NA	NA	2.24	Mallard Duck	1.58	0.0201	6.67E+00
Barium	7440-39-3	45	Rat	0.35	NA	NA	NA	0.0201	9.19E+01
Cadmium	7440-43-9	0.20	Rat	0.35	NA	NA	NA	0.0201	4.09E-01
Chromium (ECHA - as chromium III)	7440-47-3	1368.0	Rat	0.35	NA	NA	NA	0.0201	2.79E+03
Copper (ECHA - copper sulphate pentahydrate)	7440-50-8	4.2	Mouse	0.012	NA	NA	NA	0.0201	3.69E+00
Nickel (ADWG)	7440-02-0	5.0	Rat	0.35	NA	NA	NA	0.0201	1.02E+01
Silver	7440-22-4	30	Rat	0.35	NA	NA	NA	0.0201	6.13E+01
Vanadium	7440-62-2	NA	NA	NA	1	Chicken	2	0.0201	3.76E+00
Ammonia (ECHA - Ammonia, anhydrous)	7664-41-7	250	Rat	0.35	NA	NA	NA	0.0201	5.11E+02
Total Phosphorus as P (Organic Phosphate as P)	7723-14-0	1000	Rat	0.35	NA	NA	NA	0.0201	2.04E+03
Nitrogen (Total)	7727-37-9	6.7	Rat	0.35	NA	NA	NA	0.0201	1.37E+01
>C10 - C16 Fraction minus Naphthalene (ECHA: Surrogate as hydrocarbons, C9-16, hydrotreated, dearomatized))	93763-35-0	750	Rat	0.35	NA	NA	NA	0.0201	1.53E+03
>C16 - C34 Fraction F3 (ECHA: Surrogate hydrocarbons, C18-C24, iso-alkanes <2% aromatics)	EC 940-734-7	50	Rat	0.35	NA	NA	NA	0.0201	1.02E+02

Notes:
ADWG = Australian Drinking Water Guidelines
CAS = Chemical Abstracts Service
ECHA = European Chemical Agency
kg = kilogram
mg = milligram
NA = not applicable
NOAEL = No observed adverse effect level
NOAELtest = No observed adverse effect level test animal
TRV = toxicity reference value
1/ If an avian NOAEL was not available, the mammal NOAEL was used to derive the TRV for the avian receptor.

$$Derived\ TRV = NOAEL_{test} * \left(\frac{Body\ Weighttest}{Body\ WeightAvian}\right)^{(1/4)}$$

Exposure Route	Parameter Code	Parameter Definition	Units (a)	Parameter Value	Source (b)
Ingestion	IR	Ingestion rate	L/day	0.004	Table B-1
	$EF_{shortterm}$	Exposure frequency	day/yr	21	BPJ
	$EF_{longterm}$	Exposure frequency	day/yr	365	BPJ
	ED	Exposure duration	yr	1	BPJ
	BW	Body weight	kg	0.0201	Table B-1
	AT-NC	Averaging time - noncancer	days	365	BPJ

Notes:
a/ Units:
L/day = litres per day
day/yr = days per year
yr = year
kg = kilogram
b/ Source:
BPJ = Best Professional Judgement

Attachment C - Table C-4
Willie Wagtail
Amungee NW-2H Flowback Water - Avian Risk Assessment
Tamboran

Constituent Name	CAS No.	EPC [1]	Toxicity	Short-Term Storage (21 days)		Long-Term Storage (1 year)	
		CW (mg/L)	TRVs	Total Intake (mg/kg/day)	Hazard Quotient Ingestion	Total Intake (mg/kg/day)	Hazard Quotient Ingestion
Aluminium (ECHA - as aluminium citrate)	7429-90-5	0.160	4.09E+02	2.0E-03	4.8E-06	3.4E-02	8.4E-05
Antimony (ADWG)	7440-36-0	0.014	8.78E-01	1.7E-04	2.0E-04	3.0E-03	3.4E-03
Arsenic (ECHA)	7440-38-2	0.012	6.67E+00	1.5E-04	2.2E-05	2.6E-03	3.9E-04
Barium	7440-39-3	39	9.19E+01	4.8E-01	5.2E-03	8.4E+00	9.1E-02
Cadmium	7440-43-9	0.0005	4.09E-01	6.4E-06	1.6E-05	1.1E-04	2.7E-04
Chromium (ECHA - as chromium III)	7440-47-3	0.020	2.79E+03	2.5E-04	8.8E-08	4.3E-03	1.5E-06
Copper (ECHA - copper sulphate pentahydrate)	7440-50-8	0.020	3.69E+00	2.5E-04	6.7E-05	4.3E-03	1.2E-03
Nickel (ADWG)	7440-02-0	0.0073	1.02E+01	9.0E-05	8.8E-06	1.6E-03	1.5E-04
Silver	7440-22-4	0.0045	6.13E+01	5.5E-05	9.0E-07	9.6E-04	1.6E-05
Vanadium	7440-62-2	0.044	3.76E+00	5.4E-04	1.4E-04	9.4E-03	2.5E-03
Ammonia (ECHA - Ammonia, anhydrous)	7664-41-7	27	5.11E+02	3.3E-01	6.5E-04	5.8E+00	1.1E-02
Total Phosphorus as P (Organic Phosphate as P)	7723-14-0	0.62	2.04E+03	7.6E-03	3.7E-06	1.3E-01	6.5E-05
Nitrogen (Total)	7727-37-9	61	1.37E+01	7.5E-01	5.5E-02	1.3E+01	9.5E-01
>C10 - C16 Fraction minus Naphthalene (ECHA: Surrogate as hydrocarbons, C9-16, hydrotreated, dearomatized))	93763-35-0	460.268	1.53E+03	5.7E+00	3.7E-03	9.9E+01	6.4E-02
>C16 - C34 Fraction F3 (ECHA: Surrogate hydrocarbons, C18-C24, iso-alkanes <2% aromatics)	EC 940-734-7	23.599	1.02E+02	2.9E-01	2.8E-03	5.1E+00	4.9E-02
				Cumulative:	**7E-02**	**Cumulative:**	**1E+00**

Notes:
ADWG = Australian Drinking Water Guidelines
BW = body weight
CAS = Chemical Abstracts Service
CW = concentration in water
ECHA = European Chemical Agency
ED = exposure duration
EF = exposure frequency
EPC = exposure point concentration
IR = ingestion rate
mg/kg/day = milligrams per kilograms per day
mg/L = milligrams per litre
TRV = toxicity reference value
1 - EPC is average concentration presented in Attachment A. If constituent was not detected, 1/2 the detection limit was used to calculate the average.

$$Total\ Intake = \frac{EPC\ \times IR\ \times EF\ \times ED}{BW\ \times ED\ x\ 365\ ^{days}/_{year}}$$

$$Hazard\ Quotient = \frac{Total\ Intake\ \left(\frac{mg}{kg - day}\right)}{TRV\ \left(\frac{mg}{kg - day}\right)}$$

Attachment C - Table C-5
Peaceful Dove
Amungee NW-2H Flowback Water - Avian Risk Assessment
Tamboran

Constituent Name	CAS No.	Mammal NOAEL (mg/kg-day)	Mammal NOAEL Test Animal		Avian NOAEL [1] (mg/kg-day)	Avian NOAEL Test Animal		Avian Receptor Peaceful Dove	
			Animal	Body Weight (kg)		Animal	Body Weight (kg)	Body Weight (kg)	Derived TRV
Aluminium (ECHA - as aluminium citrate)	7429-90-5	200	Rat	0.35	NA	NA	NA	0.0478	3.29E+02
Antimony (ADWG)	7440-36-0	0.43	Rat	0.35	NA	NA	NA	0.0478	7.07E-01
Arsenic (ECHA)	7440-38-2	NA	NA	NA	2.24	Mallard Duck	1.58	0.0478	5.37E+00
Barium	7440-39-3	45	Rat	0.35	NA	NA	NA	0.0478	7.40E+01
Cadmium	7440-43-9	0.20	Rat	0.35	NA	NA	NA	0.0478	3.29E-01
Chromium (ECHA - as chromium III)	7440-47-3	1368.0	Rat	0.35	NA	NA	NA	0.0478	2.25E+03
Copper (ECHA - copper sulphate pentahydrate)	7440-50-8	4.2	Mouse	0.012	NA	NA	NA	0.0478	2.97E+00
Nickel (ADWG)	7440-02-0	5.0	Rat	0.35	NA	NA	NA	0.0478	8.22E+00
Silver	7440-22-4	30	Rat	0.35	NA	NA	NA	0.0478	4.93E+01
Vanadium	7440-62-2	NA	NA	NA	1	Chicken	2	0.0478	3.03E+00
Ammonia (ECHA - Ammonia, anhydrous)	7664-41-7	250	Rat	0.35	NA	NA	NA	0.0478	4.11E+02
Total Phosphorus as P (Organic Phosphate as P)	7723-14-0	1000	Rat	0.35	NA	NA	NA	0.0478	1.64E+03
Nitrogen (Total)	7727-37-9	6.7	Rat	0.35	NA	NA	NA	0.0478	1.10E+01
>C10 - C16 Fraction minus Naphthalene (ECHA: Surrogate as hydrocarbons, C9-16, hydrotreated, dearomatized))	93763-35-0	750	Rat	0.35	NA	NA	NA	0.0478	1.23E+03
>C16 - C34 Fraction F3 (ECHA: Surrogate hydrocarbons, C18-C24, iso-alkanes <2% aromatics)	EC 940-734-7	50	Rat	0.35	NA	NA	NA	0.0478	8.22E+01

Notes:
ADWG = Australian Drinking Water Guidelines
CAS = Chemical Abstracts Service
ECHA = European Chemical Agency
kg = kilogram
mg = milligram
NA = not applicable
NOAEL = No observed adverse effect level
NOAELt = No observed adverse effect level test animal
TRV = toxicity reference value
1/ If an avian NOAEL was not available, the mammal NOAEL was used to derive the TRV for the avian receptor.

$$Derived\ TRV = NOAEL_{test} * \left(\frac{Body\ Weighttest}{Body\ WeightAvian}\right)^{(1/4)}$$

Exposure Route	Parameter Code	Parameter Definition	Units (a)	Parameter Value	Source (b)
Ingestion	IR	Ingestion rate	L/day	0.008	Table B-1
	$EF_{shortterm}$	Exposure frequency	day/yr	21	BPJ
	$EF_{longterm}$	Exposure frequency	day/yr	365	BPJ
	ED	Exposure duration	yr	1	BPJ
	BW	Body weight	kg	0.0478	Table B-1
	AT-NC	Averaging time - noncancer	days	365	BPJ

Notes:
a/ Units:
L/day = litres per day
day/yr = days per year
yr = year
kg = kilogram
b/ Source:
BPJ = Best Professional Judgement

Attachment C - Table C-5
Peaceful Dove
Amungee NW-2H Flowback Water - Avian Risk Assessment
Tamboran

Constituent Name	CAS No.	EPC [1]	Toxicity	Short-Term Storage (21 days)		Long-Term Storage (1 year)	
		CW (mg/L)	TRVs	Total Intake (mg/kg/day)	Hazard Quotient Ingestion	Total Intake (mg/kg/day)	Hazard Quotient Ingestion
Aluminium (ECHA - as aluminium citrate)	7429-90-5	0.160	3.29E+02	1.5E-03	4.5E-06	2.6E-02	7.8E-05
Antimony (ADWG)	7440-36-0	0.014	7.07E-01	1.3E-04	1.8E-04	2.3E-03	3.2E-03
Arsenic (ECHA)	7440-38-2	0.012	5.37E+00	1.1E-04	2.1E-05	1.9E-03	3.6E-04
Barium	7440-39-3	39	7.40E+01	3.6E-01	4.9E-03	6.3E+00	8.5E-02
Cadmium	7440-43-9	0.0005	3.29E-01	4.8E-06	1.5E-05	8.4E-05	2.5E-04
Chromium (ECHA - as chromium III)	7440-47-3	0.020	2.25E+03	1.9E-04	8.2E-08	3.2E-03	1.4E-06
Copper (ECHA - copper sulphate pentahydrate)	7440-50-8	0.020	2.97E+00	1.9E-04	6.2E-05	3.2E-03	1.1E-03
Nickel (ADWG)	7440-02-0	0.0073	8.22E+00	6.8E-05	8.2E-06	1.2E-03	1.4E-04
Silver	7440-22-4	0.0045	4.93E+01	4.2E-05	8.4E-07	7.2E-04	1.5E-05
Vanadium	7440-62-2	0.044	3.03E+00	4.1E-04	1.3E-04	7.1E-03	2.3E-03
Ammonia (ECHA - Ammonia, anhydrous)	7664-41-7	27	4.11E+02	2.5E-01	6.1E-04	4.3E+00	1.1E-02
Total Phosphorus as P (Organic Phosphate as P)	7723-14-0	0.62	1.64E+03	5.7E-03	3.5E-06	1.0E-01	6.1E-05
Nitrogen (Total)	7727-37-9	61	1.10E+01	5.6E-01	5.1E-02	9.8E+00	8.9E-01
>C10 - C16 Fraction minus Naphthalene (ECHA: Surrogate as hydrocarbons, C9-16, hydrotreated, dearomatized))	93763-35-0	460.268	1.23E+03	4.3E+00	3.5E-03	7.4E+01	6.0E-02
>C16 - C34 Fraction F3 (ECHA: Surrogate hydrocarbons, C18-C24, iso-alkanes <2% aromatics)	EC 940-734-7	23.599	8.22E+01	2.2E-01	2.7E-03	3.8E+00	4.6E-02
				Cumulative:	**6E-02**	**Cumulative:**	**1E+00**

Notes:
ADWG = Australian Drinking Water Guidelines
BW = body weight
CAS = Chemical Abstracts Service
CW = concentration in water
ECHA = European Chemical Agency
ED = exposure duration
EF = exposure frequency
EPC = exposure point concentration
IR = ingestion rate
mg/kg/day = milligrams per kilograms per day
mg/L = milligrams per litre
NA = not available/applicable
TRV = toxicity reference value
1 - EPC is average concentration presented in Attachment A. If constituent was not detected, 1/2 the detection limit was used to calculate the average.

$$Total\ Intake = \frac{EPC\ \times IR\ \times EF\ \times ED}{BW\ \times ED\ x\ 365\ ^{days}/_{year}}$$

$$Hazard\ Quotient = \frac{Total\ Intake\ \left(\frac{mg}{kg-day}\right)}{TRV\ \left(\frac{mg}{kg-day}\right)}$$

Attachment C - Table C-6
Cattle Egret
Amungee NW-2H Flowback Water - Avian Risk Assessment
Tamboran

Constituent Name	CAS No.	Mammal NOAEL (mg/kg-day)	Mammal NOAEL Test Animal		Avian NOAEL [1] (mg/kg-day)	Avian NOAEL Test Animal		Avian Receptor Cattle Egret	
			Animal	Body Weight (kg)		Animal	Body Weight (kg)	Body Weight (kg)	Derived TRV
Aluminium (ECHA - as aluminium citrate)	7429-90-5	200	Rat	0.35	NA	NA	NA	0.36	1.99E+02
Antimony (ADWG)	7440-36-0	0	Rat	0.35	NA	NA	NA	0.36	4.27E-01
Arsenic (ECHA)	7440-38-2	NA	NA	NA	2.2	Mallard Duck	1.58	0.36	3.24E+00
Barium	7440-39-3	45	Rat	0.35	NA	NA	NA	0.36	4.47E+01
Cadmium	7440-43-9	0	Rat	0.35	NA	NA	NA	0.36	1.99E-01
Chromium (ECHA - as chromium III)	7440-47-3	1368.00	Rat	0.35	NA	NA	NA	0.36	1.36E+03
Copper (ECHA - copper sulphate pentahydrate)	7440-50-8	4.20	Mouse	0.012	NA	NA	NA	0.36	1.79E+00
Nickel (ADWG)	7440-02-0	5.0	Rat	0.35	NA	NA	NA	0.36	4.96E+00
Silver	7440-22-4	30.0	Rat	0.35	NA	NA	NA	0.36	2.98E+01
Vanadium	7440-62-2	NA	NA	NA	1	Chicken	2	0.36	1.83E+00
Ammonia (ECHA - Ammonia, anhydrous)	7664-41-7	250.0000	Rat	0.35	NA	NA	NA	0.36	2.48E+02
Total Phosphorus as P (Organic Phosphate as P)	7723-14-0	1000	Rat	0.35	NA	NA	NA	0.36	9.93E+02
Nitrogen (Total)	7727-37-9	7	Rat	0.35	NA	NA	NA	0.36	6.65E+00
>C10 - C16 Fraction minus Naphthalene (ECHA: Surrogate as hydrocarbons, C9-16, hydrotreated, dearomatized))	93763-35-0	750	Rat	0.35	NA	NA	NA	0.36	7.45E+02
>C16 - C34 Fraction F3 (ECHA: Surrogate hydrocarbons, C18-C24, iso-alkanes <2% aromatics)	EC 940-734-7	50	Rat	0.35	NA	NA	NA	0.36	4.96E+01

$$Derived\ TRV = NOAEL_{test} * \left(\frac{Body\ Weighttest}{Body\ WeightAvian}\right)^{(1/4)}$$

Notes:
ADWG = Australian Drinking Water Guidelines
CAS = Chemical Abstracts Service
ECHA = European Chemical Agency
kg = kilogram
mg = milligram
NA = not applicable
NOAEL = No observed adverse effect level
NOAELtest = No observed adverse effect level test animal
TRV = toxicity reference value
1/ If an avian NOAEL was not available, the mammal NOAEL was used to derive the TRV for the avian receptor.

Exposure Route	Parameter Code	Parameter Definition	Units (a)	Parameter Value	Source (b)
Ingestion	IR	Ingestion rate	L/day	0.0298	Table B-1
	$EF_{shortterm}$	Exposure frequency	day/yr	21	BPJ
	$EF_{longterm}$	Exposure frequency	day/yr	365	BPJ
	ED	Exposure duration	yr	1	BPJ
	BW	Body weight	kg	0.36	Table B-1
	AT-NC	Averaging time - noncancer	days	365	BPJ

Notes:
a/ Units:
L/day = litres per day
day/yr = days per year
yr = year
kg = kilogram
b/ Source:
BPJ = Best Professional Judgement

Attachment C - Table C-6
Cattle Egret
Amungee NW-2H Flowback Water - Avian Risk Assessment
Tamboran

Constituent Name	CAS No.	EPC [1]	Toxicity	Short-Term Storage (21 days)		Long-Term Storage (1 year)	
		CW (mg/L)	TRVs	Total Intake (mg/kg/day)	Hazard Quotient Ingestion	Total Intake (mg/kg/day)	Hazard Quotient Ingestion
Aluminium (ECHA - as aluminium citrate)	7429-90-5	0.2	1.99E+02	7.6E-04	3.8E-06	1.3E-02	6.7E-05
Antimony (ADWG)	7440-36-0	0.0140	4.27E-01	6.7E-05	1.6E-04	1.2E-03	2.7E-03
Arsenic (ECHA)	7440-38-2	0.01	3.24E+00	5.7E-05	1.8E-05	9.9E-04	3.1E-04
Barium	7440-39-3	39.000	4.47E+01	1.9E-01	4.2E-03	3.2E+00	7.2E-02
Cadmium	7440-43-9	0.001	1.99E-01	2.5E-06	1.2E-05	4.3E-05	2.2E-04
Chromium (ECHA - as chromium III)	7440-47-3	0.020	1.36E+03	9.5E-05	7.0E-08	1.7E-03	1.2E-06
Copper (ECHA - copper sulphate pentahydrate)	7440-50-8	0.020	1.79E+00	9.5E-05	5.3E-05	1.7E-03	9.2E-04
Nickel (ADWG)	7440-02-0	0.007	4.96E+00	3.5E-05	7.0E-06	6.0E-04	1.2E-04
Silver	7440-22-4	0.005	2.98E+01	2.1E-05	7.2E-07	3.7E-04	1.2E-05
Vanadium	7440-62-2	0.044	1.83E+00	2.1E-04	1.1E-04	3.6E-03	2.0E-03
Ammonia (ECHA - Ammonia, anhydrous)	7664-41-7	27.000	2.48E+02	1.3E-01	5.2E-04	2.2E+00	9.0E-03
Total Phosphorus as P (Organic Phosphate as P)	7723-14-0	0.620	9.93E+02	2.9E-03	3.0E-06	5.1E-02	5.2E-05
Nitrogen (Total)	7727-37-9	61.000	6.65E+00	2.9E-01	4.4E-02	5.0E+00	7.6E-01
>C10 - C16 Fraction minus Naphthalene (ECHA: Surrogate as hydrocarbons, C9-16, hydrotreated, dearomatized))	93763-35-0	460.268	7.45E+02	2.2E+00	2.9E-03	3.8E+01	5.1E-02
>C16 - C34 Fraction F3 (ECHA: Surrogate hydrocarbons, C18-C24, iso-alkanes <2% aromatics)	EC 940-734-7	23.599	4.96E+01	1.1E-01	2.3E-03	2.0E+00	3.9E-02
				Cumulative:	**5E-02**	**Cumulative:**	**9E-01**

Notes:
ADWG = Australian Drinking Water Guidelines
BW = body weight
CAS = Chemical Abstracts Service
CW = concentration in water
ECHA = European Chemical Agency
ED = exposure duration
EF = exposure frequency
EPC = exposure point concentration
IR = ingestion rate
mg/kg/day = milligrams per kilograms per day
mg/L = milligrams per litre
NA = not available/applicable
TRV = toxicity reference value
1 - EPC is average concentration presented in Attachment A. If constituent was not detected, 1/2 the detection limit was used to calculate the average.

$$Total\ Intake = \frac{EPC \times IR \times EF \times ED}{BW \times ED\ x\ 365\ ^{days}/_{year}}$$

$$Hazard\ Quotient = \frac{Total\ Intake\ \left(\frac{mg}{kg-day}\right)}{TRV\ \left(\frac{mg}{kg-day}\right)}$$

Attachment C - Table C-7
Brown Honeyeater
Amungee NW-2H Flowback Water - Avian Risk Assessment
Tamboran

Constituent Name	CAS No.	Mammal NOAEL (mg/kg-day)	Mammal NOAEL Test Animal		Avian NOAEL [1] (mg/kg-day)	Avian NOAEL Test Animal		Avian Receptor Brown Honeyeater	
			Animal	Body Weight (kg)		Animal	Body Weight (kg)	Body Weight (kg)	Derived TRV
Aluminium (ECHA - as aluminium citrate)	7429-90-5	200	Rat	0.35	NA	NA	NA	0.0106	4.8E+02
Antimony (ADWG)	7440-36-0	0	Rat	0.35	NA	NA	NA	0.0106	1.0E+00
Arsenic (ECHA)	7440-38-2	NA	NA	NA	2.2	Mallard Duck	1.58	0.0106	7.8E+00
Barium	7440-39-3	45	Rat	0.35	NA	NA	NA	0.0106	1.1E+02
Cadmium	7440-43-9	0	Rat	0.35	NA	NA	NA	0.0106	4.8E-01
Chromium (ECHA - as chromium III)	7440-47-3	1368.00	Rat	0.35	NA	NA	NA	0.0106	3.3E+03
Copper (ECHA - copper sulphate pentahydrate)	7440-50-8	4.20	Mouse	0.012	NA	NA	NA	0.0106	4.3E+00
Nickel (ADWG)	7440-02-0	5.0	Rat	0.35	NA	NA	NA	0.0106	1.2E+01
Silver	7440-22-4	30.0	Rat	0.35	NA	NA	NA	0.0106	7.2E+01
Vanadium	7440-62-2	NA	NA	NA	1	Chicken	2	0.0106	4.4E+00
Ammonia (ECHA - Ammonia, anhydrous)	7664-41-7	250.0000	Rat	0.35	NA	NA	NA	0.0106	6.0E+02
Total Phosphorus as P (Organic Phosphate as P)	7723-14-0	1000	Rat	0.35	NA	NA	NA	0.0106	2.4E+03
Nitrogen (Total)	7727-37-9	7	Rat	0.35	NA	NA	NA	0.0106	1.6E+01
>C10 - C16 Fraction minus Naphthalene (ECHA: Su	93763-35-0	750	Rat	0.35	NA	NA	NA	0.0106	1.8E+03
>C16 - C34 Fraction F3 (ECHA: Surrogate hydrocarb	EC 940-734-7	50	Rat	0.35	NA	NA	NA	0.0106	1.2E+02

Notes:
ADWG = Australian Drinking Water Guidelines
CAS = Chemical Abstracts Service
ECHA = European Chemical Agency
kg = kilogram
mg = milligram
NA = not applicable
NOAEL = No observed adverse effect level
NOAELtest = No observed adverse effect level test animal
TRV = toxicity reference value
1/ If an avian NOAEL was not available, the mammal NOAEL was used to derive the TRV for the avian receptor.
2/ LOAEL for copper used.

$$Derived\ TRV = NOAEL_{test} * \left(\frac{Body\ Weighttest}{Body\ WeightAvian}\right)^{(1/4)}$$

Exposure Route	Parameter Code	Parameter Definition	Units (a)	Parameter Value	Source (b)
Ingestion	IR	Ingestion rate	L/day	0.0028	Table B-1
	$EF_{shortterm}$	Exposure frequency	day/yr	21	BPJ
	$EF_{longterm}$	Exposure frequency	day/yr	365	BPJ
	ED	Exposure duration	yr	1	BPJ
	BW	Body weight	kg	0.0106	Table B-1
	AT-NC	Averaging time - noncancer	days	365	BPJ

Notes:
a/ Units:
L/day = litres per day
day/yr = days per year
yr = year
kg = kilogram
b/ Source:
BPJ = Best Professional Judgement

Attachment C - Table C-7
Brown Honeyeater
Amungee NW-2H Flowback Water - Avian Risk Assessment
Tamboran

				Short-Term Storage (21 days)		Long-Term Storage (1 year)	
Constituent Name	**CAS No.**	**EPC [1]**	**Toxicity**	**Total Intake (mg/kg/day)**	**Hazard Quotient**	**Total Intake (mg/kg/day)**	**Hazard Quotient**
		CW (mg/L)	**TRVs**		**Ingestion**		**Ingestion**
Aluminium (ECHA - as aluminium citrate)	7429-90-5	0.2	4.8E+02	2.4E-03	5.1E-06	4.2E-02	8.8E-05
Antimony (ADWG)	7440-36-0	0.0140	1.0E+00	2.1E-04	2.1E-04	3.7E-03	3.6E-03
Arsenic (ECHA)	7440-38-2	0.01	7.8E+00	1.8E-04	2.3E-05	3.2E-03	4.1E-04
Barium	7440-39-3	39.000	1.1E+02	5.9E-01	5.5E-03	1.0E+01	9.6E-02
Cadmium	7440-43-9	0.001	4.8E-01	7.9E-06	1.7E-05	1.4E-04	2.9E-04
Chromium (ECHA - as chromium III)	7440-47-3	0.020	3.3E+03	3.0E-04	9.3E-08	5.3E-03	1.6E-06
Copper (ECHA - copper sulphate pentahydrate)	7440-50-8	0.020	4.3E+00	3.0E-04	7.0E-05	5.3E-03	1.2E-03
Nickel (ADWG)	7440-02-0	0.007	1.2E+01	1.1E-04	9.3E-06	1.9E-03	1.6E-04
Silver	7440-22-4	0.005	7.2E+01	6.8E-05	9.5E-07	1.2E-03	1.7E-05
Vanadium	7440-62-2	0.044	4.4E+00	6.7E-04	1.5E-04	1.2E-02	2.6E-03
Ammonia (ECHA - Ammonia, anhydrous)	7664-41-7	27.000	6.0E+02	4.1E-01	6.9E-04	7.1E+00	1.2E-02
Total Phosphorus as P (Organic Phosphate as P)	7723-14-0	0.620	2.4E+03	9.4E-03	3.9E-06	1.6E-01	6.8E-05
Nitrogen (Total)	7727-37-9	61.000	1.6E+01	9.3E-01	5.8E-02	1.6E+01	1.0E+00
>C10 - C16 Fraction minus Naphthalene (ECHA: Su	93763-35-0	460.268	1.8E+03	7.0E+00	3.9E-03	1.2E+02	6.8E-02
>C16 - C34 Fraction F3 (ECHA: Surrogate hydrocarb	EC 940-734-7	23.599	1.2E+02	3.6E-01	3.0E-03	6.2E+00	5.2E-02
				Cumulative:	**7E-02**	**Cumulative:**	**1E+00**

Notes:
ADWG = Australian Drinking Water Guidelines
BW = body weight
CAS = Chemical Abstracts Service
CW = concentration in water
ECHA = European Chemical Agency
ED = exposure duration
EF = exposure frequency
EPC = exposure point concentration
IR = ingestion rate
mg/kg/day = milligrams per kilograms per day
mg/L = milligrams per litre
NA = not available/applicable
TRV = toxicity reference value
1 - EPC is average concentration presented in Attachment A. If constituent was not detected, 1/2 the detection limit was used to calculate the average.

$$Total\ Intake = \frac{EPC\ \times IR\ \times EF\ \times ED}{BW\ \times ED\ x\ 365\ {}^{days}/_{year}}$$

$$Hazard\ Quotient = \frac{Total\ Intake\ \left(\frac{mg}{kg - day}\right)}{TRV\ \left(\frac{mg}{kg - day}\right)}$$

EHS Support

Attachment D Terrestrial Risk Assessment – Amungee NW-2H Flowback Water

Table D-1
Summary of Terrestrial Tier 1 Screening Evaluation
Amungee NW-2H Flowback Water Assessment
Tamboran

Chemical	Maximum Detected Concentration in Water (mg/L)	Maximum Calculated Concentration in Soil (mg/kg)	Soil Screening Level (mg/kg)	Note	Maximum Concentration/ Soil Screening Level Ratio	Median Detected Concentration in Water (mg/L)	Median Calculated Concentration in Soil (mg/kg)*	Soil Screening Level (mg/kg)	Note	Median Concentration/ Soil Screening Level Ratio
Benzene	0.004	3.62E-04	0.12	3,17	NA	0.0005	0.0000453	0.12	3,17	3.8E-04
Toluene	0.006	5.43E-04	0.15	3,17,18	4.5E-03	0.001	0.000091	0.15	3,17,18	6.0E-04
Ethylene glycol	80	7.24E+00	0.31	17	2.3E+01	80	7.2	0.31	17	2.3E+01
Propylene glycol	4	3.62E-01	50	19	7.2E-03	4	0.362	50	19	7.2E-03
Total Phosphorus as P (Organic Phosphate as P)	2.04	1.85E-01	NV		NA	0.38	0.034	NV		NA
Sulfate as SO4 - Turbidimetric (filtered)	141	1.28E+01	NV		NA	23	2.082	NV		NA
Nitrite + Nitrate as N	0.07	6.34E-03	NV		NA	0.005	0.000452675	NV		NA
Bromide	712	6.45E+01	50	7	1.3E+00	170	15.3909465	50	7	3.1E-01
Bromine	227	2.06E+01	10	18	2.1E+00	185	16.74897119	10	18	1.7E+00
Chloride	24000	2.17E+03	NV		NA	17100	1548.148148	NV		NA
Fluoride	6	5.43E-01	120	5	4.5E-03	0.9	0.081481481	120	5	6.8E-04
Kjeldahl Nitrogen Total	73.2	6.63E+00	NV		NA	62.1	5.622222222	NV		NA
Nitrate (as N)	0.07	6.34E-03	NV		NA	0.005	0.000452675	NV		NA
Nitrogen (Total)	73.2	6.63E+00	NV		NA	62.1	5.622222222	NV		NA
Reactive Phosphorus as P (Orthophosphate as P)	0.14	1.27E-02	NV		NA	0.005	0.000452675	NV		NA
Sodium	8280	7.50E+02	NV		NA	8280	749.6296296	NV		NA
Aluminium	0.36	3.26E-02	NV		NA	0.16	0.014485597	NV		NA
Antimony	0.113	1.02E-02	0.27	3	3.8E-02	0.005	0.000452675	0.27	3	1.7E-03
Arsenic	0.043	3.89E-03	40	4	9.7E-05	0.005	0.000452675	40	4	1.1E-05
Barium	77.3	7.00E+00	820	5	8.5E-03	40.6	3.675720165	820	5	4.5E-03
Boron	24.8	2.25E+00	5.7	6	3.9E-01	20.6	1.865020576	5.7	6	3.3E-01
Cadmium	0.0017	1.54E-04	0.36	3,5,17,18	4.3E-04	0.0005	4.52675E-05	0.36	3,5,17,18	1.3E-04
Calcium	657	5.95E+01	NV		NA	657	59.48148148	NV		NA
Chromium (III+VI)	0.13	1.18E-02	100	8	1.2E-04	0.011	0.000995885	100	8	1.0E-05
Copper	0.072	6.52E-03	20	9	3.3E-04	0.011	0.000995885	20	9	5.0E-05
Iron	45.9	4.16E+00	19566	10	2.1E-04	30.1	2.725102881	19566	10	1.4E-04
Lead	0.114	1.03E-02	470	16	2.2E-05	0.005	0.000452675	470	16	9.6E-07
Magnesium	154	1.39E+01	1469	10	9.5E-03	154	13.94238683	1469	10	9.5E-03
Manganese	4.36	3.95E-01	4300	11	9.2E-05	3.13	0.283374486	4300	11	6.6E-05
Mercury	0.0002	1.81E-05	0.013	5,17,18	1.4E-03	0.00005	4.52675E-06	0.013	5,17,18	3.5E-04
Molybdenum	0.049	4.44E-03	9.9	12	4.5E-04	0.014	0.00126749	9.9	12	1.3E-04
Nickel	0.025	2.26E-03	5	13	4.5E-04	0.005	0.000452675	5	13	9.1E-05
Potassium	82	7.42E+00	NV		NA	82	7.423868313	NV		NA
Silver	0.002	1.81E-04	4.2	3,5,18	4.3E-05	0.005	0.000452675	4.2	3,5,18	1.1E-04
Strontium	125	1.13E+01	95	5	1.2E-01	74.3	6.726748971	95	5	7.1E-02
Thorium	0.017	1.54E-03	NV		NA	0.005	0.000452675	NV		NA
Tin	0.006	5.43E-04	7.6	3,18	7.1E-05	0.005	0.000452675	7.6	3,18	6.0E-05
Vanadium	0.01	9.05E-04	7.8	3,5,18	1.2E-04	0.05	0.004526749	7.8	3,5,18	5.8E-04
Zinc	0.146	1.32E-02	15	15	8.8E-04	0.026	0.002353909	15	15	1.6E-04
Formaldehyde	5.8	5.25E-01	NV		NA	4.5	0.407407407	NV		NA
3&4-Methylphenol (m&p-cresol)	0.006	5.43E-04	0.08	3,17	6.8E-03	0.0025	0.000226337	0.08	3,17	2.8E-03
Phenol	0.019	1.72E-03	0.79	3,17,18	2.2E-03	0.002	0.00018107	0.79	3,17,18	2.3E-04
Phenols (non-halogenated) EPAVic	0.019	1.72E-03	NV		NA	0.0055	0.000497942	NV		NA
Bis(2-ethylhexyl) phthalate	0.03	2.72E-03	0.02	3,5	1.4E-01	0.005	0.000452675	0.02	3,5	2.3E-02
C6-C9 Fraction	0.2	1.81E-02	NV		NA	0.09	0.008148148	NV		NA
C10-C14 Fraction	626	5.67E+01	NV		NA	380	34.40329218	NV		NA

Table D-1
Summary of Terrestrial Tier 1 Screening Evaluation
Amungee NW-2H Flowback Water Assessment
Tamboran

Chemical	Maximum Detected Concentration in Water (mg/L)	Maximum Calculated Concentration in Soil (mg/kg)	Soil Screening Level (mg/kg)	Note	Maximum Concentration/ Soil Screening Level Ratio	Median Detected Concentration in Water (mg/L)	Median Calculated Concentration in Soil (mg/kg)*	Soil Screening Level (mg/kg)	Note	Median Concentration/ Soil Screening Level Ratio
C15-C28 Fraction	590	5.34E+01	NV		NA	69.5	6.29218107	NV		NA
C29-C36 Fraction	3.15	2.85E-01	NV		NA	0.16	0.014485597	NV		NA
C6-C10 (F1 minus BTEX)	0.19	1.72E-02	NV		NA	0.11	0.009958848	NV		NA
>C10-C16 Fraction (F2 minus Naphthalene)	1050	9.51E+01	120	2	7.9E-01	476	43.09465021	120	2	3.6E-01
>C16-C34 Fraction (F3)	160	1.45E+01	300	2	4.8E-02	12.1	1.095473251	300	2	3.7E-03
>C34-C40 Fraction (F4)	1.27	1.15E-01	2800	2	4.1E-05	0.05	0.004526749	2800	2	1.6E-06
Acrylamide	0.0579	5.24E-03	NV		NA	0.0515	0.004662551	NV		NA

Notes:

ACL = Added contaminant limits
As = Arsenic
BTEX = Benzene, Toluene, Ethylbenzene, and Xylene
CEC = Cation Exchange Capacity
Cu = Copper
D = dissolved
DDT = dichlorodiphenyltrichloroethane
ECHA = European Chemical Agency
EIL = Ecological Investigation Level
ESL = Ecological Screening Level
HQ = hazard quotient
mg/kg = milligrams per kilogram
mg/L = milligrams per litre
N = null
NEPM = National Environment Protection Measures
NOAEL = no-observed-adverse=effect-level
NV = No readily available screening criterion
PNEC = predicted no effect concentration
T = total
TPH = total petroleum hydrocarbons
UCL = upper confidence limit
USEPA = United States Environmental Protection Agency

* A Non Detect Multiplier of 0.5 has been applied to calculate the median concentration.

1 = NEPM. 2011. Guideline on Investigation Levels for Soil and Groundwater. National Environment Protection (Assessment of Site Contamination)Measure April 2011 National Environment Protection (Assessment of Site Contamination) Measure. Table 1B(6) ESLs for TPH fractions F1 – F4, BTEX and benzo(a)pyrene in soil. Areas of ecological significance.

2 = NEPM. 2011. Guideline on Investigation Levels for Soil and Groundwater. National Environment Protection (Assessment of Site Contamination)Measure April 2011 National Environment Protection (Assessment of Site Contamination) Measure Table 1B(6) Schedule B (1) - ESLs for TPH fractions F1 – F4,

3 = USEPA 2018. Region 4 Ecological Risk Assessment Supplemental Guidance. Table 3 Region 4 Soil Screening Values for Hazardous Waste Sites Value for mammalian species

4 = NEPM 2011. Guideline on Investigation Levels for Soil and Groundwater. National Environment Protection (Assessment of Site Contamination)Measure April 2011 National Environment Protection (Assessment of Site Contamination) Measure Table 1B(5)Table 1B(6) Schedule B (1) - Generic EILs for aged As, fresh DDT and fresh naphthalene in soils irrespective of their physicochemical properties.

5 = USEPA 2018. Region 4 Ecological Risk Assessment Supplemental Guidance. Table 3 Region 4 Soil Screening Values for Hazardous Waste Sites Value for avian species.

6 = ECHA 2020. Boron Predicted no effect concentration (PNEC) in soil for terrestrial species. https://echa.europa.eu/brief-profile/-/briefprofile/100.028.319

7 = ECHA 2020. NOAEL as concentration in food source for Wistar Han rat

8 = NEPM 2011. Guideline on Investigation Levels for Soil and Groundwater. National Environment
9 = NEPM 2011. Guideline on Investigation Levels for Soil and Groundwater. National Environment
10 = Background threshold value based on 95 percent upper confidence limit (UCL) of mean for McArther Basin surficial soils. Note, UCL of the mean represents a central tendency and is conservative to use a central tendency value for comparison.

11 = USEPA 2007. Ecological Soil Screening Levels for Manganese Interim Final OSWER Directive 9285.7-71. Table 2.1-Avian Wildlife Manganese Eco-SSLs (mg/kg dry weight in soil).

12 = ECHA 2020. Molybdenum predicted no effect concentration (PNEC) in soil for terrestrial species. Hazard for Terrestrial Organism.

13 = NEPM 2011. Guideline on Investigation Levels for Soil and Groundwater. National Environment Protection (Assessment of Site Contamination) Measure April 2011 National Environment Protection (Assessment of Site Contamination) Measure Table 1B(3) Soil-specific added contaminant limits for aged chromium III and nickel in soil. Areas of ecological significance Schedule B (1)

14 = NEPM 2011. Guideline on Investigation Levels for Soil and Groundwater. National Environment Protection (Assessment of Site Contamination) Measure April 2011 National Environment Protection (Assessment of Site Contamination) Measure. Schedule B (1), Table 1B(3) Soil-specific added contaminant limits for aged chromium III and nickel in soil. Areas of ecological significance

15 = NEPM 2011. Guideline on Investigation Levels for Soil and Groundwater. National Environment Protection (Assessment of Site Contamination) Measure April 2011 National Environment Protection (Assessment of Site Contamination) Measure. Schedule B (1), Table 1B(1) Soil-specific added contaminant limits for aged zinc in soil at pH 4 and CEC 5.

16 = NEPM 2011. Guideline on Investigation Levels for Soil and Groundwater. National Environment Protection (Assessment of Site Contamination) Measure April 2011 National Environment Protection (Assessment of Site Contamination) Measure. Schedule B (1) Table 1B(4) Generic added contaminant limits for lead in soils irrespective of their physicochemical properties. Areas of ecological significance

17 = USEPA 2018. Region 4 Ecological Risk Assessment Supplemental Guidance. Table 3 Region 4 Soil Screening Values for
18 = USEPA 2018. Region 4 Ecological Risk Assessment Supplemental Guidance. Table 3

19= ECHA 2020 Propylene glycol Predicted no effect concentration (PNEC) in soil for terrestrial species. https://echa.europa.eu/registration-dossier/-/registered-dossier/16001/6/1