Ecological Assessment

Appendix 01

Amadeus Basin: Jacko Bore 1DW1 Drill and Test Program

EP125

Santos QNT Pty Ltd

Ecological Assessment Jacko Bore

EP 125

Santos Limited

02 December 2022

→ The Power of Commitment

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Executive Summary

This report is subject to, and must be read in conjunction with, the limitations set out in section 1.7 and the assumptions and qualifications contained throughout the report.

Project description and objectives of this assessment

This Ecological Assessment report created for the Jacko Bore site has been prepared for Santos QNT Pty Ltd (Santos) as an appendix to the Jacko Bore Environmental Management Plan (EMP) (InGauge Energy, 2022). The purpose of this report is to determine potential impacts on threatened species and communities within the Jacko Bore Project Area (refer to Figure 1-1) from data gathered from desktop assessment and a rapid habitat assessment.

Recommendation for mitigation and management measures to avoid and minimise impact to listed threatened species have been outlined within this report (refer to Section 6).

Methods used for this assessment

Information presented in this report was obtained using the following methods:

- Literature review of environmental reports from surveys previously conducted within the Amadeus Basin.
- Desktop searches of government database information relating to fauna distributions, including the Commonwealth Department of the Environment (DoE) Protected Matters Search Tool (PMST) and the Northern Territory Natural Resources Maps, Flora and Fauna Atlas (DEPWS, 2022d).
- Rapid habitat assessment (12 October 2022) of the area based on a vegetation structure assessment and habitat assessment only. Additional survey methods were undertaken throughout the Project Area when time permitted.
- Assessment of the significance of impacts to threatened species and communities using the '*Significant Impact Guidelines 1.1'* (Commonwealth of Australia, 2013).
- Identifying potential adverse impacts to threatened fauna species and communities from the project, proposing mitigation measures to avoid and reduce the risk of impacts and determining residual risks to fauna with a focus on threatened species and communities.

Results of field assessment

Threatened Fauna

The PMST search identified nine threatened fauna species as occurring or having the potential to occur within the desktop search extent (20 km buffer around the Project Area, defined in Section 3). NR Maps identified an additional two threatened fauna species that have been recorded within the desktop search extent (DEPWS, 2022d). The searches collectively identified 13 *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act) and/or *Territory Parks and Wildlife Conservation Act 1976* (TPWC Act) listed threatened fauna species that are either predicted to occur or have been confirmed as occurring within the desktop search extent. This comprised of six birds, four mammals and one reptile.

A rapid habitat assessment and vegetation and flora assessment, comprising two fauna ecologists and one flora ecologist was undertaken on the 12 October 2022. Day time temperatures provided good conditions for birds, mammals and reptiles activity.

The team used a range of observational survey methods (e.g. habitat assessment, bird survey, active searches, and opportunistic searches) which resulted in a list of ten fauna species. This comprised of seven birds, one introduced mammals and two reptiles. No threatened fauna species were identified within the Project Area. However, there is potentially suitable habitat for one EPBC-listed threatened species within the extent of the Project Area. A detailed assessment of significant impacts has been prepared for each threatened species that has the potential to be adversely impacted upon by the project (see Section 5).

Threatened Flora

No threatened ecological communities (TECs) were identified in a PMST search. A search of NT sites of botanical significance (NR maps 2022) identified Karinga Creek, located approximately 10 km the north of the Jacko Bore Study Area. This site has botanical significance within the Finke Bioregion and is within the Karinga Creek paleodrainage system which is recorded as an international site of conservation significance. No sites of botanical significance or conservation significance are located within the Study Area.

One listed threatened flora species were identified in a PMST search as occurring or has the potential to occur within the desktop search extent. However, during the field survey no listed threatened flora species were identified within the Project Area.

Vegetation communities were mapped within the Project Area and are provided within the report (see 4.1.2 and Figure 4-1).

Feral / pest species

A search of the NT Fauna Atlas (DEPWS, 2022d) identified seven (all mammals) introduced fauna species within the desktop search extent. During the field survey one introduced fauna species was observed within the Project Area. An account of this is provided within the report (see Section 4.2.4). The management of introduced species within the Jacko Bore Project Area is outlined in Appendix 04 (Risk Assessment) (InGauge Energy, 2022).

A search of the NT Weeds Branch database (DEPWS, 2022d) identified a total of 12 introduced flora records within the desktop search extent, none of which are listed under the NT *Weeds Management Act 2001* and Weeds of National Significance (WoNS) as requiring management. A weed survey undertaken during the field survey observed two introduced flora species, Buffel grass (*Cenchrus ciliaris*) and Bitter Paddy Mellon (*Citrullus colocynthis*), neither of which require management under the NT *Weeds Management Act 2001*.

Significant impact assessment and mitigation

A detailed assessment of significant impacts was undertaken for the project for Matters of National Environmental Significance (MNES) protected under the EPBC Act. Listed threatened species, migratory species and EPBC wetlands of national importance, which were considered 'present', or as 'possible' occurrences within the Project Area were assessed (refer to Section 5). Evaluations of the significance of potential impacts were based on the *Commonwealth's Matters of National Environmental Significance Significant Impacts Guidelines 1.1* as applied to Endangered and Vulnerable species.

One terrestrial fauna species were considered 'possible' to occur within the Project Area. This included, the Grey Falcon (*Falco hypoleucos*) (list as vulnerable under the EPBC Act and TPWC Act).

The following mitigation measures are suggested to reduce the likelihood of impacts on fauna caused by the project:

– Micro-sitting of new project elements to avoid disturbance of previously undisturbed native vegetation. Impact will be less likely if new project elements are situated on previously cleared or disturbed land.
– Follow management measures for predation against introduced fauna species as outlined in the risk assessment of the Environmental Management Plan (EMP) ((inGauge Energy, 2022)
– Follow management measures for the control of weeds as outlined in the Weed Management Plan (WMP) (EcOz, 2022).
– Follow management measures for bushfire control as outlined in the Fire Management Plan (FMP) (inGauge Energy, 2022).

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1. Introduction

1.1 Overview

Santos QNT Pty Ltd (Santos) is the operator of Exploration Permit (EP) 125 which is located approximately 200 km south of Alice Springs in the Northern Territory (NT) (Figure 1-1). The Project Area of EP 125 is situated in the Finke and Stony Plain bioregion, west of the Stuart Highway and south of the Lasseter Highway, and extends over the Lyndavale Station pastoral lease (DEPWS, 2022). Santos is proposing to undertake exploration drilling activities in EP 125 at the Jacko Bore site, extending from activities at the adjacent Mt Kitty 1 site. Activities at the Jacko Bore site include civil works to repair and upgrade the existing Lyndavale Homestead/Mt Kitty 1 access track as necessary, preparation of a well pad, water bores, laydown areas and campsites for the Jacko Bore exploration well. The well site will be accessed from the Stuart Highway via the Lyndavale Homestead access road, then via the Mt Kitty 1 access road.

As a result of desktop searches included within this report and Appendix 01 of the Environmental Management Plan (EMP) (inGauge Energy, 2022), Santos commissioned an ecological assessment to be conducted prior to any activities commencing. The aim of the assessment is to adequately assess potential impacts to matters protected under both the *Territory Parks and Wildlife Conservation Act 1976* (TPWC Act) and *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). No previous ecology assessments have been undertaken at the Jacko Bore site (Project Area).

1.2 Purpose of this report

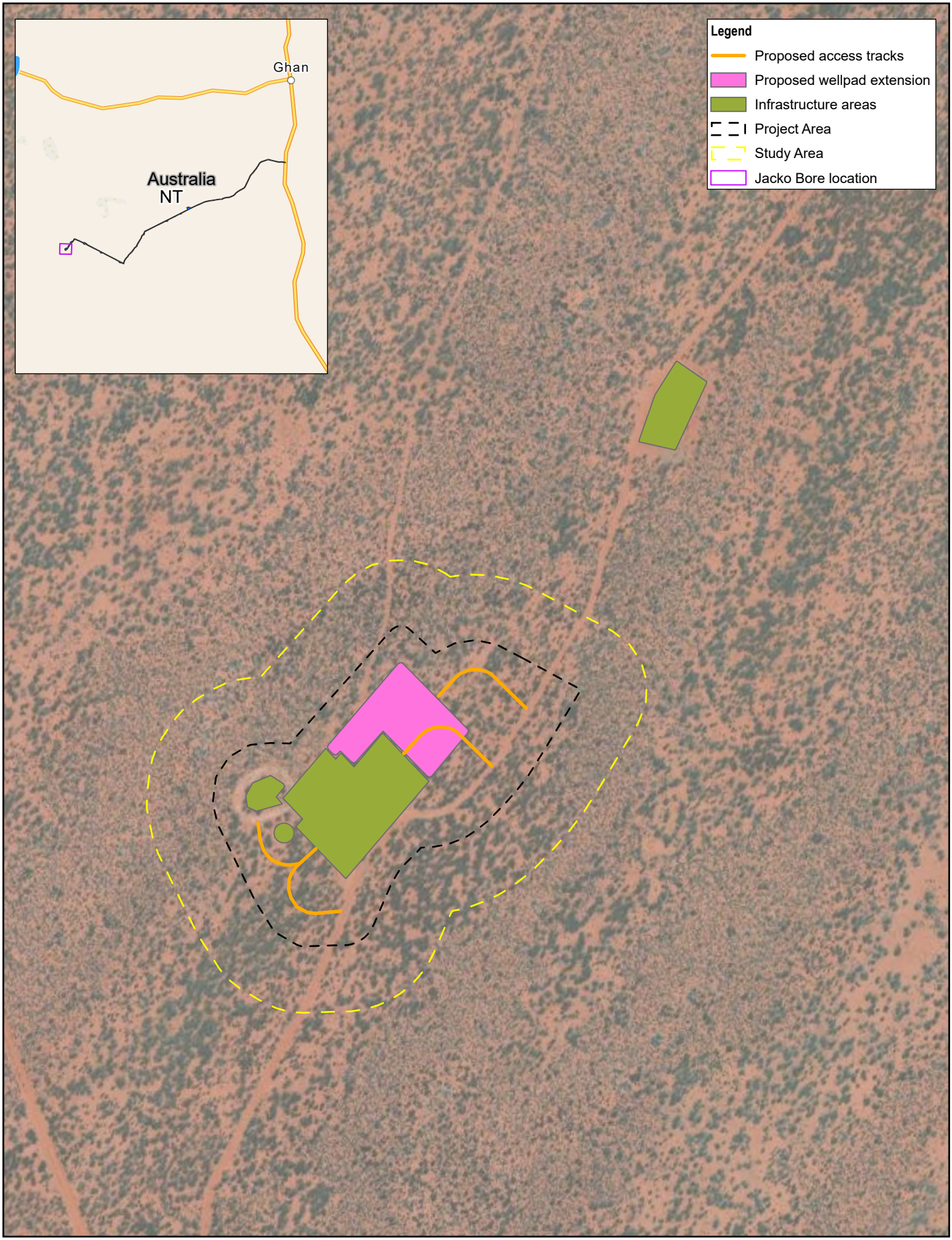
GHD were engaged by Santos to undertake a desktop assessment of the biodiversity values within the vicinity of the Project Area. The objectives of the desktop assessment were:

– To provide information on biodiversity values for Santos to update the associated EMP for the proposed exploration drilling program
– To identify biodiversity values within the site to inform project planning for the proposed exploration drilling program.

This report has been prepared to provide the methods and results of the 2022 Ecological Assessment of the Project Area. The scope of the assessment was to identify flora and fauna values within the Santos exploration leases EP 125.

Specific objectives of the assessment were as follows:

– Investigate the flora and fauna values protected under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and the *Territory Parks and Wildlife Conservation Act 1976* (TPWC Act), known or potentially present within the site. This is to include threatened ecological communities (TECs) known threatened flora and threatened fauna records and potential habitat.
– Ground-truth landforms and NVIS Level V vegetation mapping.
– Conduct a likelihood of occurrence assessment for listed threatened species and ecological communities
– Conduct an environmental risk assessment.
– Identify necessary controls to avoid, reduce or manage ecological impacts.
– Provide recommendations for further investigation including whether a targeted threatened species survey is required.



Paper Size ISO A4

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Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 53

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Environmental Management Plans Amadeus Basin

Project No. **12576304**
Revision No. **A**
Date **11 Nov 2022**

Project Locality

FIGURE 1-1

G:\43\12576304\GIS\Maps\12576304_TechnicalReport\12576304_TechnicalReport.aprx\12576304_001_MtKittyProjectLocality_RevA
Print date: 11 Nov 2022 - 16:30

Data source: GA - Watercourses (2022), Roads (2008), Santos - Project Footprint, Access Tracks, Infrastructure (2022), World Navigation Map: Esri, HERE, Garmin, Foursquare, FAO, METI/NASA, USGS
World Imagery: Maxar. Created by: cmacgregor

1.3 Description of the activity

The proposed drilling program will be undertaken within EP 125 and includes the following key activities:

– Civil works (construction of access tracks, excavation of borrow pits, construction of well pad, pits for drilling, development of a temporary laydown area, and the construction of a temporary workers camp with an associated wastewater treatment facility).
– Groundwater extraction and storage, including the drilling of up to three new bores.
– Drilling activities, including formation evaluation (open hole or cased hole wireline).
– Wellbore seismic evaluation (e.g., vertical seismic profiling or check shot surveying).
– Production testing (drill stem test, extended production tests).
– Well integrity monitoring.

To enable the proposed civil works, up to 14.7 ha of land and vegetation disturbance will be required, in addition to the existing 255.6 ha of clearing which was primarily used to construct the access track from the Lasseter Highway to the Jacko Bore well site. On decommissioning of the proposed activities, Santos will remediate the Project Area.

1.4 Definitions

For the purposes of this report, definitions as described in Table 1.1 apply.

Table 1.1 Report definitions

Subject	Definition
Study Area	The area subject to ecological field surveys, which includes a 100 m buffer around the infrastructure (i.e. borrow pits, well pad, drill pits and temporary laydown area) (refer to Figure 1-1)
Project Area	The area proposed to be directly impacted by the project, which includes the 30 m wide new access track and supporting civil works (refer to Figure 1-1).
Desktop search extent	20 km buffer around the Project Area used for desktop searches of environmental values.

1.5 Report structure

The report is comprised of the following information:

Section 1	An overview of the project and identification of key objectives of the assessment
Section 2	A description of the methods employed during the desktop and field assessments
Section 3	A summary of the existing environment and description of the desktop assessment results
Section 4	A description of the terrestrial flora and fauna field assessment results
Section 5	Discussion of the results based on the likelihood of occurrence assessment
Section 6	A concluding summary identifying key results and recommendations

1.6 Limitations

This Ecological Assessment Report has been prepared by GHD for Santos Limited and may only be used and relied on by Santos Limited for the purpose agreed between GHD and Santos Limited as set out in Section 1.2 of this report.

GHD otherwise disclaims responsibility to any person other than Santos Limited arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on information obtained from. And undertaken at or in connection with, specific survey sites. Survey conditions at other parts of the site may be different from the site condition sound at the specific survey sites.

Investigations undertaken in respect of this report are constrained by the particular survey conditions, such as land access, geographic constraints and vegetation. As a result, not all relevant site features and conditions may have been identified in this report.

Site conditions (including the presence of flora and fauna populations) may change after the date of this Report. GHD does not accept responsibility arising from, or in connection with, any change to the site conditions. GHD is also not responsible for updating this report if the site conditions change.

1.7 Assumptions

1.7.1 Use of Protected matters Search Tool (PMST) and NR Maps

This report should be read with respect to the following:

– The information presented in this report are based on findings from desktop and field assessments listed in Section 3 and Section 4. The level of confidence surrounding the likelihood of occurrence and potential impact on threatened species is limited by previously documented surveys and our ecological assessment.
– The Protected Matters Search Tool (PMST) produces lists of threatened species, communities, and other Matters of National Environmental Significance (MNES) that has the potential to occur within a defined search area, or for which there may be potentially suitable habitat within the defined search area. It takes into account previous records and habitat modelling; however, it does not confirm the presence/absence of threatened species and communities.
– The NT Government Department of Environment and Natural Resources – Natural Resource Maps database is based on information recorded from previous surveys. Using the database, results of surveys in a defined geographical area can be searched to produce lists of species known to occur or known to have occurred in the case of extinct species. The accuracy of this is limited by the quality and quantity of data recorded from the search area. This does not necessarily reflect the survey effort, type or timing. For example, targeted surveys may have been undertaken, ineffective survey techniques may not yield accurate results, a large survey effort may yield few results and the data include incidental observations that were not part of a formal survey. Therefore, the database results (particularly the quantity of records) cannot be used as a definitive estimate of survey effort in a given area. Least concern species have not been mapped, hence distribution and density of species locations across the Project Area have not been assessed. The location for threatened species records in the Project Area (both from NR Maps and field investigation) have been mapped in Figure 2-1. The NR Maps Flora and Fauna Atlas was utilised for nomenclature of mammals, reptiles and frogs. Species listed as near threatened (NT), or data deficient (DD) under the TPWC Act that are not listed elsewhere (e.g. EPBC Act listed species) are not included in this assessment unless they possess cultural significance to Traditional Owners in the region.

1.7.2 Site investigation and methods

– The ecological field assessment was carried out on the 12 October 2022. Daytime temperatures provided good conditions for birds, mammals and reptiles activity. Due to time constraints, this field survey did not include nocturnal survey which limited the surveys to detect diurnal fauna species only.
– This report highlights the potential presence/absence of some species and possible impacts of the project, based on desktop assessment and a rapid habitat assessment only. Targeted surveys for fauna, flora, or communities were not undertaken as these were beyond the scope of the project.
– The ecological assessment is limited to vascular plant species (ferns, conifers, and flowering plants). Non-vascular flora (e.g., mosses, liverworts, lichens) and fungi have not been considered in detail as part of this assessment, except where listed threatened species are known or suspected to occur.

2. Methods

2.1 List of relevant legislation

The key legislation of relevance to the project are:

– *Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth)
– *Territory Parks and Wildlife Conservation Act 1976* (Northern Territory)
– *Environmental Protection Act 2019* (Northern Territory)
– *Weeds Management Act 2001* (Northern Territory)

2.2 Approach

The ecological assessment for the project included a combination of desktop review of environmental databases, relevant mapping layers and a field assessment of the terrestrial flora and fauna values within the Study Area. The desktop assessment and ecological field assessment are described below.

2.3 Desktop assessment

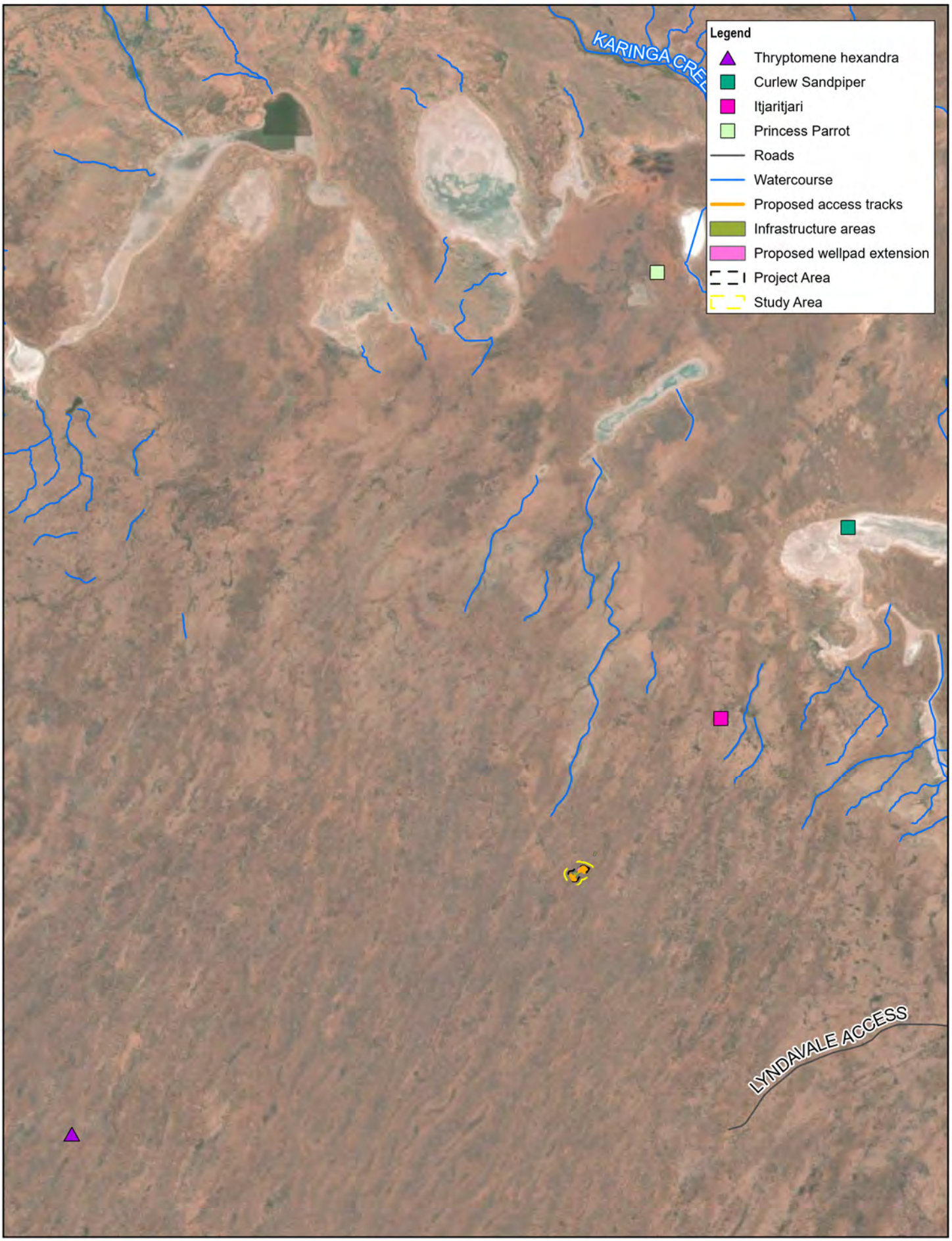
The desktop assessment was undertaken to identify and collate existing information on the ecological values of the environment within the Study Area. Desktop searches were undertaken for the Study Area to provide location-specific information on EPBC Act and TPWC Act listed threatened species, threatened ecological communities (TECs) and ecosystems/habitats with the potential to occur.

For all desktop searches, the search extent encompassed a 20 km buffer around the Project Area. This was undertaken to provide context about the potential presence of mobile species or cryptic species that are known to occur in similar habitat within the region. To gain a full understanding of the potential ecological values present, desktop results present current listed species and communities. The location of conservation significant species historically recorded within the desktop search extent (20 km buffer of the Project Area) is provided in Figure 2-1 below.

The desktop assessment used the information sources listed in Table 2.1Table 2.1.

Table 2.1 Information sources used for the desktop assessment

Information sources	Description
Department of Climate Change, Energy, the Environment and Water (DCCEEW) PMST	Review of the DCCEEW Protected Matters Search Tool (PMST) for MNES listed under the EPBC Act that may occur in each of the Study Area (refer to Appendix A).
Department of Environment, Parks and Water Security (DEPWS) Natural Resource (NR) Maps	NR Maps was searched to retrieve: – Historical records of flora and fauna species previously recorded within the vicinity of the Study Area. – Vegetation community types, including sensitive vegetation communities mapped within the Study Area. – Vegetation mapping – FINKE_100K, (Sparrow & Leitch 2009). – Land systems – South NTLS 1M (2021). – Watercourses, wetlands, and waterholes.
Alas of Living Australia database	The Atlas of Living Australia database was searched to retrieve historical records of flora and fauna species previously observed in the vicinity of the Study Area.
Groundwater Dependent Ecosystems Atlas	Used to identify the occurrence of Groundwater Dependent Ecosystems (GDEs) within the Study Area.
Previous environmental assessments	Literature review of previous environmental reports from surveys previously conducted within the Amadeus Basin, including: – Environmental Management Plan: Dukas-1 – Convention Gas Well (Santos, 2019). – Ecological Assessment Dukas 1 Project (EcOz, 2018).



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Threatened species records within the desktop search extent

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Revision No. **A**
Date **10 Nov 2022**

FIGURE 2-1

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Print date: 10 Nov 2022 - 11:27

Data source: GA - Watercourses (2022), Roads (2008), Santos - Project Footprint, DLRM - Threatened species (2021)|World Imagery: Earthstar Geographics. Created by: mvandermerwe

2.4 Ecological field assessment

2.4.1 Overview

Terrestrial surveys were undertaken by senior fauna ecologist Shannon Blatchford (GHD), fauna ecologist Sheydin Stapleton (GHD) and senior flora ecologist David van den Hoek (Connect Environmental). Shannon has a Bachelor of Science in Ecology and Conservation Biology with 12 years' experience in environmental management and ecological assessments. Sheydin has a Bachelor of Science in Environmental Science with 3 years' experience in undertaking ecological assessments. David has 18 years' experience in vegetation and flora surveys across the Northern Territory.

A rapid habitat assessment and vegetation and flora survey assessment was undertaken on the 12 October 2022. The survey was conducted within the Project Area to gather information about the ecological values associated with the existing environment, confirm the presence of species of conservation significance, and record any key ecological features that should be avoided or considered for the proposed project. This assessment did not include targeted species surveys. Due to limitations with field survey time, this field survey did not include nocturnal survey which limited the surveys to detect diurnal fauna species only.

Climatic records were taken from a nearby weather station Erldunda (15574) for rainfall data and Kulgera (015603) for temperature data (BoM, 2022). Rainfall and temperature data for the six months leading up to and during the survey for the Project Area are represented in Table 2.2. During the field survey warm daytime temperatures were recorded (daily maximum of 33°C). Daytime temperatures provided good conditions for birds, mammals and reptiles activity.

Table 2.2 Temperature and rainfall data

Month	Historical mean monthly rainfall (mm)	2022 total rainfall (mm)	Historical mean temperature (°C)	2022 mean temperature (°C)
April	12.1	0.0	28.3	N/A
May	13.0	0.0	22.9	N/A
June	10.1	29.0	18.8	16.5
July	11.5	N/A	19.3	20.2
August	9.2	N/A	22.1	23.4
September	8.7	N/A	27.2	31.1

2.4.1 Vegetation communities and flora survey methods

Vegetation and flora survey assessments were undertaken at two survey sites, as presented in Figure 2-2. Surveys were undertaken in accordance with relevant NT guidelines (Brocklehurst et al., 2007). Vegetation mapping was undertaken within the Study Area to include a 100 m buffer area around proposed access tracks and well site infrastructure (refer to Figure 4-1). Vegetation community boundaries were delineated into visually distinct patches at a 1:10,000 mapping scale using Qgis mapping software. The vegetation boundary mapping referenced nearby existing vegetation mapping for the southern Finke bioregion ('FINKE'_1:100,000 (Sparrow & Leitch, 2009)) and recent aerial imagery (ESRI world imagery 2022). Updates to vegetation boundaries were also recorded during the field survey. Vegetation survey sites were recorded within selected vegetation mapping boundaries to inform community descriptions at an association level (NVIS level V). The three dominant flora species within the three dominant strata were identified. Photos of vegetation and surface soils were taken at each survey site. Given the sparse nature of vegetation in the Study Area, assessment areas were chosen to allow representative estimates on vegetation structure, to inform broad community descriptions more accurately (Brocklehurst et al., 2007). A more general vegetation description was applied to vegetation communities observed to occur on top of dune crests. Observations of landform and weeds were also recorded at each survey site.

Incidental weed observations, including weed type, location and density were recorded to determine the level of weed risk within the Study Area and inform requirements for further targeted weed surveys.

A description of survey methods employed for relevant environmental matters is provided in Table 2.3.

Table 2.3 Vegetation communities and flora survey methods used within the Study Area

Assessment	Survey method
Sensitive Vegetation and vegetation mapping	Sensitive/significant vegetation are those that are considered significant under the *NT Land Clearing Guidelines* (DEWPS, 2021). The structural and compositional characteristics of the vegetation communities across the Project Area were assessed to identify the occurrence of Sensitive Vegetation Communities within the site, to validate results from the desktop assessment. Two sites were surveyed as part of this assessment. Vegetation mapping was conducted of the site to ground-truth identified vegetation communities from the desktop assessment. Vegetation mapping was conducted using the *Northern Territory Guidelines and Field Methodology for Vegetation Survey and Mapping (Brockelhurst et al., 2007).*
Threatened flora species	There is a low likelihood of threatened flora species occurring within the Study Area for the following reasons, (1) no records occur within the NT Flora Atlas and (2) flora species identified within the EPBC Protected Matter, 20 km desktop search area do not have suitable habitat within the Study Area. Therefore, targeted surveys were not undertaken for threatened flora species.
Weeds	Flora species listed under the *Weeds Management Act 2013* as 'Class A', 'Class B' or 'Class C' invasive species were recorded where encountered across the Project Area. Species distribution and density were recorded to provide an understanding of the overall presence within the Project Area.
Land Systems and Landform Units	Utilising existing land system (South NTLS 1M) data, ground-truthing of the Project Area was conducted to confirm the descriptions of land systems and landforms identified from the desktop assessment. A total of two sites were surveyed as part of this assessment.

Paper Size ISO A4

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Metres

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Distribution of vegetation and flora survey sites within the Study Area

Project No. **12576304**
Revision No. **A**
Date **11 Nov 2022**

FIGURE 2-2

N:\AU\Darwin\Projects\43\12576304\GIS\Maps\12576304_TechnicalReport\12576304_TechnicalReport.aprx\12576304_002_MtKittyFloraSurveyEffort_RevA
Print date: 11 Nov 2022 - 10:01

Data source: Santos - Project Footprint, Proposed access tracks, Infrastructure (2022), GHD - Flora survey effort (2022), World Imagery: Maxar World Navigation Map: Esri, HERE, Garmin, FAO, NOAA, USGS. Created by: acjackson

2.4.2 Terrestrial fauna survey methods

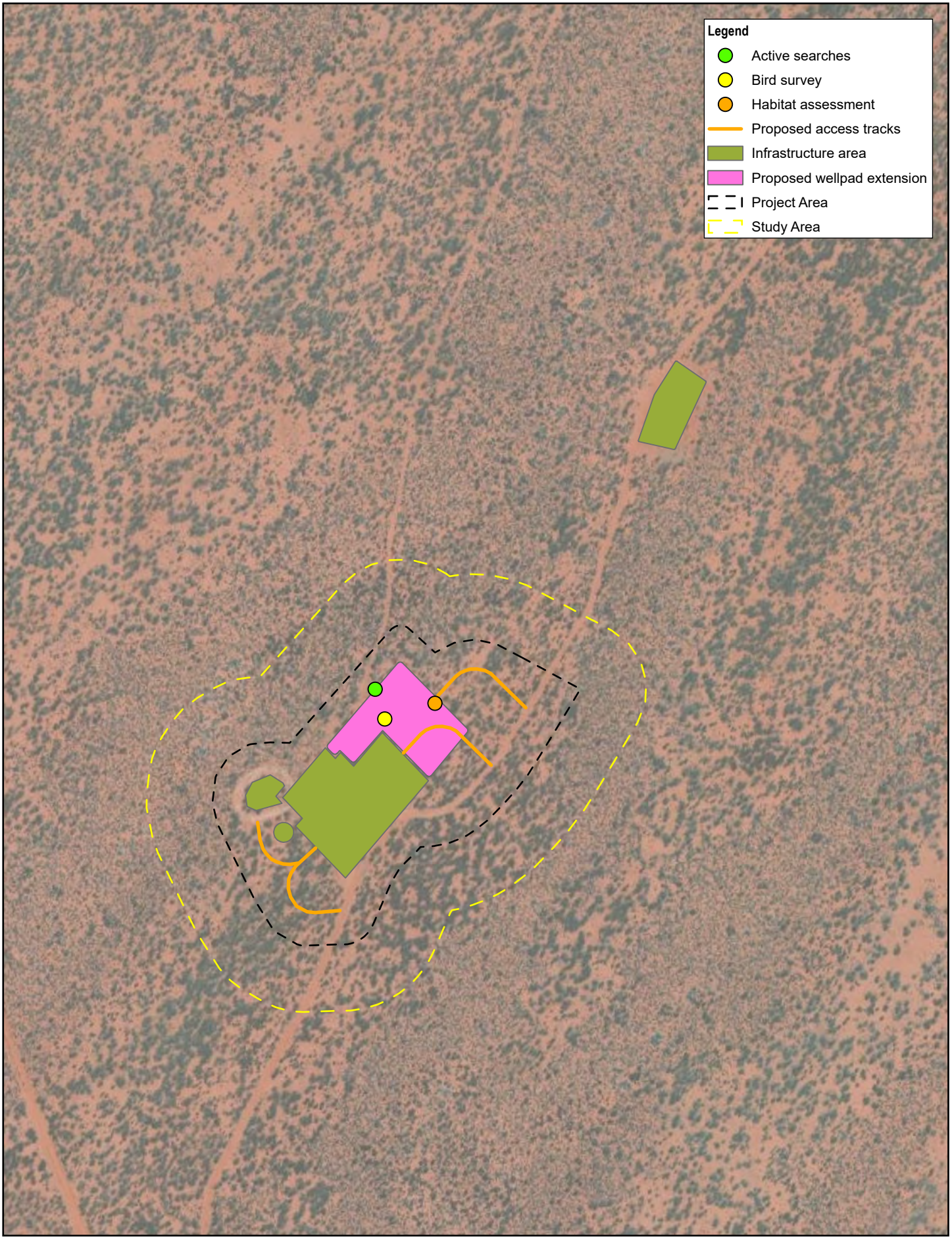
Terrestrial fauna assessments were undertaken at three survey sites, as presented in Figure 2-3Table 2.4. Areas selected were those that were representative based upon vegetation structure, topographic location, and habitat features (e.g. presence of hollow-bearing trees, long grass, leaf litter) of the site.

The choice of sites was made in an effort to maximise the likelihood of detecting listed threatened species.

Fauna survey methods that were used within the Project Area are outlined in Table 2.4.

Table 2.4 Fauna survey methods used within the Project Area

Assessment	Survey method
Habitat assessment	Habitat assessments were conducted in areas of high-quality habitat and used to rapidly assess the suitability of habitat for listed threatened species. The habitat assessments characterised vegetation communities into broad habitat types based on shared ecological characteristics such as (1) the structure and composition of vegetation at canopy, shrub and ground layers; (2) the presence of foraging, nesting and refuge resources; and (3) key habitat features such as rocky outcrops, burrows, woody debris and hollow-bearing trees. Threatened species records identified in the desktop assessment were considered at each habitat assessment site to assist with determining potential habitat mapping for species considered likely to occur within the Study Area. The assessment involved documenting the presence/abundance of habitat features, particular habitat attributes known to be utilised by listed threatened species potentially occurring within the Project Area (e.g. burrows, certain vegetation communities, etc.).
Bird surveys	One bird survey was undertaken within a 2 hectares (ha) area using the Birds Australia census method. The survey was conducted early morning when the birds were most active (i.e. not during the heat of the day) within each of the different vegetation communities present in Project Area. All birds seen and heard calling were recorded. Opportunistic bird surveys were also undertaken throughout the Project Area, recording birds seen or heard that had not been recorded during standardised 2 ha searches.
Opportunistic searches	All incidental records of fauna observed during the ecological field surveys were recorded. Bones, feather, skulls, sloughed skins, faecal pellets, tracks, burrows, scratchings and other wildlife traces were also recorded.



Paper Size ISO A4

0 50 100 150 200

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 53

N

GHD

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Distribution of fauna survey sites within the Study Area

Project No. **12576304**
Revision No. **B**
Date **11 Nov 2022**

FIGURE 2-3

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Print date: 11 Nov 2022 - 10:21

Data source: Santos - Project Footprint, Proposed access tracks, Infrastructure (2022),GHD - Fauna survey sites (2022),World Imagery: Maxar World Navigation Map: Esri, HERE, Garmin, FAO, NOAA, USGS. Created by: acjackson

2.5 Likelihood of occurrence assessment

An assessment was conducted to attribute a 'likelihood of occurrence' to listed threatened species listed under the EPBC Act and TPWC Act that have been previously recorded or were predicted to occur from the desktop search extent. The assessment criteria are provided in Table 2.5.

The likelihood of occurrence assessment was based on a review of species distributions and habitat requirements, historical records for the region, and the results of habitat assessments and ecological field surveys conducted within the Project Area. The likelihood of occurrence findings are provided in Table 2.5.

Table 2.5 Likelihood of occurrence assessment criteria

Category	Criteria
Confirmed present	Species recorded during the GHD field surveys.
Possible	Suitable habitat is present in the Project Area and species has been historically recorded in the desktop search extent and/or the species known distribution incorporates the Project Area.
Unlikely	Suitable habitat does not occur within the Project Area, or suitable habitat is present but substantially modified or degraded.
Highly unlikely	Suitable habitat does not occur within the Project Area and the species known distribution does not encompass the Project Area.

3. Desktop Assessment Results

3.1 Bioregional context

The Project Area lies within both the Finke and Stony Plans bioregions. The Finke bioregion covers an area of 5,464,837 ha (DNPEA, 2004) and is characterised by gorges, water holes and dissected sandstone plateaus comprising Proterozoic sandstone outcrops. The broad vegetation type across the bioregion consists of Eucalyptus low woodland with Tussock and/ or Hummock Grass Understorey, *Triodia basedowii* (hummock grassland), *Acacia aneura* (Mulga) tall sparse-shrubland between dunes and Chenopod shrubland.

The Stony Plains bioregion covers an area of 171, 451 ha (DNPEA, 2004). The broad vegetation type across the bioregion comprises Acacia Woodland, Hummock Grassland and Chenopod Shrublands. (DNPEA, 2004). A significant biodiversity feature within the bioregion situated within 20 km of the Project Area includes wetlands listed as significant (Karinga Creek Palaeodrainage System).

3.2 Ecological values

3.2.1 Vegetation communities and flora

3.2.1.1 Threatened ecological communities and sites of botanical significance

No threatened ecological communities (TECs) were identified in the PMST search. A search of NT sites of botanical significance (DEPWS, 2022) identified Karinga Creek, located approximately 10 km the north of the Jacko Bore Study Area. This site has botanical significance within the Finke Bioregion and is within the Karinga Creek paleodrainage system which is recorded as an international site of conservation significance. No sites of botanical significance or conservation significance are located within the Study Area.

3.2.1.2 Vegetation communities

Vegetation mapping of the southern Finke bioregion ('Finke'; Sparrow & Leitch 2009) is located nearby (<500 m) of the Jacko Bore Study Area. Mapping boundaries have been generated from across the Project Area (approximately 200 km by 365 km), using remote sensing inputs at a 1:100,000 mapping scale. Given the large scale and broad scope of available vegetation mapping, ground truthing of vegetation communities within the Study Area was undertaken during the field visit.

3.2.1.3 Listed threatened flora species

A single flora species was identified in the PMST search report as potentially occurring within the desktop search area and is outlined below.

Frankenia plicata is listed as Endangered under the EPBC Act. No NT Flora Atlas records of this species occur within the NT. Habitat for the species occurs in South Australia on small hillside channels and on loamy sands to clay swales (DCCEEW, 2008). This habitat was not located during the survey and the species is unlikely to occur within the mapped Study Area. Targeted surveys were not undertaken for the species.

3.2.1.4 Introduced flora species

A search of the NT Weeds Branch weeds records database (DEPWS, 2022) identified a total of 12 introduced flora records within the desktop search extent, none of which are listed under the NT *Weeds Management Act 2001* and Weeds of National Significance (WoNS) as requiring management.

The full list of introduced flora recorded within Study Area desktop search extent, is provided below in Table 3.1.

Table 3.1 Desktop records of Introduced flora species within the Study Area

Common name	Botanical name	Class (NT Weeds Act 2001)	WoNS
Wild Turnip	*Brassica tournefortii*	-	-

Common name	Botanical name	Class (NT Weeds Act 2001)	WoNS
Buffel Grass	*Cenchrus ciliaris*	-	-
Nettle-leaf Goosefoot	*Chenopodium murale*	-	-
Bitter Paddy Melon	*Citrullus colocynthis*	-	-
Pitted Lovegrass	*Eragrostis barrelieri*	-	-
Small-flower Mallow	*Malva parviflora*	-	-
Spiked Malvastrum	*Malvastrum americanum*	-	-
Disc Medic	*Medicago polymorpha*	-	-
Date Palm	*Phoenix dactylifera*	-	-
Wireweed	*Polygonum aviculare*	-	-
Indian Hedge Mustard	*Sisymbrium orientale*	-	-
Milk Thistle	*Sonchus oleraceus*	-	-

3.2.2 Terrestrial fauna

3.2.2.1 Threatened fauna species

The PMST search identified nine threatened fauna species as occurring or having the potential to occur within the desktop search extent (20 km buffer around the Project Area, defined in Section 1.4). NR Maps identified an additional two threatened fauna species that have been recorded within the desktop search extent (DEPWS, 2022d).

The searches collectively identified 11 *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act) and/or *Territory Parks and Wildlife Conservation Act 1976* (TPWC Act) listed threatened fauna species that are either predicted to occur or have been confirmed as occurring within the desktop search extent. This comprised of six birds, four mammals and one reptile. The PMST and NR Maps desktop search results are provided in Appendix A and summarised in Table 3.2 below.

Table 3.2 Threatened fauna species predicted to occur and/or historically recorded within the desktop search extent

Scientific name	Common name	Status		Source	Records (date of last sighting)
		EPBC Act	TPWC Act		
Birds					
Falco hypoleucos	Grey Falcon	V	v	PMST/ NR Maps	One record (1995)
Amytornis modestus	Thick-billed Grasswren	V	cr	PMST	
Calidris ferruginea	Curlew Sandpiper	CR	cr	PMST/ NR Maps	One record (1989)
Pezoporus occidentalis	Night Parrot	EN	cr	PMST	
Polytelis alexandrae	Princess Parrot	V	v	PMST/ NR Maps	Three records (1992)
Rostratula australis	Australian Painted Snipe	EN	en	PMST	
Mammals					
Petrogale lateralis centralis	Central Australian Rock-wallaby/Warru	V	nt	PMST	
Macrotis lagotis	Greater Bilby	V	v	NR Maps	One record (no date)

Scientific name	Common name	Status		Source	Records (date of last sighting)
		EPBC Act	TPWC Act		
Lagorchestes hirsutus	Mala	EN	nl	NR Maps	One record (no date)
Sminthopsis psammophila	Sandhill Dunnart	EN	dd	PMST	
Reptiles					
Liopholis kintorei	Great Desert Skink	V	v	PMST	
Key to table: CR – critically endangered (EPBC Act); cr - critically endangered (TPWC Act); EN – endangered (EPBC Act); en – endangered (TPWC Act); V – vulnerable (EPBC Act); v – vulnerable (TPWC Act) nt – near threatened (TPWC Act); dd – data deficient (TPWC Act), nl – not listed (TPWC Act).					

3.2.3 Introduced fauna species

Seven previously recorded introduced fauna species were identified within the desktop extent by NR maps. These species are listed below:

– Cat (*Felis catus*)
– Camel (*Camelus dromedarius*)
– Cattle (*Bos taurus*)
– Fox (*Vulpes vulpes*)
– Horse (*Equus caballus*)
– House Mouse (*Mus musculus*)
– Rabbit (*Oryctolagus cuniculus*)

3.2.4 Migratory species

The PMST and NR Maps search identified nine migratory species that have the potential to occur within the desktop search extent. One migratory species has been historically recorded within the Project Area. The PMST and NR Maps desktop search results are provided in Appendix A and summarised in Table 3.3 below.

Table 3.3 Migratory species predicted to occur and/or historically recorded within the desktop search extent

Scientific name	Common name	Status	Source	Records (most recent sighting)
		EPBC Act		
Birds				
Actitis hypoleucos	Common Sandpiper	Mig	PMST	
Apus pacificus	Fork-tailed Swift	Mig	PMST	
Calidris acuminata	Sharp-tailed Sandpiper	Mig	PMST	
Calidris ferruginea	Curlew Sandpiper	CE; Mig	PMST/NR Maps	One record (1989)
Calidris melanotos	Pectoral Sandpiper	Mig	PMST	
Cuculus optatus	Oriental Plover	Mig	PMST	
Glareola maldivarum	Oritental Plantincole	Mig	PMST	
Motacilla cinerea	Grey Wagtail	Mig	PMST	
Motacilla flava	Yellow Wagtail	Mig	PMST	
Key to table: CR – critically endangered (EPBC Act); Mig – migratory (EPBC Act), nl – not listed (TPWC Act)				

3.2.5 Other Matters of National Environmental Significance

A PMST search identified all other MNES within the desktop search extent as identified in Table 3.4.

Table 3.4 Consideration of other Matters of National Environmental Significance

Protected matter	Matter located within search radius
Nationally important wetlands	None
World Heritage Property	None
National Heritage Places	None
Nuclear actions	None
Commonwealth Marine Areas	None
Great Barrier Reef Marine Park	None

4. Field Assessment Results

4.1 Vegetation communities and flora

4.1.1 Threatened ecological communities

No threatened ecological communities were identified within the Study Area.

4.1.2 Vegetation communities

Mapping of vegetation communities was undertaken within the Jacko Bore Study Area (see Figure 4-1Figure 4-1). A total of two vegetation communities were ground-truthed within the Study Area (see Table 4.1).

Table 4.1 Ground-truthed vegetation communities mapped within the Study Area

Vegetation Community		Area of Study Area
Comm 1	Mulga (*Acacia aneura*) low woodland over Mulga tall shrubland, over Bunched kerosene grass (*Aristida contorta*), Erect kerosene grass (*Aristida holathera*), mid high open tussock grassland	22.59 ha (67.1%)
Comm 2	Sandhill Wattle (*Acacia ligulata*), Rattle Pod Grevillea (*Grevillea stenobotrya*), Desert Heath Myrtle (*Aluta maisonneuvei*) tall open shrubland, over Bunched kerosene grass, Erect kerosene grass, mid high open tussock grassland	9.73 ha (28.9%)
Well Pad	Regrowth – Mulga mid high sparse shrubland on Well Pad	1.36 ha (4%)

Photos showing vegetation communities are shown below in Plate 1 and vegetation mapping for the Study Area is provided in Figure 4-1.

Plate 1 Comm 1 – Mulga low woodland on interdunal sandplain (left) and Comm 2 Sandhill Wattle and Rattle Pod Grevillea tall open shrubland on sand dune crests (right).

The Jacko Bore well pad and associated infrastructure and access tracks are located within the Jacko Bore Study Area which is situated entirely within the Simpson Land System (NTLS 1M), characterised by red sand dunefields with parallel linear dunes, reticulated dunes and irregular or aligned short dunes. Proposed developments within the Project Area include an extension to the existing well pad (1.72 ha) and four access tracks totalling approximately 620 m in length. Within the Study Area, the Project Area falls almost entirely within Comm 1 – Mulga low woodland, over tall Mulga open shrubland, over open tussock grassland (12.88 ha – 87.6%). A small section of the Study Area (0.46 ha 3.1%) falls within Comm 2 – Sandhill Wattle, Rattle Pod Grevillea, Desert Heath

Myrtle tall open shrubland, over open tussock grassland. The existing Jacko Bore well pad area (1.36 ha – 9.3%) is dominated by regrowth Mulga sparse shrubland (see Figure 4-1).

During the survey Comm 1 – Mulga low woodland was observed to be in poor health and nearly all the dominant Mulga trees and shrubs that form this community were dead. The Jacko Bore well site is around 8 km to the south-west of the Karinga Creek paleodrainage system which consists of a chain of more than 100 saline lakes (NRETAS, 2009). Given the relatively close proximity of the study site to Karinga Creek and impacts being more severe at low points in the landscape, it is thought that die back of Mulga woodlands could be linked to landscape scale changes in soil salinity levels, however further studies would be required to confirm this.

4.1.3 Listed threatened flora species

No listed threatened flora species were identified within the Study Area.

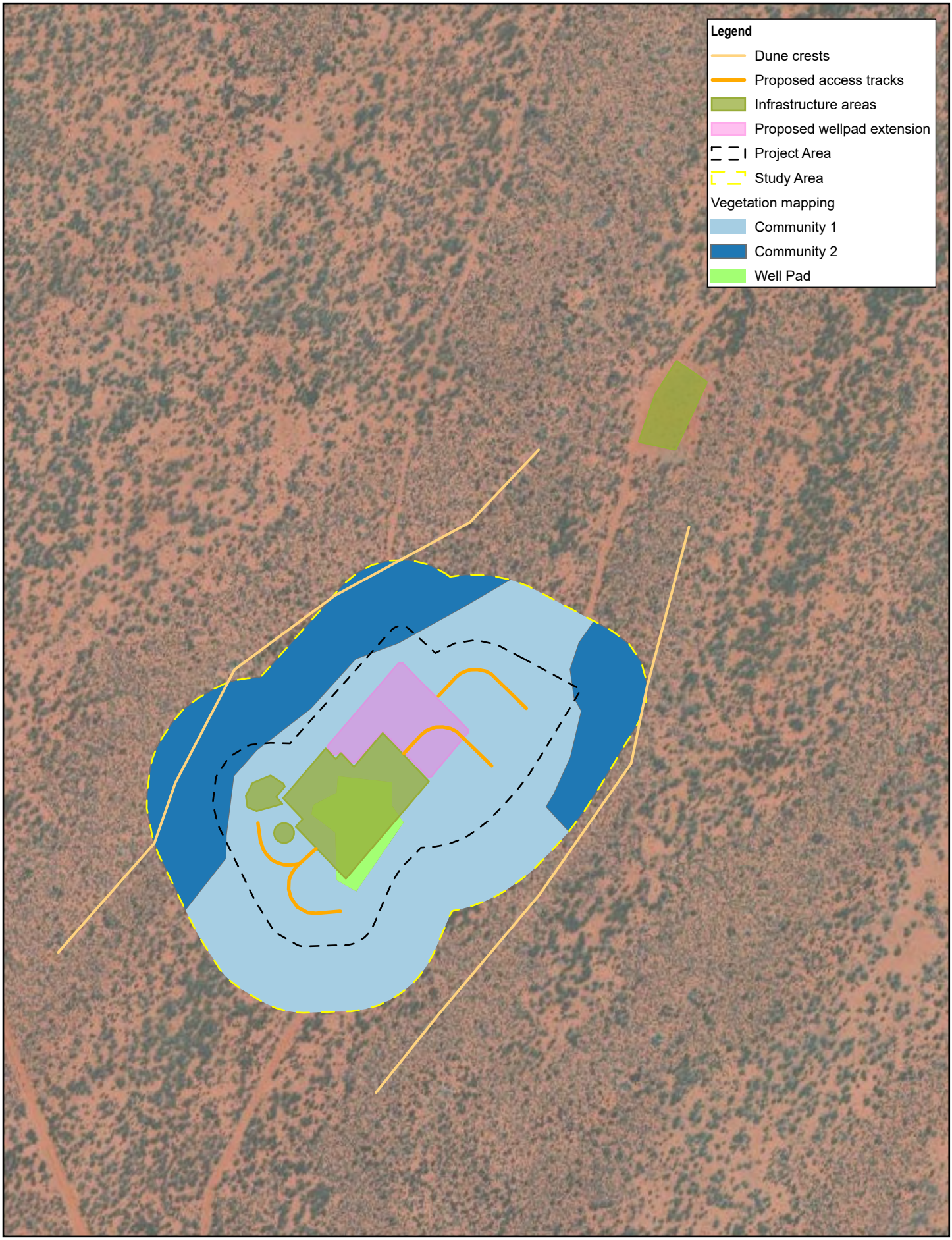
4.1.4 Introduced flora species

A weed survey undertaken during the field survey observed two introduced flora species, Buffel grass (*Cenchrus ciliaris*) and Bitter Paddy Mellon (*Citrullus colocynthis*), neither of which require management under the NT *Weeds Management Act 2001.*

A list of introduced flora observed within the Study Area during the field survey, is provided below in Table 4.2.

Table 4.2 Introduced flora occurrences located within the Study Area

Common name	Botanical name	Class (NT Weeds Act 2001)	Location within the Study Area
Buffel grass	*Cenchrus ciliaris*	-	Jacko Bore Well Pad (GDA94, z53, 278601e, 7177165n)
Bitter Paddy Melon	*Citrullus colocynthis*	-	Jacko Bore Well Pad (GDA94, z53, 278580e, 7177175n)



Paper Size ISO A4

0 50 100 150 200

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 53

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Project No. **12576304**
Revision No. **B**
Date **11 Nov 2022**

Vegetation communities

FIGURE 4-1

N:\AU\Darwin\Projects\43\12576304\GIS\Maps\12576304_TechnicalReport\12576304_TechnicalReport.aprx\12576304_004_MtKittyVegetationMapping_RevB
Print date: 11 Nov 2022 - 10:39

Data source: GA - Watercourses (2022), Roads (2008), Santos - Project Footprint, Infrastructure (2022), GHD - Vegetation mapping (2022), World Imagery: Maxar.
Created by: acjackson

4.2 Terrestrial fauna

4.2.1 Overview

A total of ten terrestrial fauna species were recorded within the Study Area during the field survey. This was comprised of seven birds, one introduced mammal and two reptile species. A description of each fauna group is provided below. A list of all fauna species encountered during the field survey is provided in Appendix C.

4.2.1.1 Birds

No threatened bird species were recorded within the Project Area during the field survey. However, suitable habitat for one listed threatened species, the Grey Falcon occurs within the Project Area. A significance assessment has been undertaken for this species (see Section 5).

A total of seven bird species were recorded during the field survey. Open landscapes provided suitable foraging habitat for raptors, including the Brown Falcon (*Falco berigora*) and Nankeen Kestrel (*Falco cenchroides*). Although the habitat present within the Project Area was in poor condition (e.g. dead trees/shrubs) the following birds species were observed foraging: Black-faced Woodswallow (*Artamus cinereus*), Crested Pigeon (*Ocyphaps lophotes*), Galah (*Eolophus roseicapillus*), Torresian Crow (*Corvus orru*) and Willie Wagtail (*Rhipidura leucophrys*).

4.2.1.2 Mammals

No threatened mammal species were recorded or considered likely to occur within the Project Area based on observations made during the field survey.

One introduced mammal was recorded within the Project Area during the field survey (Cattle (*Bos taurus*)). No native mammals were recorded during the survey.

4.2.1.3 Reptiles

No threatened reptile species were recorded or considered likely to occur within the Project Area based on observations made during the field survey.

A total of two reptile species were recorded within the Project Area during the field survey.

The Inland Bearded Dragon (*Pogona vitticeps*) and Dwarf Bearded Dragon (*Pogona minor*) were recorded basking on vegetation and in open landscapes within the Project Area.

4.2.1.4 Amphibians

No amphibians were recorded during the field survey within the Project Area. No threatened amphibians are considered likely to occur within the Project Area based on observations made during the field survey.

4.2.2 Habitat types

Habitats assessed during the site assessment broadly align with the vegetation communities identified within Section 4.1.2. The extent of the Study Area consisted of low woodland on interdunal sandplain. Fauna sites were chosen for their likelihood of supporting listed threatened species.

A detailed description of habitat types identified within the Study Area is provided in Table 4.3 Habitat types identified within the Study Area below.

Table 4.3 Habitat types identified within the Study Area

Habitat type	General characteristics and ecological values
Low woodland on interdunal sandplain 	– Habitat throughout the extent of the Project Area. – The upper stratum consisting of Mulga (*Acacia aneura*). Majority of Mulga was in dead or in poor condition. Low density of hollow-bearing trees within the Project Area. – Shrub layer consisted of Mulga, Sandhill Wattle (*Acacia ligulata*), Rattle Pod Grevillea (*Grevillea stenobotrya*) and Desert Heath Myrtle (*Aluta maisonneuvei*). Majority of the shrub layer was in poor condition and provided minimal foraging resources, nesting habitat or shelter from predators from shrub-dwelling birds. – Ground cover dominated by Bunched kerosene grass (*Aristida contorta*) and Erect kerosene grass (*Aristida holathera*). – Sparse ground-level microhabitats, including, patches of fallen woody debris providing shelter and foraging habitat for small ground mammals, reptiles and amphibians. Additionally, loose bark was present providing shelter for arboreal reptiles and microbats. – The vegetation within the site may provide potentially suitable foraging habitat for the Grey Falcon. – Well-drained sandy red soils. – Burrows were present providing refuge for small ground-dwelling mammals and reptiles. – Minimal cattle disturbance present.

4.2.3 Threatened fauna species

No threatened fauna species were recorded within the Project Area during the field survey. However, potentially suitable habitat was identified for the Grey Falcon.

Potentially suitable habitat for the species is detailed above in Section 4.2.2 and an assessment of likelihood of occurrence for all species is provided in Appendix B.

4.2.4 Introduced fauna

One introduced mammal was recorded within the Project Area during the field survey, Cattle (*Bos taurus*).

4.3 Likelihood of occurrence for listed threatened species

As described in Section 2.5 a likelihood of occurrence assessment was undertaken for each listed threatened flora and fauna and communities that was identified in desktop assessment as potentially occurring within the desktop search extent. This assessment is based on desktop results, habitat requirements of the species, records and habitat values observed within the Project Area during the field surveys.

A full assessment of impacts on listed threatened species against the criteria set out in the EPBC Act and NT *Environmental Protection Act 2019* is provided in Section 5 of this report. Evaluations of the significance of potential impacts were based on the *Commonwealth's Matters of National Environmental Significance Significant Impacts Guidelines 1.1 the guidelines* as applied to Endangered and Vulnerable species.

Marine or marine obligate species, or species listed 'near-threatened' or 'data-deficient' (EPBC Act and/or the TPWC Act) have been included in the statistics developed for this report in relation to the number of listed species within the Study Area. However, the following analysis provides greater detail for species with higher conservation status' under both the EPBC Act and TPWC Act i.e. those listed as 'threatened', 'endangered' and 'critically endangered'. In addition, no marine habitat is anticipated to be impacted by the Project and therefore these species are excluded from the assessment. Potential impacts to species listed as Migratory Wetland and Migratory Terrestrial under the EPBC Act are considered further in Section 5. A full assessment of impacts against the criteria set out in the EPBC Act and *NT Environmental Protection Act 2019* is provided in Section 5.

No threatened or migratory species were confirmed present within the Project Area. One threatened fauna species has the potential to occur within the Project Area. The results of the likelihood of occurrence assessment have been summarised in Table 4.4presented in Appendix C.

Table 4.4 Summary of threatened and migratory species that have the potential to occur within the Project Area

Scientific name	Common name	Status	
		EPBC Act	TPWC Act
Threatened species			
Falco hypoleucos	Grey Falcon	VU	vu
Key to table: VU – vulnerable (EPBC Act); vu – vulnerable (TPWC Act)			

5. Impact Assessment on Matters of National Environmental Significance

5.1 Introduction

A detailed assessment of impacts has been prepared for the one federally listed threatened species that has the potential to occur and possibly be adversely impacted upon by the project. Evaluations of the significance of potential impacts are based on the C*ommonwealth's Matters of National Environmental Significance Significant Impacts Guidelines 1.1* as applied to Endangered and Vulnerable species. Only species that were considered 'present', or 'possible' to occur within the Project Area are considered in this significant impact assessment.

The following species have the potential to be impacted by the project and have been assessed in further detail (see Section 5.2)

– Grey Falcon (*Falco hypoleucos*) (list as vulnerable under the EPBC Act and TPWC Act).

5.2 Grey Falcon (*Falco hypoleucos*)

5.2.1 Conservation status and species ecology

The Grey Falcon is listed as vulnerable under the EPBC Act and TPWC Act. The Grey Falcon is an elusive species occurring in low densities throughout much of Australia's arid and semi-arid zones (TSSC, 2020) including Murray-Darling Basin, Eyre Basin, central Australia and Western Australia (Marchant et al., 1993).

The Grey Falcon is generally found where rainfall is less than 500 mm. When wet years are followed by drought, the species is known to become more widespread. However, still considered essentially confined to arid and semi-arid zones at all times (Schoenjahn, 2018). The species frequents timbered lowland plains, particularly *Acacia* shrublands that are crossed by tree-lined watercourses (TSSC, 2020).

The species has also been observed foraging in treeless areas and occupying tussock grasslands and open woodlands (TSSC, 2020). Breeding occurs from June to November, during this time the Grey Falcon chooses nests of other birds to lay their eggs. The nests are usually chosen in the tallest trees along watercourses, particularly River Red Gum (*Eucalyptus camaldulensis*) and Coolibah (*E. coolabah*) (Marchant and Higgins, 1993).

5.2.2 Distribution of suitable habitat within the Study Area

One historic record (DEPWS, 2022), from 1995 for the species exists within the desktop search extent. The record is located approximately 10 km southwest of the Project Area.

The Grey Falcon was not recorded during the field surveys. However, potentially suitable foraging habitat was recorded throughout the extent of the Project Area, including habitat of low woodland on interdunal sandplain. No potentially suitable breeding habitat (e.g. tall trees particularly tall trees along watercourses) exists within the Project Area.

5.2.3 Significant impact assessment

A detailed assessment of significant impacts for the Grey Falcon is provided in Table 5.1. The project is considered unlikely to result in a significant impact on the Grey Falcon.

Table 5.1 Significance of impact on the Grey Falcon

Significant impact criteria	Assessment
A: Lead to a long-term decrease in the size of an important population of the species	**Unlikely** Grey Falcon is an elusive species occurring in low densities across inland Australia (TSSC, 2020). The species occurs throughout much of Australia's arid and semi-arid

Significant impact criteria	Assessment
B: Reduce the area of occupancy of an important population C: Fragment an existing important population into two or more populations	zones, including Murray-Darling Basin, Eyre Basin, central Australia and Western Australia (Marchant et al., 1993). The Grey Falcon is generally found where rainfall is less than 500 mm. However, when wet years are followed by drought, the species is known to become more widespread however, still considered essentially confined to arid and semi-arid zones at all times. On individual record of the species exist within the Project Area. The most recent record is from 1995 and was recorded approximately 10 km to the south west of the Project Area. Survey's conducted by GHD (October 20220) detected potentially suitable foraging habitat for the species throughout the extent of the Project Area (e.g. within low woodland within interdunal sandplains). The current proposed Project Area represents a relatively small area of potentially suitable foraging habitat for this species (~14.7 ha of vegetation within the approximately 126,798.4 ha of Mulga wodlands within the broader desktop search extent (20 km buffer of the Project Area) (or 0.01%). No potentially suitable breeding habitat (e.g. tall trees particularly tall trees along watercourses) exists within the Project Area. Given the small scale of vegetation clearance within the broader areas of potentially suitable habitat, it is considered unlikely the project will have a significant impact on the long-term decrease in the size of a population, reduce the area of occupancy of an important population of this species or fragment an existing population (if present) into two or more populations.
D: Adversely affect habitat critical to the survival of a species E: Disrupt the breeding cycle of an important population F: Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	**Unlikely** There is no listed critical habitat for this species. Surveys conducted by GHD in October 2022, identified that the Project Area consisted entirely of low woodlands (14.7 ha). No large eucalypt trees, that had the potential to provide suitable nesting habitat for the Grey Falcon were identified within the Project Area. An area of 14.7 ha of potentially suitable foraging habitat will be cleared within approximately 126,798 ha of suitable foraging habitat within the broader desktop search extent (or 0.01%). This is considered a small scale of vegetation clearance within broader areas of potentially suitable habitat. There is no suitable breeding habitat for the Grey Falcon within the Project Area. Where possible micro-sitting of project elements (e.g. access road, borrow pits) should also focus on avoiding previously undisturbed areas of native vegetation. The project is not at risk of adversely impacting upon habitat critical to the survival of the species or modifying, destroying, removing, isolating or decreasing the availability of quality habitat to the extent that the species is likely to decline.
G: Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	**Unlikely** Predation by Feral Cat are considered a high risk to the species. The Grey Falcon will roost on the bare ground making them vulnerable to Feral Cat predation (Schoenjahn, 2018). There is evidence that the Feral Cat and other invasive predators are already established within the Project Area (NR Maps, 2022). It is possible that clearing new tracks will make it easier for feral predators to move through new pieces of land that were previously unoccupied. Uncontrolled waste (food) and inappropriate fire regime also has the potential to increase introduced species. Efforts should be made to manage food waste around construction areas and infrastructure to prevent exotic predator numbers from increasing. Fire regime should be managed through the implementation of the Jacko Bore FMP (inGauge Energy, 2022). Invasive species controls listed in the Environmental Management Plan (EMP) will be implemented surrounding the Project Area. These measures have been designed to avoid, minimise and reduce the potential for weed dispersal, and increase in feral predator populations.
H: Introduce disease that may cause the species to decline	**Unlikely** Recognised threats to the Grey Falcon do not include diseases. It is however, not expected that the project would result in the introduction of disease.
I: Interfere with the recovery of the species	**Unlikely** There is no recovery plan for the Grey Falcon, the approved Conservation Advice for the species provides sufficient direction to implement priority actions, mitigate against

Significant impact criteria	Assessment
	key threats and enable recovery. Primary conservation and management for the Grey Flacon include (TSSC, 2020): – Protect known nesting trees and include adequate exclusion buffers with regard to proposed developments and land clearing activities. – Management actions also include the control of invasive Feral Cat and Camel, especially in known roosting and nesting areas. – Management of fire to prevent habitat loss, disturbance, and modification. It is considered unlikely that the project would interfere with the recovery of the Grey Falcon (if present) based on the following: – No known nesting trees occur within the vicinity of the Project Area. – Management actions for invasive species through the implementation of the Jacko Bore EMP (inGauge Energy, 2022). – Management of fire through the implementation of the Jacko Bore FMP (inGauge Energy, 2022). – Small scale of vegetation clearance within widespread areas of potentially suitable habitat.

6. Potential Impacts and Mitigation

6.1 Impacts

We have identified and assessed the following potential impacts to terrestrial biodiversity that could occur as a result of the project:

– Loss of important fauna habitat from clearing vegetation.
– Introduction and spread of weeds, pests, and pathogens.
– Increased intensity of fire events.

Loss of important fauna habitat from clearing vegetation

One EPBC Act listed bird, the Grey Falcon, has been predicted to possibly occur within the Project Area based on a likelihood of occurrence assessment that was undertaken for the project (see Appendix B).

Potentially suitable foraging habitat is present within the Project Area for the Grey Falcon. The project will remove approximately 14.7 ha of suitable habitat within approximately 126, 798 ha of vegetation within the broader desktop extent (or 0.01%). No suitable breeding habitat for the Grey Falcon exists within the Project Area based on observation made during the field survey.

The total area of native vegetation removed compared to the total area of native vegetation within the greater desktop extent is outlined below in Table 6.1. The proposed clearing areas represents a relatively small scale of vegetation clearance within widespread areas of potentially suitable habitat for the Grey Falcon.

Table 6.1 Proportion of vegetation proposed to be removed from the project relative to total area of available mapped habitat within the Study Area plus a 20 km buffer

Species	Total area of available foraging habitat (ha)	Area of suitable foraging habitat proposed to be removed (ha)	Proportion of suitable foraging habitat proposed to be removed (%)	Total area of available nesting habitat (ha)	Area of suitable nesting habitat proposed to be removed (ha)	Proportion of suitable nesting habitat (birds only) proposed to be removed (%)
Grey Falcon	126, 798	14.7	0.01	0	0	0

Introduction and spread of weeds, pests, and pathogens

The project has the potential to increase the degree of weed infestation through dispersal of weed propagules (seeds, stems, and flowers) via erosion (wind and water), footwear and clothing, and construction vehicles and equipment. The project also has the potential to increase predation by feral animals. Mitigation measures to reduce the spread of exotic species and priority weeds species are provided below in Section 6.2 and within the Jacko Bore EMP (inGauge Energy, 2022) and WMP (EcOz, 2022).

Increased intensity of fire events

Increased intensity of fire events, due to higher fuel loads, is suspected to threaten terrestrial fauna, including listed threatened species (i.e. Grey Falcon) that may be present within the Project Area. Mitigation measures to reduce the impacts from fires throughout the Project Area are provided in Section 6.2 and within the FMP(Appendix 08 of the Jacko Bore EMP (inGauge Energy, 2022)).

6.2 Mitigation and management

The project would result in some unavoidable residual adverse impacts to some elements of the natural environment. These residual impacts are not expected to impose a significant negative effect on any, threatened flora, fauna and/or community which occur within the Project Area.

Most impacts can be reduced or avoided through the implementation of mitigation measures. Specific mitigation measures are recommended below to minimise likely impacts of the project on the biota, and include:

Vegetation clearing

– Micro-sitting of new project elements to avoid disturbance of previously undisturbed native vegetation. Impact will be less likely if new project elements are situated on previously cleared or disturbed land.

Weeds, pests, and pathogens

– Follow management measures for predation against introduced fauna species as outlined in Appendix 04 Risk Assessment, within the EMP (inGauge Energy, 2022).
– Follow management measures for the control of weeds as outlined in the WMP (EcOz, 2022).

Increased intensity of fire events

– Follow management measures for bushfire control as outlined in the FMP (inGauge Energy, 2022).

7. Conclusion

Santos is proposing to undertake exploration drilling activities in EP 125, which will include civil works to repair and upgrade the existing Lyndavale Homestead/Mt Kitty 1 access track as necessary, preparation of a well pad, water bores, laydown areas and campsites for the Jacko Bore exploration well. The Project Area is located approximately 200 km south of Alice Springs in the NT in the Finke bioregion, east of the Stuart Highway and north of the Lasseter Highway.

The purpose of this report is to determine potential impacts on threatened species and communities within the Jacko Bore Project Area, assess impacts of the project and outline management and mitigation measures to limit impacts on ecological values that occur or have the potential to occur within the Project Area.

The Study Area occurred within low woodland on interdunal sandplains. Much of the remnant vegetation observed within the site was in poor condition.

One threatened fauna species was predicted to occur within the desktop extent and has the potential to be adversely impacted upon by the project. Species predicted to occur were subject to an Assessment of Significance in accordance with the '*Significant Impact Guidelines 1.1'* of the EPBC Act. No threatened fauna species or communities were observed throughout during the survey.

No listed threatened flora species or TECs were identified to occur throughout the desktop extent.

With the mitigation measures outlined in Section 6 and within the Jacko Bore EMP (inGauge Energy, 2022), WMP (EcOz, 2022) and FMP (inGauge Energy, 2022), the project is unlikely to have a significant impact on any threatened flora, fauna and communities listed under the TPWC or EPBC Act. No targeted threatened species surveys are recommended at this stage provided no changes are made to the Project Area.

Given the project is unlikely to have a significant impact on any MNES, it does not appear the project will require a referral under the EPBC Act.

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Appendices

Appendix A

Desktop search results

Australian Government
Department of Agriculture, Water and the Environment

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected. Please see the caveat for interpretation of information provided here.

Report created: 26-Oct-2022

Summary
Details
- Matters of NES
- Other Matters Protected by the EPBC Act
- Extra Information

Caveat
Acknowledgements

Summary

Matters of National Environment Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance (Ramsar	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	10
Listed Migratory Species:	9

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Lands:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	12
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None
Habitat Critical to the Survival of Marine Turtles:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have

State and Territory Reserves:	None
Regional Forest Agreements:	None
Nationally Important Wetlands:	1
EPBC Act Referrals:	1
Key Ecological Features (Marine):	None
Biologically Important Areas:	None
Bioregional Assessments:	None
Geological and Bioregional Assessments:	None

Details

Matters of National Environmental Significance

Listed Threatened Species			[Resource Information]
Status of Conservation Dependent and Extinct are not MNES under the EPBC Act. Number is the current name ID.			
Scientific Name	Threatened Category	Presence Text	Buffer Status
BIRD			
Amytornis modestus Thick-billed Grasswren [84121]	Vulnerable	Species or species habitat may occur within area	In feature area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat likely to occur within area	In feature area
Falco hypoleucos Grey Falcon [929]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Pezoporus occidentalis Night Parrot [59350]	Endangered	Species or species habitat may occur within area	In feature area
Polytelis alexandrae Princess Parrot, Alexandra's Parrot [758]	Vulnerable	Species or species habitat known to occur within area	In feature area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat may occur within area	In feature area
MAMMAL			
Petrogale lateralis centralis Warru, Central Australian Rock-wallaby [90831]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Sminthopsis psammophila Sandhill Dunnart [291]	Endangered	Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
PLANT			
Frankenia plicata [4225]	Endangered	Species or species habitat may occur within area	In feature area
REPTILE			
Liopholis kintorei Great Desert Skink, Tjakura, Warrarna, Mulyamiji [83160]	Vulnerable	Species or species habitat may occur within area	In feature area

Listed Migratory Species [Resource Information]

Scientific Name	Threatened Category	Presence Text	Buffer Status
Migratory Marine Birds			
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area	In feature area
Migratory Terrestrial Species			
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area	In feature area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area	In feature area
Migratory Wetlands Species			
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area	In feature area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area	In feature area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat likely to occur within area	In feature area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area	In feature area
Charadrius veredus Oriental Plover, Oriental Dotterel [882]		Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Glareola maldivarum			
Oriental Pratincole [840]		Species or species habitat may occur within area	In feature area

Other Matters Protected by the EPBC Act

Listed Marine Species			[Resource Information]
Scientific Name	Threatened Category	Presence Text	Buffer Status
Bird			
Actitis hypoleucos			
Common Sandpiper [59309]		Species or species habitat may occur within area	In feature area
Apus pacificus			
Fork-tailed Swift [678]		Species or species habitat likely to occur within area overfly marine area	In feature area
Calidris acuminata			
Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area	In feature area
Calidris ferruginea			
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat likely to occur within area overfly marine area	In feature area
Calidris melanotos			
Pectoral Sandpiper [858]		Species or species habitat may occur within area overfly marine area	In feature area
Chalcites osculans as Chrysococcyx osculans			
Black-eared Cuckoo [83425]		Species or species habitat known to occur within area overfly marine area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Charadrius veredus Oriental Plover, Oriental Dotterel [882]		Species or species habitat may occur within area overfly marine area	In feature area
Glareola maldivarum Oriental Pratincole [840]		Species or species habitat may occur within area overfly marine area	In feature area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area overfly marine area	In feature area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area overfly marine area	In feature area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area overfly marine area	In feature area
Rostratula australis as Rostratula benghalensis (sensu lato) Australian Painted Snipe [77037]	Endangered	Species or species habitat may occur within area overfly marine area	In feature area

Extra Information

Nationally Important Wetlands [Resource Information]

Wetland Name	State	Buffer Status
Karinga Creek Palaeodrainage System	NT	In buffer area only

EPBC Act Referrals [Resource Information]

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Not controlled action				
Improving rabbit biocontrol: releasing another strain of RHDV, sthrn two thirds of Australia	2015/7522	Not Controlled Action	Completed	In feature area

Caveat

1 PURPOSE

This report is designed to assist in identifying the location of matters of national environmental significance (MNES) and other matters protected by the Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) which may be relevant in determining obligations and requirements under the EPBC Act.

The report contains the mapped locations of:

- World and National Heritage properties;
- Wetlands of International and National Importance;
- Commonwealth and State/Territory reserves;
- distribution of listed threatened, migratory and marine species;
- listed threatened ecological communities; and
- other information that may be useful as an indicator of potential habitat value.

2 DISCLAIMER

This report is not intended to be exhaustive and should only be relied upon as a general guide as mapped data is not available for all species or ecological communities listed under the EPBC Act (see below). Persons seeking to use the information contained in this report to inform the referral of a proposed action under the EPBC Act should consider the limitations noted below and whether additional information is required to determine the existence and location of MNES and other protected matters.

Where data are available to inform the mapping of protected species, the presence type (e.g. known, likely or may occur) that can be determined from the data is indicated in general terms. It is the responsibility of any person using or relying on the information in this report to ensure that it is suitable for the circumstances of any proposed use. The Commonwealth cannot accept responsibility for the consequences of any use of the report or any part thereof. To the maximum extent allowed under governing law, the Commonwealth will not be liable for any loss or damage that may be occasioned directly or indirectly through the use of, or reliance

3 DATA SOURCES

Threatened ecological communities

For threatened ecological communities where the distribution is well known, maps are generated based on information contained in recovery plans, State vegetation maps and remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species

Threatened, migratory and marine species distributions have been discerned through a variety of methods. Where distributions are well known and if time permits, distributions are inferred from either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc.) together with point locations and described habitat; or modelled (MAXENT or BIOCLIM habitat modelling) using

Where little information is available for a species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc.).

In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More detailed distribution mapping methods are used to update these distributions

4 LIMITATIONS

The following species and ecological communities have not been mapped and do not appear in this report:

- threatened species listed as extinct or considered vagrants;
- some recently listed species and ecological communities;
- some listed migratory and listed marine species, which are not listed as threatened species; and
- migratory species that are very widespread, vagrant, or only occur in Australia in small numbers.

The following groups have been mapped, but may not cover the complete distribution of the species:

- listed migratory and/or listed marine seabirds, which are not listed as threatened, have only been mapped for recorded
- seals which have only been mapped for breeding sites near the Australian continent

The breeding sites may be important for the protection of the Commonwealth Marine environment.

Refer to the metadata for the feature group (using the Resource Information link) for the currency of the information.

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact Us page.

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Appendix B

Likelihood of occurrence assessment

Key to conservation status for listed threatened species

Code	Conservation status	Legislation
CR	Critically Endangered	EPBC Act (Federal)
cr	Critically Endangered	TPWC Act (NT)
EN	Endangered	EPBC Act (Federal)
en	Endangered	TPWC Act (NT)
VU	Vulnerable	EPBC Act (Federal)
vu	Vulnerable	TPWC Act (NT)
lc	Not Listed	TPWC Act (NT)
Mig	Listed as Migratory terrestrial/wetland	EPBC Act (Federal)
ex	Extinct	TPWC Act (NT)
dd	Data Deficient	TPWC Act (NT)

Likelihood of Occurrence Assessment

Species common name (*scientific name*)	Status		Habitat requirements	Likelihood of occurrence
	EPBC Act	TPWC Act		
Birds				
Thick-billed Grasswren (MacDonnell Ranges subspecies) (*Amytornis modestus modestus*)	V	ex	**Distribution:** In the NT, the Thick-billed Grasswren was formerly recorded in the Finke River Drainage Basin, from Mereenie Bluff and the upper reaches of Hugh River, south to the lower reaches of the Finke River, and at Laurie's Creek and McMinn's Creek, but there have been no confirmed records in these regions since 1936 (DCCEEW, 2022). **Habitat:** This species can be found on drainage lines where saltbush and bluebush shrubs are taller and thicker There are historical records in *Zygochloa paradoxa* (Sandhill Canegrass) on sand dunes. They possibly also occurred on the plains of the Lower Namoi River in *Nitraria* sp. (Nitre Bush) shrubland, although this historical record could also have been from areas of *Atriplex cinerea* (Grey Saltbush) or *Salsola kali* (Roly-poly) (DCCEEW, 2022).	**Unlikely** – The species has not been historically recorded within the desktop search extent. – The species (MacDonnell Ranges subspecies) is extinct in the NT.
Curlew Sandpiper (*Calidris ferruginea*)	CR	cr	**Distribution**: In Australia, Curlew Sandpipers occur around the coasts and are also quite widespread inland, though in smaller numbers. Records occur in all states	**Unlikely**

Species common name (*scientific name*)	Status		Habitat requirements	Likelihood of occurrence
	EPBC Act	TPWC Act		
			during the non-breeding period, and also during the breeding season when many non-breeding one year old birds remain in Australia rather than migrating north (DCCEEW, 2022). **Habitat**: This species occur on intertidal mudflats and sandflats, estuaries, coastal brackish lagoons, saltmarshes and occasionally on inland freshwater wetlands (DEPWS, 2021). Curlew Sandpipers mainly occur on intertidal mudflats in sheltered coastal areas, such as estuaries, bays, inlets and lagoons, and also around non-tidal swamps, lakes and lagoons near the coast, and ponds in saltworks and sewage farms. They are also recorded inland, though less often, including around ephemeral and permanent lakes, dams, waterholes and bore drains, usually with bare edges of mud or sand. They occur in both fresh and brackish waters. Occasionally they are recorded around floodwaters (DCCEEW, 2022).	– The species is rarely observed away from coastal areas. One record exists (from 1989) for this species within the desktop search extent. – If the species is present in the region, species would be emigrants in passage to coastal areas, although, short term stop overs are limited to freshwater wetlands which do not occur within the Project Area.
Grey Falcon (*Falco hypoleucos*)	V	v	**Distribution:** The Grey Falcon is an elusive species occurring in low densities throughout much of Australia's arid and semi-arid zones (TSSC, 2020) including Murray-Darling Basin, Eyre Basin, central Australia and Western Australia (Marchant et al., 1993). **Habitat:** Occupy areas of sparsely timbered lowland plains, typically on inland drainage systems, where the average annual rainfall is less than 500 mm. The species use nests built by other bird species and prefer nests in the tallest trees along watercourses.	**Possible** – The species has been historically recorded within the desktop search extent. – Suitable foraging habitat exists throughout the extent of the Project Area.
Night Parrot (*Pezoporus occidentalis*)	EN	cr	**Distribution:** The current distribution is poorly known with data recorded in remote arid and semi-arid regions within WA, NT, SA and QLD. Two areas indicate populations: western QLD and the Pilbara (TSSC, 2016). **Habitat:** Within the arid and semi-arid zones, most records are of *Triodia* (Spinifex) grasslands and/or chenopod shrublands (TSSC, 2016).	**Unlikely** – No records for the species exit within the desktop search extent. – Field survey did not identify any suitable habitat within the Project Area.
Princess Parrot (*Polytelis alexandrae*)	V	V	**Distribution:** Patchy and irregular distribution in arid Australia. In the NT, it occurs in the southern section of the Tanami Desert south to Angas Downs and Yulara and east to Alice Springs (DEPWS, 2021b). **Habitat:** Occupies swales between sand dunes and is occasionally seen on the slopes and crests of dunes.	**Unlikely** – Known to occur in the region, however the species has not been recorded from within the desktop search extent since 1992. The

Species common name (*scientific name*)	Status		Habitat requirements	Likelihood of occurrence
	EPBC Act	TPWC Act		
			This habitat consists mostly of shrubs such as *Eremophila* spp., *Grevillea* spp., and *Hakea* spp., with scattered trees. Some records are from riverine forest, woodland and shrubland (DEPWS, 2021b).	species was not recorded during the field survey. – Potentially suitable foraging habitat (*Acacia aneura*) is located within the Project Area. However, this habitat was generally either dead on of poor condition, and it is considered unlikely to support foraging bird species.
Australian Painted Snipe (*Rostratula australis*)	EN	en	**Distribution**: Scattered across NT Sturt Plateau, Barkly, Tanami Desert, Alice Springs (DCCEEW, 2022c). **Habitat**: wide variety of shallow freshwater (and occasionally brackish) wetlands, both permanent and ephemeral, including swamps, inundated claypans and waterlogged grasslands. Typically inhabits shallow terrestrial freshwater (occasionally brackish) wetlands, including temporary and permanent lakes, swamps, claypans and waterlogged grasslands (DCCEEW, 2022c).	**Unlikely** – The species has not been historically recorded within the desktop search extent and no suitable habitat occurs within the Project Area.
Mammals				
Mala (Rufous hare-wallaby) (*Lagorchestes hirsutus*)	EN	ex	**Distribution:** Previously occupied central Australia throughout the NT, WA and northern SA. It became extinct in the wild in 1991. It now only occurs in fenced sanctuaries at Uluru-Kata Tjuta National Park and Newhaven Sanctuary in the NT and at Matuwa (Lorna Glen) in WA. **Habitat:** Inhabits arid and semi-arid environments, particularly grasslands of the sand plain and sand dune deserts.	**Highly Unlikely** – The species no longer occupies its former range across the NT and is only found in fenced, predator proof sanctuaries.
Greater Bilby (*Macrotis lagotis*)	V	v	**Distribution:** Previously occurred widely across arid and semi-arid regions of Australia, however it is now only restricted to the western deserts of the NT and WA. Within the NT, its distribution is highly fragmented. Records of the species in the Tanami region date from around the early 2000's. The most recent records are recorded in regional SA and NSW (dated 2020 – 2021). **Habitat:** Occurs primarily in open tussock grasslands, Mulga (*Acacia aneura*) woodlands and shrublands (including mixed associations with Witchetty Bush (*A. kempeana*), and hummock grasslands. These habitats occur on a variety of landforms, including uplands, rises,	**Unlikely** – The species no longer occupies its former range, and is sparsely populated in arid to semi-arid regions northwest of the NT, WA and SA and NSW. – Potentially suitable habitat is located within the Project Area. However, this habitat is in very poor condition, and it is considered unlikely the species would persist within the Project Area.

Species common name (*scientific name*)	Status		Habitat requirements	Likelihood of occurrence
	EPBC Act	TPWC Act		
			sand plains, dunes, drainage systems and other alluvial areas.	– Field surveys did not identify evidence of the species (e.g. burrow, tracks).
Central Australian Rock-wallaby/Warru (*Petrogale lateralis centralis*)	V	nt	**Distribution:** In the NT, the species range extents north to the Davenort and Murchinson Ranges, east to the Jervois Range, west to the WA border and south to the SA border. Only the central Australian subspecies is known to occur in the NT. Six records of the species exist within the greater desktop extent. The most recent record is from 1996 (DEPWS, 2021g). **Habitat:** Occurs in rocky ranges, cliffs, gorges outcrops and associated steep rocky slopes and boulder fields. The species feeds on grasses and herbs (DEPWS, 2021g).	**Unlikely** – The species has not been historically recorded within the greater desktop extent, and suitable habitat for the species does not exist within with Project Area.
Sandhill Dunnart (*Sminthopsis psammophila*)	EN	dd	**Distribution:** The species was previously known to occur near Lake Amadeus 1894 between Kurtitina Well and Uluru. Since that time, it has not been seen in the NT. The Northern Territory specimen came from sand dune country in an area covered by spinifex hummocks with groves of desert oaks in the swales. Suitable habitat or species may occur in this area (DEPWS 2021d). **Habitat:** Occupies sandy, arid and semi-arid regions with spinifex grass hummock.	**Unlikely** – The species has not been recorded within the NT since 1894. – There are no historic records of the species within the greater desktop extent. – No suitable habitat occurs within the Project Area.
Reptiles				
Great Desert Skink (*Liopholis kintorei*)	V	v	**Distribution:** Western deserts region from Uluru-Kata Tjuta National Park north to Rabbit Flat in the Tanami Desert. In the NT, the most recent records (post 1980) are recorded within the western deserts region (TSSC, 2016b). **Habitat**: The closest known population located at Uluru-Yulara, has recorded important habitat for the species being, lateritic sand plains with both gummy spinifex and or lobed spinifex on a palaeodrainage line (TSSC, 2016b).	**Unlikely** – The species has not been historically recorded within the desktop search extent. However, a known population of the species is located at uluru – Klata Tjuta National Park (approximately 200 km west of the Project Area). – Field survey did not identify important habitat for the species (e.g. spinifex groundcover) or evidence of the species occurring within the Project Area (e.g. no multiple entrance burrows with characteristic latrines).
Migratory species				

Species common name (*scientific name*)	Status		Habitat requirements	Likelihood of occurrence
	EPBC Act	TPWC Act		
Common Sandpiper (*Actitis hypoleucos*)	Mig	-	**Distribution:** In the NT, recorded from most coastal areas, which are important non-breeding and staging grounds. Inland records include the Victoria River District, Barkly Tableland and Alice Springs region. Areas of national importance and maximum counts include Kakadu National Park and Darwin area (DCCEEW, 2022). **Habitat:** These non-breeding birds occur on intertidal mudflats and sandflats, estuaries, coastal brackish lagoons, saltmarshes and occasionally on inland freshwater wetlands. Found along all coastlines of Australia and in many areas inland, the common sandpiper is widespread in small numbers. The population when in Australia is concentrated in northern and western Australia (DCCEEW 2022).	**Unlikely** – The species has not been historically recorded within the desktop search extent. – No suitable habitat occurs within the Project Area.
Fork-tailed Swift (*Apus pacificus*)	Mig	-	**Distribution:** widespread in Australia in non-breeding season. In the NT there are scattered records in the north. These include some offshore islands, mostly south to Victoria River Downs. Scattered records occur further south to Attack Creek, north of Tennant Creek. Further south, isolated records occur in the Tanami Desert, Avon Downs in the south, Barkly Tableland and, also in far south, at the Hay River. They have also been recorded in the north Simpson Desert and west near Alice Springs (DCCEEW, 2022). **Habitat:** In Australia, the species mostly occur over inland plains but sometimes above foothills or in coastal areas, cliffs and beaches and also over islands and sometimes well out to sea. The species can also occur over settled areas, including towns, urban areas and cities. The species has been recorded mostly occur over dry or open habitats, including riparian woodland and tea-tree swamps, low scrub, heathland or saltmarsh. They are also found at treeless grassland and sandplains covered with spinifex, open farmland and inland and coastal sand-dunes. The sometimes occur above rainforests, wet sclerophyll forest or open forest or plantations of pines (DCCEEW 2022). They are known to only come down to near ground level at times of bad weather	**Unlikely** – The species has not been historically recorded within the desktop search extent. – No suitable habitat occurs within the Project Area.
Sharp-tailed Sandpiper	Mig	-	**Distribution:** summer migrant from Arctic Siberia. In the NT they mostly occur in the north coastal regions,	**Unlikely**

Species common name (*scientific name*)	Status		Habitat requirements	Likelihood of occurrence
	EPBC Act	TPWC Act		
(*Calidris acuminata*)			generally east to Groote Eylandt and Gove Peninsula, but also around McArthur River and east of Borroloola. Widely but sparsely scattered inland records occur south to northern Tanami Desert, and in south Northern Territory, from Alice Springs, north to Napabie Lakes and south to Uluru National Park (DCCEEW, 2022). **Habitat:** Found on wetlands throughout Australia. Prefers the grassy edges of shallow inland freshwater wetlands. It is also found around sewage farms, flooded fields, mudflats, mangroves, rocky shores and beaches. Most of the population migrates to Australia, mostly to the south-east and are widespread in both inland and coastal locations and in both freshwater and saline habitats. Many inland records are of birds on passage. In Queensland, they are recorded in most regions, being widespread along much of the coast and are very sparsely scattered inland (DCCEEW 2022).	– The species has not been historically recorded within the desktop search extent. – No suitable habitat occurs within the Project Area.
Pectoral Sandpiper (*Calidris melanotos*)	Mig	-	**Distribution:** Migratory species, with some individuals residing in Australia. In the NT, the species is found at Darwin and Alice Springs (DCCEEW, 2022). **Habitat:** It inhabits grasslands, inland wetlands and marine intertidal zones. Prefers shallow fresh to saline wetlands. The species is found at coastal lagoons, estuaries, bays, swamps, lakes, inundated grasslands, saltmarshes, river pools, creeks, floodplains and artificial wetlands. The species is usually found in coastal or near coastal habitat but occasionally found further inland. It prefers wetlands that have open fringing mudflats and low, emergent or fringing vegetation (DCCEEW 2022).	**Unlikely** – The species is rarely observed away from coastal areas. The species has not been historically recorded within the desktop search extent. – If the species is present in the region, species would be emigrants in passage to coastal areas, although, short term stop overs are limited to freshwater wetlands which do not occur within the Project Area.
Oriental Plover (*Cuculus optatus*)	Mig	-	**Distribution**: This species are a non-breeding season migrate to northern Australian both in coastal and inland areas. Internationally important sites in Australia and maximum counts include Lake Sylvester, NT (DCCEEW, 2022). **Habitat:** Arrival to Australia includes a few weeks in coastal habitats such as estuarine mudflats and sandbanks, on sandy or rocky ocean beaches or nearby reefs, or in near-coastal grasslands. Thereafter they usually inhabit flat, open, semi-arid or arid grasslands, where the grass is short and sparse, and interspersed with hard, bare ground, such as claypans, dry paddocks, playing fields, lawns and cattle camps (DCCEEW, 2022)	**Unlikely** – The species has not been historically recorded within the desktop search extent. – No suitable habitat occurs within the Project Area.

Species common name (*scientific name*)	Status		Habitat requirements	Likelihood of occurrence
	EPBC Act	TPWC Act		
Oriental Pratincole (*Glareola maldivarum*)	Mig	-	**Distribution**: Predominantly northern Australia. The Australian Pratincole is mainly found in the north and eastern inland of Australia, as well as on Lord Howe Island, Christmas Island, and in New Guinea, Borneo and Sulawesi (BirdLife, 2022a) **Habitat:** It inhabits grasslands, inland wetlands and marine intertidal zones. found close to water, in open inland plains, sparsely wooded plains and tussock grasslands, usually in arid and semi-arid rainfall zones, and mainly in the lowlands. It is also found in areas of gibber (stony plains) and stony ground, and areas with sparse vegetation including claypans, stock-tanks, stock routes and airfields (BirdLife, 2022a).	**Unlikely** – The species has not been historically recorded within the desktop search extent. – No suitable habitat occurs within the Project Area.
Grey Wagtail (*Motacilla cinerea*)	Mig	-	**Distribution:** This species has an extremely large range and is an extant and vagrant visitor to Australia (BirdLife, 2022b). **Habitat**: This species inhabits fast-flowing mountain streams and rivers with riffles and exposed rocks or shoals, often in forested areas. It is also found in more lowland watercourses, even canals, where there are artificial waterfalls, weirs, millraces or lock gates (Birdlife, 2022b)	**Unlikely** – The species has not been historically recorded within the desktop search extent. – No suitable habitat occurs within the Project Area.
Yellow wagtail (*Motacilla flava*)	Mig	-	**Distribution:** extremely large global range with central and eastern populations migrating to South Asia and Australia (BirdLife, 2022). **Habitat:** This species occupies a range of damp or wet habitats with low vegetation, from damp meadows, marshes, waterside pastures, sewage farms and bogs to damp steppe and grassy tundra (BirdLife, 2022).	**Unlikely** – The species has not been historically recorded within the desktop search extent. – No suitable habitat occurs within the Project Area.

Appendix C

Fauna species list

Jacko Bore fauna species list

Common name	Scientific name	Status	
		EPBC Act	TPWC Act
Birds			
Black-faced Woodswallow	*Artamus cinereus*		
Brown Falcon	*Falco berigora*		
Crested Pigeon	*Ocyphaps lophotes*		
Galah	*Eolophus roseicapillus*		
Nankeen Kestrel	*Falco cenchroides*		
Torresian Crow	*Corvus orru*		
Willie Wagtail	*Rhipidura leucophrys*		
Mammals			
Cattle	*Bos taurus*		
Reptiles			
Dwarf Bearded Dragon	*Pogona minor*		
Inland Bearded Dragon	*Pogona vitticeps*		

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Historical Cultural Assessment

Appendix 02

Amadeus Basin: Jacko Bore 1DW1 Drill and Test Program

EP125

Santos QNT Pty Ltd

An historical heritage assessment of the proposed Mount Kitty #2 well lease and access roads, Northern Territory

A report to Santos Ltd

by

Allan Lance

Heritage Consulting Australia Pty Ltd
GPO Box 2677
Canberra ACT 2601

November 2022

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Executive summary

Heritage Consulting Australia Pty Ltd (HCA) has been engaged by Santos Ltd on behalf of its joint venture partners, to undertake a cultural heritage (archaeological) survey and assessment of non-Indigenous cultural heritage for the Mt Kitty #2 exploration well in EP125 in the southern Amadeus Basin, approximately 228km southwest of Alice Springs.

This report documents an historical heritage field assessment of the newly proposed well, and of the access roads and tracks to be upgraded and used during the drilling program. The heritage assessment was carried out by archaeologist Allan Lance on 1 November 2022, adopting a methodology consistent with the Northern Territory *Cultural Heritage Act*, 2011.

This archaeological study did not address places of Indigenous significance, as defined by the *Northern Territory Aboriginal Sacred Sites Act,* 1989. The relevant statutory body for the project area is the Central Land Council which has previously carried out an assessment in the project area and its vicinity.

Field survey methodology

An archaeological field survey was carried out within and around areas potentially subject to impact from work activities associated with well lease construction and access road and track upgrades from the Stuart Highway. This survey was undertaken by archaeologist Allan Lance on 1 November 2022, assisted in the field by Land Access Consultant Mr Peter Rogers. Mr Rogers had visited the locations visited during this study on many previous occasions and has been in regular communication with the managers of Lyndavale Station, prior to the fieldwork.

All access roads were driven slowly, with potential cultural features observed from the vehicle examined on foot, the lease site was inspected on foot, and bores, tanks and dams were investigated on foot for relics of the earlier water extraction technologies.

Results of the archaeological field survey

As there were no known historical sites in the project area, water sources were targeted as being likely to contain historically interesting items.

Beefwood Bore

The remains of an early windmill are found scattered on the ground surface at Beefwood Bore. It is likely that the gearbox, pump rod guide, steel rings and galvanized steel blades date the windmill found at this location to the period after 1920, after the arrival of the Stanes family to Erldunda. The location is not likely to affected by construction of the access road as the remnants of the windmill are located nearly 130m from the road.

Mallee Bore

Two large, riveted, galvanized tanks, rusted galvanized water troughs and corrugated iron tanks, cut bush timber, and rusted galvanized iron windmill vanes and angle iron windmill legs are found lying on the ground, having been pushed up and heaped in several piles.

In addition to the mostly early to mid-20th Century artefacts, is found a dressed timber roller with wrought steel handle. This is likely to be the remains of one of the windlasses used to raise water as part of Warburton's stock watering system dating from before 1898.

The historical items recorded in this location have been disturbed previously, however, as the bore is still

an important Lyndavale water source, and as the historical relics are located at least 30m from the access road, these are not threatened by construction traffic along the road.

Conclusions

No sites or places of Territory or National significance have been recorded within 80km of the project area. During the archaeological field survey, the only historical heritage items identified were located at two water sources, and while these are of local historical interest, neither is of special archaeological significant, nor is either at risk from activities associated with the construction of the Mt Kitty #2 well lease or access roads and tracks.

General recommendations

In general, ground surface visibility was relatively high in the areas examined. It is notable that only two historical sites were identified during the survey, associated with the pastoral industry. If further archaeological sites occur in this area, it is likely that they too will be associated with the pastoral industry. No further archaeological survey is recommended, unless historical heritage items are uncovered during construction. Should historical relics be identified these should be identified and reported to the Northern Territory Heritage Office.

1. Introduction

Heritage Consulting Australia Pty Ltd (HCA) has been engaged by Santos Ltd on behalf of its joint venture partners, to undertake a cultural heritage (archaeological) survey and assessment of non-Indigenous cultural heritage for the Mt Kitty #2 exploration well in EP125 in the southern Amadeus Basin, approximately 228km southwest of Alice Springs (Figure 1).

This follows an earlier seismic survey program and the drilling of the Mt Kitty #1 well, situated approximately 3km to the southwest of the newly proposed well. The Mt Kitty #1 well revealed gas reserves in the targeted Heavitree formation.

This report documents an historical heritage field assessment of the newly proposed well, and of the access roads and tracks to be upgraded and used during the drilling program (Figure 2). The heritage assessment was carried out by archaeologist Allan Lance on 1 November 2022, adopting a methodology consistent with the Northern Territory *Cultural Heritage Act*, 2011. The potential impact areas were intensively examined for traces of historical activities, to allow the development of appropriate management strategies to ensure the protection of any identified cultural heritage values.

This archaeological study did not address places of Indigenous significance, as defined by the *Northern Territory Aboriginal Sacred Sites Act,* 1989. The relevant statutory body for the project area is the Central Land Council which has previously carried out an assessment in the project area and its vicinity.

2. The project area

The project area lies within Santos exploration lease EP125, located on Lyndavale Station, a 3,700 km^2 beef cattle grazing property, situated west of the Stuart Highway. Lyndavale Station, formerly part of the larger Erldunda Station, was first leased by Richard E. Warburton, son of explorer Peter Egerton Warburton, in the early 1870s and stocked in 1884. The station remained in the Warburton family until 1920, when it was sold to (*The Farmer and Settler* 5 December 1935 page 12). Lyndavale, subdivided from the original pastoral lease, is now managed by the grandson of the first owner, and This station and Mt Ebenezer Station which adjoins to the north, are the Northern Territory properties run by the Stanes Family company. The location of the proposed developments in relation to the original pastoral leases (c. 1922) are shown in Figure 3.

Cattle breeding is the primary activity on Lyndavale Station. The original herds run by the family from the 1920s were Hereford cattle, however, these were replaced first with Brahman and Charbray, and then since 2002 with Angus cattle or Charolais cross

Figure 1. Location of the proposed Mt Kitty #2 well lease site and access road.

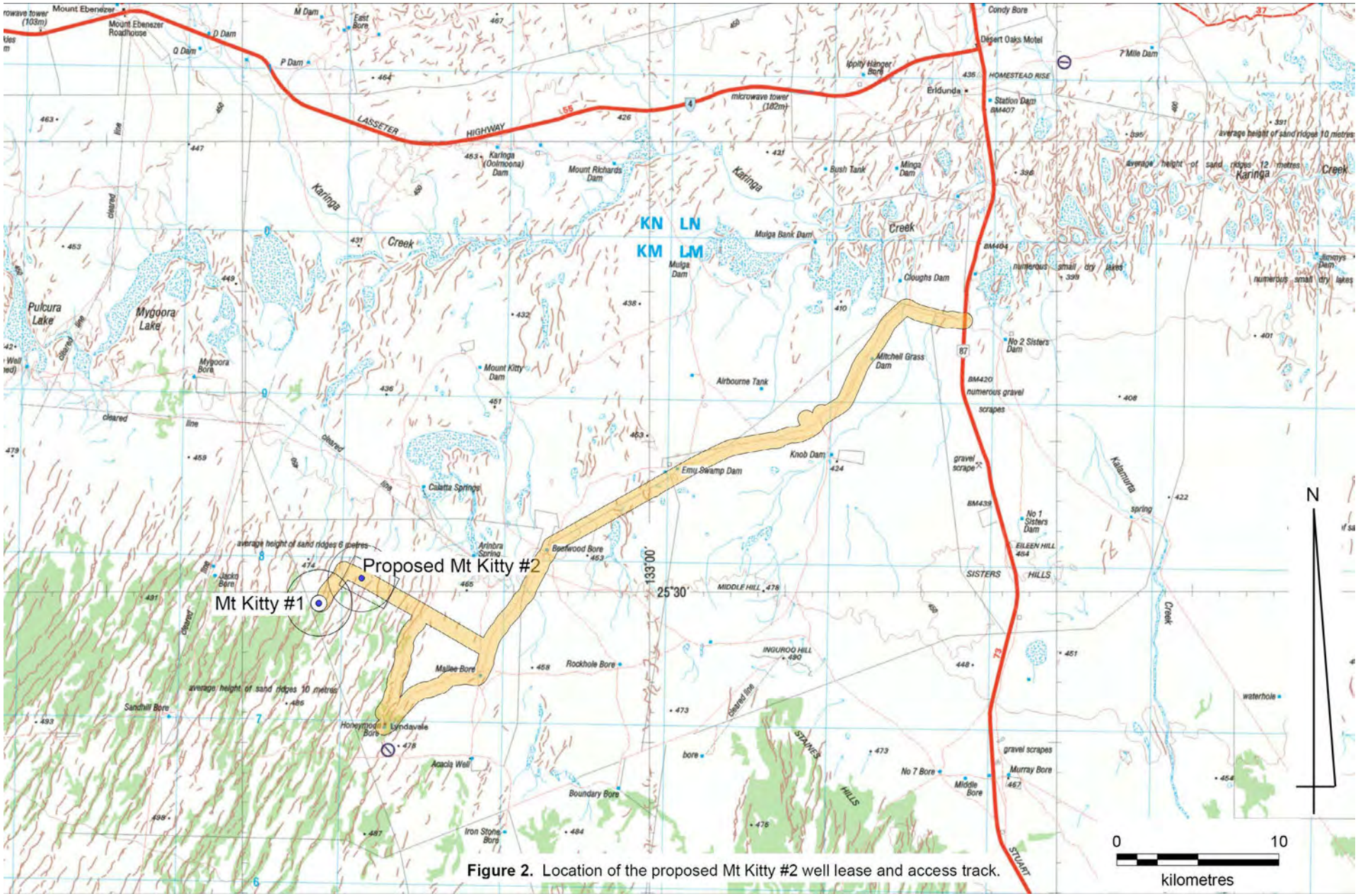


Figure 2. Location of the proposed Mt Kitty #2 well lease and access track.

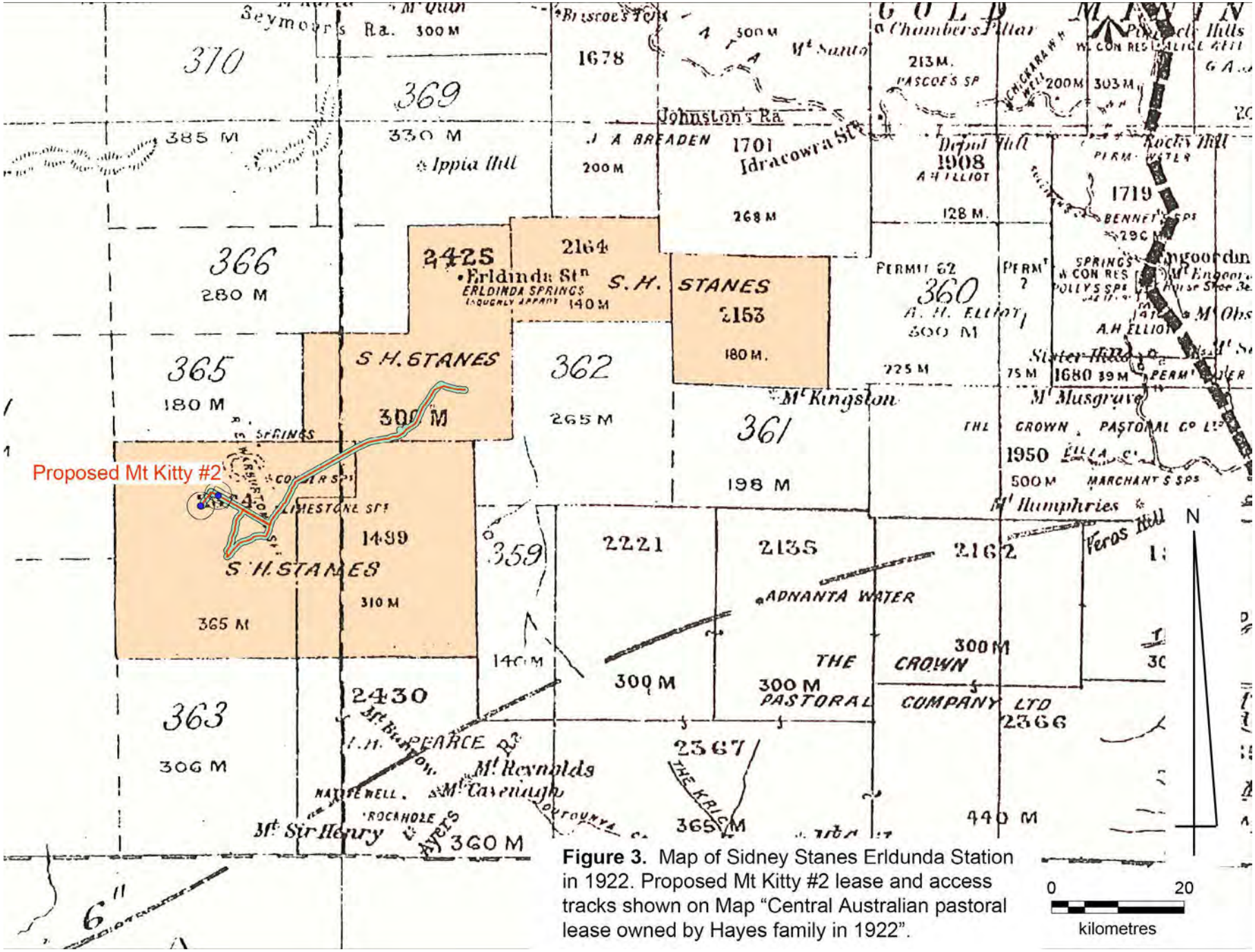


Figure 3. Map of Sidney Stanes Erldunda Station in 1922. Proposed Mt Kitty #2 lease and access tracks shown on Map "Central Australian pastoral lease owned by Hayes family in 1922".

Angus (Angus Australia 2022).

Lyndavale homestead and the Santos project area are accessed via a 47km gravel road from the Stuart Highway. Additional access to the Mt Kitty #2 well lease site follows a track that was built during drilling of the Mt Kitty #1 well, but will need to be upgraded.

3. Legislative context

Historical sites found in Central Australia provide physical evidence of the period that commenced in 1860 with the arrival of the first European explorers, and continued with later surveyors, construction workers and pastoralists.

The cultural heritage values of these sites and places vary greatly, depending on a combination of factors that have been distilled as encompassing their aesthetic, historical, scientific, social or spiritual values for past, present or future generations (The Burra Charter 2013, *Northern Territory Heritage Act*, 2011 Section 11). These values may change through time, as the understanding of their place in Territory history is better understood; as other similar sites are lost through natural processes or human intervention; and therefore a wide range of historical heritage sites are protected by Territory legislation.

3.1 *Northern Territory Heritage Act* 2011

This legislation was enacted on 1 October 2012. Areas, places, sites, buildings, shipwrecks and heritage objects considered to be of heritage value to members of the community can be nominated for inclusion in the Register. If these are considered by the Minister, on advice from the Heritage Council to be of special significance to the history and heritage of the Northern Territory, these will be added to the register and receive statutory protection. The Act provides a process for the approval of work to listed places.

The NT Heritage Act provides blanket protection to Aboriginal and Macassan archaeological heritage places and objects (Parts 17 and 18), unless the protection is revoked by the Chief Executive Officer of the Department of Territory Families, Housing and Communities. The revocation of protection will be considered on application to carry out work on a heritage place or object. A permit to disturb such sites would normally only be granted, following consultation with the relevant Traditional Owners or Custodians.

Under Part 114 of the Heritage Act, it is an offence to discover an Aboriginal or Macassan archaeological place or object and not report the finding to the Chief Executive Officer.

The Heritage Branch, NT Department of Families, Housing and Communities is the regulatory authority responsible for administering most sections of the *NT Heritage Act* 2011. It is also responsible for administering the Heritage Register (Part 139) and providing logistical support for the Heritage Council, established under Part 6.1 of the *NT Heritage*

Act, 2011.

4. Environmental setting

The landscape and environmental setting of the project area influenced the location and extent of activities undertaken by the earliest colonial explorers and settlers. Water, always necessary for survival in arid landscapes, was eagerly sought by the explorers who passed through this region from the 1860s, and led to the siting of settlements and pastoral infrastructure from the 1880s.

Through the project area, it was the water sources including the creeks and soaks that saw the most readily identifiable traces of activity dating from early colonial times, although these are mostly avoided by the proposed construction activities. The wells and bores that were built by the earliest colonial settlers remain, although as these are still used, the original technology employed to obtain that water has been replaced. Traces of the early water gathering machinery remain and have been noted below. Much of the project area, distant from the water sources, is covered with dunes or sand plain, which effectively conceals any minor traces of pastoral activity that may exist.

4.1 Topography

The topography of the project area comprises gently undulating low-relief plains, upon which are superimposed dunefields and sandplain (Kennedy and Bazzacco 2002). Several broad drainage channels are crossed at the northern end of the access track, near the Stuart Highway (Reu and Garbin 1999).

4.2 Land units

The access tracks and lease area are found in an area with a small number of land units, identified in a detailed study of Lyndavale Station by Kennedy and Bazzacco (2002), and of the adjoining Erldunda Station by Reu and Garbin (1999). These are primarily dunefields and plains formed on calcrete. Localised sand plains are also present near the proposed Mt Kitty #2 well lease site. The land systems encountered in the project area are described in detail below and are mapped in Figure 4.

4.2.1 Plains

Various undulating plains are traversed at the northern end of the access track (within Erldunda Station), adjacent to the Stuart Highway. These are interspersed with sandplains covered with mulga and witchetty bush (*Acacia kempeana*) low open woodland.

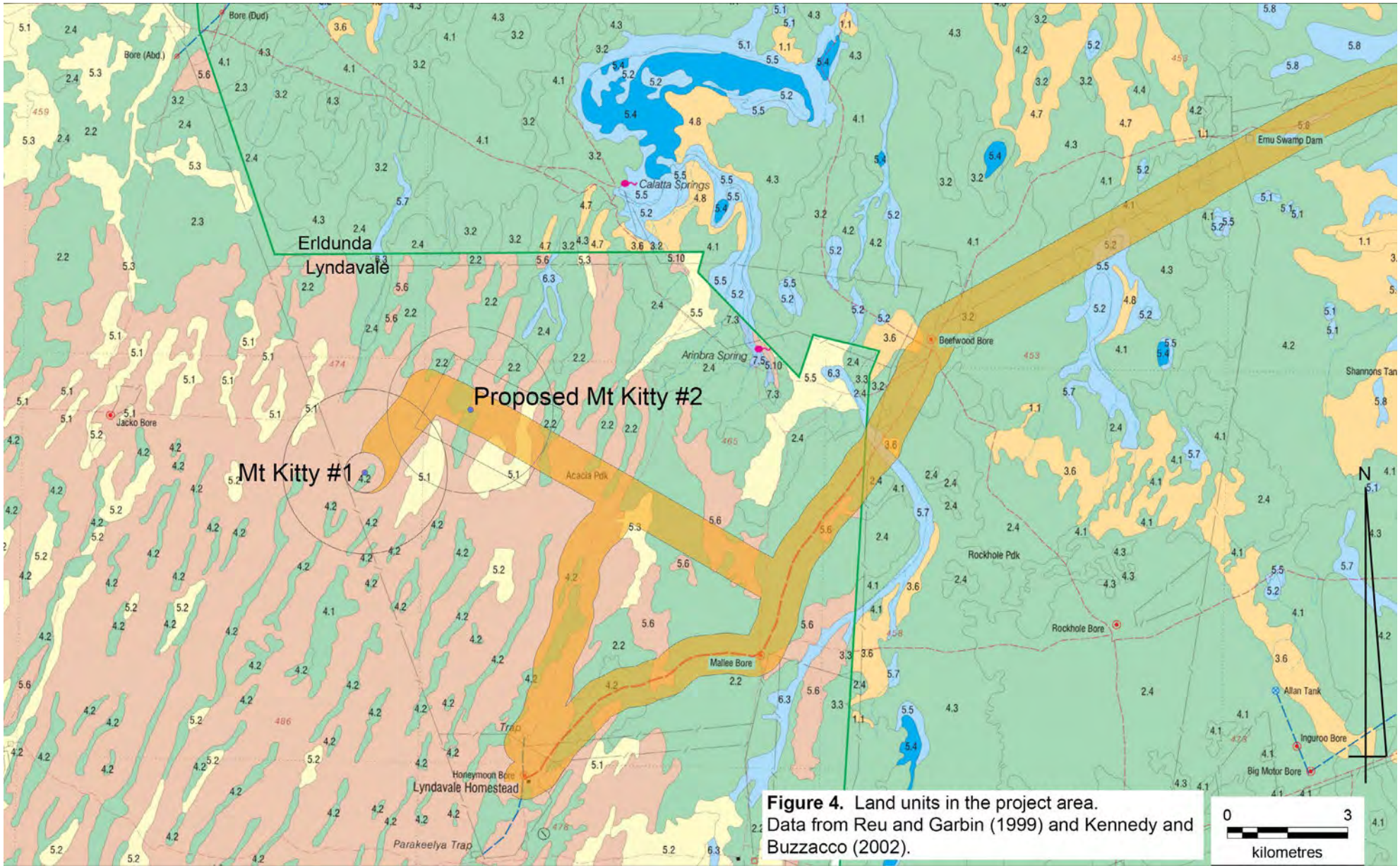


Figure 4. Land units in the project area. Data from Reu and Garbin (1999) and Kennedy and Buzzacco (2002).

Figure 4. Land units in the project area. Data from Reu and Garbin (1999) and Kennedy and Buzzacco (2002).

Calcareous rises with mulga plains

The entire access track alignment from the Erldunda property boundary to Lyndavale Homestead and from the homestead north and west to the proposed well lease, crosses this land unit. It comprises gently undulating calcareous plains with red earth and calcareous red earth soils and vegetated with mulga (*Acacia aneura*) low open woodland and open grassland.

Open calcareous plain

These gently undulating plains are found in the area south of Beefwood Bore. Here, the landscape is characterised by plains with grassland of limestone oatgrass and oatgrass. Witchetty bush grows along the minor drainage lines and in isolated clumps. Other shrub varieties include mulga, dead finish and desert cassia. Salsolaceous plants such as grey copper burr, southern bluebush and grasses including narrow-leaf neverfail are also present.

Mulga plains

The Mt Kitty #2 well site and access tracks north of Lyndavale Station traverse areas of the mulga plains land unit, and are found in the dune swales. Here, the red earth soils support an open mulga woodland with an understorey dominated by desert cassia (*Senna artemisioides subsp. filifolia*). Other shrub species found in this land unit include dead finish, witchetty bush, sandhill native fuchsia, desert fuchsia and weeping emu bush. The dominant grass species include bunched kerosene grass (*Aristida contorta*) and woollyoat grass (*Enneapogon polyphyllus*).

4.2.2 Drainage systems

The access track crosses Karinga Creek, a narrow creekline with alluvial soils and vegetated with a mixture of river red gum (*E. camaldulensis*) and coolabah (*E. coolabah*). Around Mitchell Grass Dam and Emu Swamp Dam, two other small drainage basins are passed with low chenopod shrubland, dominated by leafless bluebush (*Maireana aphylla*). South of Beefwood Bore and near the boundary fence approaching Lyndavale Station a further shallow watercourse is crossed, which drains a series of swamps and springs located further to the north. The drainage line is vegetated with mulga and other low woodland species.

Mulga drainage lines

The minor drainage line passed near the Lyndavale – Erldunda property boundary that drains towards Karinga Creek can be classified in this land unit. It comprises a broad drainage channel floor with open mulga woodland and mulga grass grassland and other perennial grasses. It is thought that infrequent heavy local falls fill this drainage line and would provide persistent surface water for several days.

4.2.3 Dunefields

The access track previously built between the main Lyndavale access road and the Mt Kitty #1 well lease traverses sandy dunefields vegetated with mulga open woodland. The dunes are generally low and when the location was visited in November 2022, they were well vegetated with grasses and shrubs following above average local rainfall.

4.2.4 Sand plains and dunefields

Two areas of sand plain are crossed near the proposed Mt Kitty #2 lease area. These sand plains are either gently undulating, or have minor dunes. Both areas of sand plain are vegetated with mulga shrubland and a dense understorey of grasses and forbs.

Sand plains with minor calcrete rises

Two areas of sand plain with calcrete rises are found near the proposed Mt Kitty #2 well lease and access track. These undulating sand plains have sandy soils and support a sparse mulga shrubland with closed grassland of erect kerosene grass, mulga grass and woollyoat grass. The calcrete rises support sparse shrubland with witchetty bush and limestone oatgrass.

Mulga sand plains

A small area of this land unit is crossed by the original Mt Kitty #1 access track, situated around seven kilometres north of the Lyndavale homestead. Topographically, this land unit comprises level sand plain, with minor dunes (~2m high). The land unit is vegetated with open mulga woodland with a sparse understorey of desert cassia and woolybutt grass.

4.3 Geology

While the bedrock geology in the project area predominantly comprises Neoproterozoic sediments of the Amadeus Basin, these are not exposed on the surface. The project area is covered with Quaternary sediments, with widespread calcrete, particularly around the salt lakes. Much of this calcrete is thought to have originated from precipitation of groundwater sediments (Kennedy and Bazzacco 2002:5). In locations near the well sites, some of this precipitated calcrete has been silicified. Some gypseous duricrusts occur near the salt lakes, although these are avoided by the access tracks and well lease. Much of the access route and the Mt Kitty #2 well site are covered with Quaternary aeolian sand, either as a sheet or dunes overlying the duricrust. Quaternary alluvium is found in drainage lines and in depressions.

4.4 Hydrology

The project area occurs in an area of relatively low relief, traversed by only minor tributar-

ies of the drainage lines originating in the Basedow Range to the northwest. These minor drainage lines crossed by the access tracks are tributaries of Karinga Creek, and these are fed by both local rainfall and permanent springs and soaks.

5. Colonial history and settlement in the region

5.1 Exploration

A number of exploring expeditions moved through the country surrounding the project area in the early years of colonial settlement. The first recorded colonial exploration expedition led by Stuart (1860) passed well to the east of the project area, crossing the Finke River approximately 82km from the project area, and then headed northward past Chambers Pillar towards the Macdonnell Ranges and as far north as Attack Creek, where the expedition, attacked by Waramungu people, retreated back along the path they had come. Although not passing near the project area, the favourable reports of pasture encouraged the subsequent spread of pastoralists into Central Australia.

In August 1872 Ernest Giles mounted an expedition commenced at Chambers Pillar (Giles 1889 I:lix), and like many that preceded him, the expedition members engraved their names in the rock (Giles 1889 I:11).

Giles following the route of the Finke River towards the north west and through the western Macdonell Ranges, before a lack of water led him southward to the shores of lake Amadeus, and then back eastward to the Charlotte Waters Telegraph Station (Giles 1889 I:160, Grimm 1888:221). The nearest this expedition approached the project area was approximately 80km to the north. Giles' second expedition to the west passed through the region in August the following year. The party trekked from the Telegraph Line near The Peake Telegraph Station westward through the Musgrave Range, then north to Kata Tjuta, Uluru and Mt Connor. This expedition passed approximately 40km to the south of the project area through the Ayres Range, named by Giles after Sir Henry Ayres,. This expedition reached the Gibson Desert, but was also turned back by water shortages, having to butcher their horses on the return journey. They reached the safety of the Overland Telegraph Line in July 1874. In February of 1876 Giles again attempted to cross Western Australia, following a successful crossing from east to west the previous year, but this attempt commenced in the west. He travelled with camels, rather than horses and reached the Overland Telegraph line in September of the same year, traversing regions he had first visited in 1873.

William Christie Gosse led a South Australian government sponsored expedition that left the Alice Springs Telegraph Station in April 1873 to investigate the country between the Overland Telegraph Line and Perth. He recorded and named Ayres Rock (Uluru) after Sir Henry Ayres (one of the expedition sponsors), which he climbed to observe the sur-

rounding landscape, noting the Olgas (Kata Tjuta) and Lake Amadeus, both of which had previously been mapped and named by Giles. On finding the route to the west blocked by spinifex and sand, and an absence of water, he retreated eastward along the northern flank of the Musgrave Ranges following the route taken by Giles the same year. Gosse too came within 40km of the present project area.

In 1874 John Forrest traveling from Perth, followed a similar route to that used by Giles and Gosse through the Musgrave Ranges, then followed Marryat Creek and the Alberga River to the Overland Telegraph Line. This expedition passed approximately 60km to the south of the project area.

5.2 Overland Telegraph

In 1860, the year that Stuart commenced his first unsuccessful expedition to travel across the continent from south to north, telegraphic connection of the three cities on the east coast was completed. News from Britain was still sent by ship and would take up to two months.

An undersea cable had been laid between Great Britain and North America in 1865 and this encouraged the colonial governments to consider Telegraphic communication with Great Britain. Competition between the colonies to build the first cable to Port Darwin to connect with a planned cable from Java. By 1862, Stuart had demonstrated that the continent could be crossed and had mapped the route. South Australia, seeing economic benefit in the cable, signed a contract with the company laying the undersea cable, agreeing to pay for the construction of a Telegraph Line across the continent from north to south, and that it would be completed in 18 months, by 1 January 1872.

The telegraph line followed the route of Stuart's expedition, with construction starting in June 1870. Scouting expeditions spread throughout the region refining the route and construction commenced. Construction in the north was delayed by the tropical wet season and the line was finally completed in August 1872 and although the deadline for completion was not met, there was no penalty as the undersea cable from Java had failed, giving a reprieve to the flood affected line builders.

Evidence of the Overland Telegraph Line survey expeditions comes from the graffiti around the base of Chambers Pillar, where several inscriptions made by explorers, surveyors and construction contractors are found dating from 1870 and 1871. The grave of Carl Kraegen, found on Maryvale Station, who perished in December 1871 while surveying a route for the telegraph line, is further physical evidence of the activities of the exploration parties.

Many of the steel poles and portions of the line itself survive, although as the route is well to the east of the Stuart Highway, it survey, construction and use is unlikely to have resulted in any direct impacts, or site formation, in the project area.

The discovery of gold in the Pine Creek region in 1872 during line construction led to an influx of southern miners, including many of Chinese who had been brought into the colony as cheap labour to work on construction of the telegraph line. This increased the number of travellers passing through the region, and an influx of prospective pastoralists. These travellers would have also remained close to the telegraph line and are unlikely to have strayed into the project area.

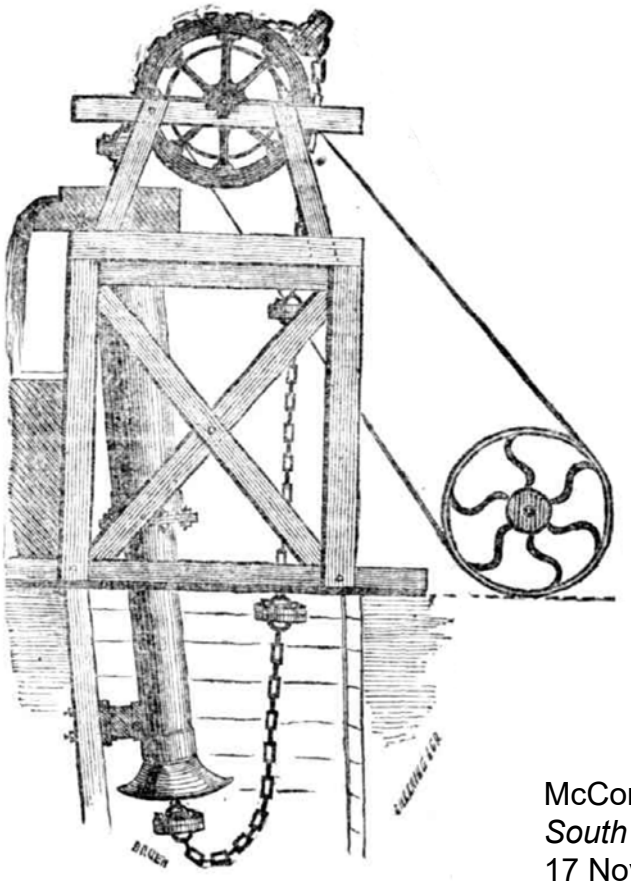
5.3 Pastoral expansion

Following the reports of favourable pasture observed by the early explorers, pastoralists started moving their flocks and herds northward along the route of the Overland Telegraph Line and into the rangelands of the interior.

The project area is on Lyndavale Station, which was once part of the original Erldunda Station, established in the 1870s by Richard Warburton, son of explorer Peter Egerton Warburton, with whom he travelled on the Thomas Elder sponsored expedition crossing the Great Sandy Desert and reaching the Western Australian coast in January 1874. Reports of rich pasture led to the establishment by Elder of cattle stations on the Finke River and in the Western MacDonnell Ranges. These stations were managed by Richard Warburton, who in 1883 selected land in country to the west of Idracowra Station. Warburton grazed cattle, but also commenced a successful horse breeding program, with breeding stock being sourced from eastern Australia and the Lake Eyre district. In 1916 the herd was reported to have exceeded 1,000 head (*The Australasian* 4 March 1916 Page 6). Horses were overlanded from Erldunda to Oodnadatta, from where they were sent by rail to Adelaide to for sale. Erldunda had no permanent surface water, but was known to contain semi-artesian water, with native wells, soaks and springs. A description of the watering practices was provided in the article in *The Australasian* (4 March 1916 Page 6), and is relevant to an understanding of the historical sites and features recorded in the project area.

> The water occurred at 12ft. from the surface, and the first method adopted for hauling it was the lever and bucket system, operating in an excavation 12ft. by 12ft. by 15ft, with troughing of hollow logs. Everything was watered by lever and bucket, worked by hand, just as was done for many years from the soakages in the sandy bed of the Finke. In 1899, a McComas water lift was introduced, this, too, being worked by hand. Everything going to and from water passed through a gate, and entered an enclosure or yard. This had the effect of ac-

customing all stock to yards and gate ways, as well as to the sight of human beings moving about on foot. The tendency to docility imparted in the earlier history of this horse herd has been not the least important of its qualifications. In 1892, owing to the manner in which the stock were increasing, another well was sunk about six miles south of the homestead, abundant supplies of fresh water being obtained in 30ft. This Supply was drawn upon by windlass and buckets much the same principle of yarding and gateways being introduced. Another McComas water lift was also introduced at the homestead. About 1898 the business of watering by hand proving somewhat too arduous, the McComas [*see below*] was connected with a horseworks. This, principle held good till 1904, when a windmill, the first to be introduced into this part of Australia, was installed, with a 5,000-gallon galvanised iron tank with, a clay bottom. This was installed at the homestead, and connected with the two wells. Some time later another 5,000-gallon tank was set up at the six-mile well. And, following thereon, a 10,000-gallon tank was added at the homestead. Last year another windmill was installed, together with another 10,000-gallon tank and a petrol engine. The supply of water has all along been abundant and fresh. In 1908 another line of so-called spring country, known as Goyder's Springs, was opened up, 30 miles farther west, somewhat south of west. This relieved the strain upon the home waters, and brought, under utilisation a fine tract of mulga country at a time when feed was getting scarce about the homestead.



McComas Water Lifter
South Australian Weekly Chronicle
17 November 1883 page 13.

Warburton's water supply arrangements can be summarised as:

1883-1899	Hand lever and bucket, with wooden troughs
1892	Additional well sunk 6 miles south of Erldunda homestead
1899	Introduction of McComas water lift (hand operated)
1898-1904	McComas water lift mechanised with horseworks
1904	First windmill erected, with 5,000 gallon galvanized iron tank, with clay base
1904-1908	additional 5000 gallon tank at 6 mile well 10,000 gallon tank installed at homestead with petrol operated pump
1908	Goyders Springs area 30 miles to the southwest of Erldunda opened up for grazing.

The water sources referred to in 1916 as Goyders Springs are a series of water sources located approximately 10-15km north of Lyndavale homestead. These are now mapped as Arinbra Springs and Calatta Springs. Richard Warburton died on 6 July 1917 (*The Barrier Miner* 9 July 1917 page 2). Three years later the property was sold to Sidney Stanes.

and a colleague founded Old Hamilton Downs Station, situated in the foothills of the West MacDonnell Ranges, west of Alice Springs, in the early 1900s.

A substantial homestead was built in 1913, and its heritage significance was recognised with its gazettal as a Heritage Place (Northern Territory Heritage Register File number H92/0010).in June 1993.

In late 1920, the *Northern Territory Times and Gazette* (2 October 1920 page 3) records the transfer of the PHT brand from and the cancelling of J.E. Warburton's 6T3 brand on Erldunda Station.

A map of the pastoral holdings in the region dating from 1922 shows the extent of Stanes' Erldunda holdings, which extended 64km to Idracowra Station in the east and 60km south where it abutted with Kulgerra Station. operated Erldunda until 1950, when he retired to Adelaide. The property was run by until in 1987 it was subdivided and a portion (excluding Lyndavale) sold to Bernie Kilgarriff, former NT Legislative Assembly speaker and NT Senator.

6. Nature of the proposed work activities

The impacts resulting from construction of the Mt Kitty #2 well will be restricted to upgrading of the existing access road from the Stuart Highway to Lyndavale Homestead and minor tracks to the proposed lease. In total, this entails the upgrading and maintenance of approximately 67km of gravel roads and tracks: 47km of road to Lyndavale and 20.2km

of tracks. As these are existing roads and tracks impacts will be minimal and will mainly be localised upgrades in areas where the existing tracks have been damaged by water erosion. Material to upgrade the road and tracks will be sourced from existing and new borrow pits. Water to undertake the roadworks will be obtained from existing bores or waterholes and if necessary, new bores will be drilled.

The well lease and campsite will be built in an area of mulga sandy dunefield and a mulga-covered swale. It will cover an area of several hundred square metres.

7. Historical heritage assessment methodology

Ideally, there are five major steps that are required in archaeological heritage assessment.

Step 1 – Register search

A search of relevant heritage registers is undertaken to:

- ascertain if any known historical heritage sites/relics occur within or in close proximity to the project area;
- provide data to assist in predicting the types and frequency of historical sites/relics that may occur in the development area, within the local area or region generally.

Step 2 – Assessment of landscape features The second stage of the assessment process requires the examination of the landscape setting and environment of the project area. These include an understanding of the surface geology, geomorphology and sediments, which may have affected past land-use practices, survival of sites in the landscape and the detectability of sites.

Step 3 – Desktop assessment and visual inspection

An archaeologist identifies landscape features with the potential to contain sites and undisturbed relics. Relevant archaeological research reports for sites within the project area and for the area or region generally, as appropriate, are examined to provide baseline data and a broader understanding of the cultural heritage context of the area subject to potential impact.

A field assessment entails a vehicle and pedestrian archaeological survey of the subject land, with particular attention to archaeologically sensitive landscape features such as watercourses, wells, waterholes, rocky escarpments; all locations where historical heritage sites may be expected to occur.

Step 4 – Reporting results

Reporting of the findings and recommendations from the assessment. A written report

documenting the procedures, results and recommendations of the archaeological heritage assessment is produced to support the conclusions.

Step 5 – Further investigation and impact assessment (if required)
After assessing the significance of the archaeological site/relic, recommendations are made regarding compliance with the provisions of the Northern Territory *Heritage Act,* 2011.

The specific aims of this archaeological assessment were to:

1. Identify known historical heritage sites and/or relics within the subject land area and assess the area for its potential to contain unidentified sites/objects.

2. Identify any potential archaeological heritage constraints and formulate recommendations and management strategies and options with regard to the proposed activity/ development.

3. Provide an assessment as to whether or not further archaeological heritage investigation or assessment is required prior to the commencement of the proposed development.

8. Cultural heritage site definition

Assessment of the cultural heritage resources in the project area was undertaken to investigate only archaeological contexts. Sacred sites and places with special significance to Aboriginal people have not been investigated as part of this assessment. These have been evaluated, recorded and recommendations have been made during the
AAPA Authority Certificate process. Sites and places of special significance have been noted and avoided, in accordance with these requirements.

From an archaeological perspective, the *Northern Territory Heritage Act* 2011 (Division 2 Sections 6, 7, 8 and 9) defines archaeological features relevant to this study as follows:

> **6 Meaning of *archaeological place* and *Aboriginal or Macassan archaeological place***
>
> (1) An ***archaeological place*** is a place that:
>
> (a) relates to the past human occupation of the Territory; and
>
> (b) has been modified by the activity of the occupiers.
>
> (2) An ***Aboriginal or Macassan archaeological place*** is a place that:
>
> (a) relates to the past human occupation of the Territory by Aboriginal or Macassan people; and

(b) has been modified by the activity of those people.

7 Meaning of *object*

(1) An ***object*** is a natural or manufactured object that is moveable.

(2) An ***object*** includes an archaeological object but does not include a place.

8 Meaning of *archaeological object* and *Aboriginal or Macassan archaeological object*

(1) An ***archaeological object*** is a relic that:

(a) relates to the past human occupation of the Territory; and

(b) is in an archaeological place.

(2) An ***Aboriginal or Macassan archaeological object*** is a relic that:

(a) relates to the past human occupation of the Territory by Aboriginal or Macassan people; and

(b) is:

(i) in an Aboriginal or Macassan archaeological place; or

(ii) stored in a place in accordance with Aboriginal tradition, including, for example, in an Aboriginal keeping place.

9 Meaning of *relic*

(1) A ***relic*** is:

(a) an artefact or thing given shape by a person; or

(b) human or animal skeletal remains; or

(c) something else prescribed by regulation.

(2) An artefact or thing can be of any material.

Examples for subsection (2)

1 A secret or ceremonial object.

2 A log or bark coffin.

3 Human remains.

4 Rock or wood carvings or engravings.

5 Stone tools.

(3) However, an artefact or thing made for sale is not a relic.

(4) In addition, a thing prescribed by regulation is not a relic.

For recording archaeological features and sites, the concept of the isolated artefact, object, site, place and cultural landscapes have been applied to describe features of different orders of magnitude. In the present study, small and localised features have been described as heritage places. Further afield, sites and objects associated with the Overland Telegraph Line can best be imagined as an interrelated collection of sites and features within a cultural landscape. The *Northern Territory Heritage Act* 2011 specifically men-

tions the OT Line as an example of a protected *class* of interconnected heritage sites (Part 2.3, Section 42).

9. Results of the background research and the Site Register searches

Searches of the Commonwealth Register of the National Estate, and NT Heritage Register were undertaken on 15 November 2022. (Tables 1 and 2).

9.1 Register of the National Estate (Commonwealth)

Five places within this region are recorded on the Register of the National Estate, an historic heritage register of sites and places deemed to be of National significance compiled between 1976 and 2003. The Register was discontinued in February 2007 and many of the listed sites and places were transferred to State and Territory Registers.

Place name	Place ID	Description	Distance from project area
Chambers Pillar Historical Reserve	195	Sandstone column used as a landmark by early explorers and pastoralists in Central Australia. The names of some of the early explorers, settlers and workers are engraved in the rocks at the base. The site has special significance to the region's Aboriginal People.	82km
Alice Well	16396	Sites associated with the Overland Telegraph Line, Ghan Railway and Police Station (1911)	117km
Arandaspis Site	103774	Fossil fish site	~170km
George Gill Range	16721	Environmentally rich mountain range with historical associations (Ernest Giles)	115km
Charlotte Waters Telegraph Station Ruins	16394	Significant as emblematic of the construction and operation of the Overland Telegraph Line and early anthropological research.	183km

Table 1. Historical and environmental places listed on the Register of the National Estate.

Chambers Pillar historical reserve was one of the first significant heritage places listed on the Register of the National Estate, registered in October 1980. It was listed for its significance both to the local Aboriginal People, but also as an important landmark used by the early European explorers who visited the region from the 1860s. Stuart named the 30m high monolith after James Chambers from Oratunga Station near Blinman, who had supplied horses to the expedition. Names engraved into the sandstone at the base include those of early explorers, workers on the Overland Telegraph Line, policemen and pastoralists, including numerous members of the Hayes family, who settled in the region in the mid 1880s.

An historically important historical heritage place on the Register of the National Estate is Alice Well, near Finke, located 117km from the present project area (Place ID 16396). The site is situated a short distance to the north of the junction of the Finke and Hugh Rivers and was an important water source used during construction of the Overland Telegraph Line and later for the Old Ghan Railway. It was also the site of the 1911 Police Station. In the 1920s it also contained a telephone office, staffed by the Alice Well Police, and was therefore unattended when the police officer went on patrol (*Northern Territory Times and Gazette* 22 May 1925 page 7).Another registered place of National Heritage Value in this region is the Central Australian *Arandaspis* Site, located approximately 75 km NNW of Finke (Place ID 103774). This is the site of one of Australia's most important early vertebrate fish fossil finds. While only a general location of the find site is listed, it is thought to be approximately 170km from the project area.

The George Gill Range is listed as an Indicative Place on the Register of the National Estate (Place ID 16721). It has been listed due to its association with explorer Ernest Giles, with geomorphological features, and for the rich assemblage of plants and animals. The listed place encompasses the portion of the George Gill Range within the Watarrka National Park, but also extends eastward. This heritage place is located approximately 115km to the northwest of the project area. The ruins of the Charlotte Waters Telegraph Station site were listed on the Register in 2003, in recognition of the multiple layers of significance it possesses. It is connected with the construction of the construction and operation of the telegraph line, significant in the development of the Territory and of the country as a whole, ending the isolation from the world that had been felt since first colonization. Construction of the line was a significant engineering achievement crossing more than 3,000 km through inhospitable and mostly unknown country. The line is also associated with exploration, with many of the parties heading westward from the telegraph station. It is also connected with two of the telegraph operators: P.M. Byrne and Frank Gillan, who lived at the station and recorded important aspects of the language and customs of the local Aboriginal People. A large Aboriginal camp was established at the Telegraph Station and so it became a ration depot used by the local Aboriginal People.

9.2 Northern Territory Heritage Register

A number of places of Territory heritage significance were transferred from the Register of the National Estate in 2007 when it was no longer updated, and additional local heritage items have also been added since.

Historic Place	Description	Location
Chambers Pillar Historical Reserve	Significant to the Southern Arrente Aboriginal People, for its association with early explorers, and with notable members of the Central Australian Pastoral Community, with the names of many carved into the sandstone rocks at the base.	82km from the project area
Charlotte Waters Telegraph Station Ruins	This site is significant for its association with the construction and operation of the Overland Telegraph Line, as a place where historical exploration expeditions began or ended, for the connections with anthropology and for the connections with the local Aboriginal community that settled near the Station.	Near the South Australian border, 183km to the east of the project area.
Rumbalara Ochre Mine	Ochre deposit used in traditional times for Aboriginal ceremonies. The yellow ochre was used for paint in the late 1930s and was in demand for camouflage paint during WWII. The mine ceased production in 1951.	146km east and approximately 32km northeast of the Rumbalara Rail Siding on the Old Ghan Line.

Table 2. Historical places listed on the NT Heritage Register.

Chambers Pillar Historical Reserve comprises three prominent mesas: Chambers Pillar (Itirkawara), Castle Rock (Yayurara) and Window Rock (Umiarri), each formed from Devonian-Carboniferous sandstone. The Pillar was a prominent landmark noted by Stuart in 1860 on the first European expedition through Central Australia. The inscriptions at the base of the pillar include the names of historical characters important in the development of the Northern Territory. These include members of the Overland Telegraph survey parties, Overland Telegraph construction crew members, early pastoralists, police, missionaries, scientists and stockmen.

Alice Well and the associated police station located beside the Hugh River were gazetted and entered on the Northern Territory Heritage Register in October 2005. In addition to the significance identified in the listing on the Register of the National Estate, the connection with the Hayes family, important for the foundation of the Central Australian pastoral

industry was noted in the statement of heritage value. The Charlotte Waters Telegraph Station Ruins was gazetted on the NT Heritage Register in 2002. The significance of the site is found in the abundant associations with historical events: the construction and use of the Overland Telegraph; the exploring parties that started and ended their expeditions here; and the anthropological research undertaken by the Telegraph Station workers.

The Rumbalara Ochre Mine was registered as a location of Territory significance in 1996, for its Indigenous heritage values and its historical value for the wartime mining of ochre used in the production of camouflage paint. The yellow ochre deposit was traditionally mined by Aboriginal People for ceremonial purposes. The ochre was mined from tunnels excavated into the deposit at the base of the Rumbalara Shale. Wartime reports indicate that most of the underground mining was undertaken by Aboriginal People, digging the ochre from the exposed faces in drives excavated into the rock, where it was bagged into wheat sacks, hauled to a chute and dumped into the back of trucks (Sullivan 1944:5).

10. Potential for historical heritage sites in the project area

As most early exploration and engineering works taking place in the region during in the early years following European colonization were occurred at some distance from the project area, either concentrated along the Overland Telegraph line, Old Ghan Railway, or in the ranges to north and south, there are unlikely to be significant early historical sites present near the access roads and tracks or the Mt Kitty #2 lease area. The main historical activities bordering the project area are connected with the pastoral industry taking place from the time Erldunda was first stocked in 1884. Infrastructure associated with watering stock is most likely to survive.

11. Field survey methodology

An archaeological field survey was carried out within and around areas potentially subject to impact from work activities associated with well lease construction and access road and track upgrades from the Stuart Highway. This survey was undertaken by archaeologist Allan Lance on 1 November 2022, assisted in the field by Land Access Consultant Mr Peter Rogers. Mr Rogers had visited the locations visited during this study on many previous occasions and has been in regular communication with the managers of Lyndavale Station, prior to the fieldwork.

All access roads were driven slowly, with potential cultural features observed from the vehicle examined on foot, the lease site was inspected on foot, and bores, tanks and dams were investigated on foot for relics of the earlier water extraction technologies.

Using the methodology outlined above, the following procedures were adopted to record heritage places and sites:

The project area was mapped using a Geographic Information System with maps transferred in the Avenza app, uploaded to a handheld Android tablet with Trimble Catalyst GPS connected, giving sub-metre accuracy, on which the tracks to be used for access to the lease and the proposed Mt Kitty #2 lease and existing Mt Kitty #1 lease were shown.

All heritage features and tracks were recorded on the GIS. Historical features were photographed during the survey recording and the nature of the sites were noted.

12. Results of the archaeological field survey

As there were no known historical sites in the project area, water sources were targeted as being likely to contain historically interesting items.

Site ID	Site type	Age	Location	Proximity to project area
Beefwood Bore	Remains of windmill, gearbox and motor associated with pumping water from artesian water source	From 1920		
Mallee Bore	Remains of windmill, tanks, timber yards, windlass	Some items pre-1898		

Table 3. Historical heritage sites located near the proposed development area.

12.1 Beefwood Bore

The remains of an early windmill are found scattered on the ground surface at Beefwood Bore (Figure 5). The bore still operates with a solar pump, however, originally this would have been pumped with the windmill with backup auxiliary belt drive petrol pump. The galvanized steel windmill blades are attached to the inner and outer ring with spot welds and rivets. It is likely that the gearbox, pump rod guide, steel rings and galvanized steel blades date the windmill found at this location to the period after 1920, after the arrival of the Stanes family to Erldunda. The location is not likely to affected by construction of the access road as the remnants of the windmill are located nearly 130m from the road.

12.2 Mallee Bore

This still functioning water source operated by a solar pump also has the remains of earlier technologies that were used to raise and store water (Figure 6). Two large, rivetted, galvanized tanks, rusted galvanized water troughs and corrugated iron tanks, cut bush timber, and rusted galvanized iron windmill vanes and angle iron windmill legs are found lying on the ground, having been pushed up and heaped in several piles. A poured con-

Figure 5. Location of historic relics located at Beefwood Bore. Aerial photography Google Maps and MapperG.

Figure 6. Location of historic relics located at Mallee Bore. Aerial photography Google Maps and MapperG.

crete engine stand is located near an operating petrol pump. Large pieces of concrete that once formed the bases of water tanks are also found.

In addition to the mostly early to mid-20th Century artefacts, is found a dressed timber roller with wrought steel handle. This is likely to be the remains of one of the windlasses used to raise water as part of Warburton's stock watering system dating from before 1898, when McComas water pumps were installed to mechanize the raising of water.

The historical items recorded in this location have been disturbed previously, however, as the bore is still an important Lyndavale water source, and as the historical relics are located at least 30m from the access road, these are not threatened by construction traffic along the road.

13. Conclusions

No sites or places of Territory or National significance have been recorded within 80km of the project area. During the archaeological field survey, the only historical heritage items identified were located at two water sources, and while these are of local historical interest, neither is of special archaeological significant, nor is either at risk from activities associated with the construction of the Mt Kitty #2 well lease or access roads and tracks.

The only unidentified historical sites likely to occur through this region will be associated with the pastoral industry, and these are likely to be insubstantial. The project area comprises either dunes and sandplain, where archaeological traces are likely to be buried; or calcareous landscapes, where archaeological traces are likely to be exposed on the surface (and would therefore have been detected). It is possible that construction will unearth further archaeological features or relics, although the risks are small.

14. General recommendations

In general, ground surface visibility was relatively high in the areas examined. It is notable that only two historical sites were identified during the survey, associated with the pastoral industry. If further archaeological sites occur in this area, it is likely that they too will be associated with the pastoral industry. No further archaeological survey is recommended, unless historical heritage items are uncovered during construction. Should historical relics be identified these should be identified and reported to the Northern Territory Heritage Office.

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Plate 1. Access track landscape showing the gently undulating plains (Land Unit 4.2) near Emu Swamp Dam.

Plate 2. Access Road looking northeast in area of sand plains (Land Unit 4.3) to the west of Emu Swamp Dam.

Plate 3. Gearbox and other associated artefacts at Beefwood bore historic site.

Plate 4. Windmill at Beefwood bore historic site.

Plate 5. Landscape to the east of Mt Kitty #1 well site, in the sandy dunefields land unit (5.6).

Plate 6. Windlass found at Mallee Bore historic site.

Plate 5. Debris from old water storage facilities at Mallee Bore site.

Plate 6. Cut bush timber and windmill vanes at Mallee Bore site.

Risk Assessment Framework

Appendix 03

Amadeus Basin: Jacko Bore 1DW1 Drill and Test Program

EP125

Santos QNT Pty Ltd

Date	Rev	Description	Initiated	Reviewed	Approved
14/02/2023	1	Issued for	KR	TS, JG, JH, LD, VC	MD
16/06/2023	2	Approved for Use	TS	PS, NF	MD
15/12/2023	3	Approved for Use for STO5-5			MD

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1. Environmental Risk Assessment Process

Santos QNT Pty Ltd (the Interest Holder), in collaboration with inGauge Energy, has identified the consequence, likelihood, and risk of environmental impacts associated with the Activity as per *ISO 31000*.

This included:

- The identification of environmental factors and risk sources associated with the works required to drill a helium well on a pre-existing/expanded well pad as described in **Appendix 02** Project Activity.
- An analysis and ranking of the inherent consequences of risk before controls are applied. The identification and evaluation of the relevant section of the C*ode of Practice: Onshore Petroleum Activities in the Northern Territory* (*the Code*) and additional risk management controls to reduce the risk of impact.
- An assessment of consequence, likelihood, risk level, acceptability, and scientific uncertainty [DEPWS et al., 2019; ISO, 2018].

The environmental risks presented in **Appendix 04** have been translated into the Santos Risk Management Framework. The Likelihood (**Table 4—1**), Consequence classification (**Table 4—2**) and Risk Matrix (**Table 4—3**) are based on the Santos Risk Matrix (SMS-LRG-OS01-TP02) [Santos QNT Pty Ltd, 2022].

2. Environmental Factors

For the purposes of this assessment, the description of the environmental aspect that may be impacted is deemed an Environmental Factor.

Environmental Factors are categorised into themes (Land, Water, Air, People) as guided by the *Northern Territory Environment Protection Authority Factors and Objectives* [NT EPA, 2019].

Environmental Factors are described in **Appendix 01** (Description of the Existing Environment) and include:

- Air Quality
- Community and Economy
- Human Health
- Culture and Heritage
- Human Health
- Inland Water Environmental Quality
- Landforms
- Terrestrial Ecosystems
- Terrestrial Environmental Quality

Environmental factors cover The Interest Holder's Environmental Values (EVs), which are defined as:

- Flora and fauna species (terrestrial and aquatic) populations and habitat
- Vegetation; water resources (surface water, groundwater and marine)
- Soils and landforms
- Community and reputation.

Criticism includes criticism by one or more individuals in person, public forums, traditional media, or social media, as referenced in **Table 4—2**.

3. Risk Source, Potential Impact, and Inherent Consequence

A risk source is a planned activity or event that could cause an environmental impact, defined as 'any adverse change, or potential adverse change, to the environment resulting wholly or partly from a regulated activity' [NT Government, 2016a]. Regulated works associated with the proposed Activity are described in further detail in **Appendix 02** (Project Activity).

Potential sources of environmental impacts were identified during third-party site assessments, stakeholder consultations, and via publicly available information.

The inherent consequence associated with an environmental impact was assigned to reflect the potential if works were to proceed with no controls. The consequence classification is assigned based on **Table 4—2**.

3.1 Risk Management Controls

To minimise the potential impact of an unwanted event, the relevant section of *The Code of Practice: Onshore Petroleum Activities in the Northern Territory* (*the Code*) has been identified, as well as additional risk controls (preventative, detective, mitigative) and listed within **Appendix 04** [DENR, 2019].

3.2 Code of Practice

For each identified environmental factor, risk source, and potential impact, a corresponding section of *the Code* will be applied to mitigate potential impacts.

3.3 Risk Controls

Risk controls (e.g., systems, processes, people, barriers) either work to prevent the risk from occurring (preventative) or to mitigate the impact once the risk has occurred (mitigative).

Controls are classified in alignment with the hierarchy of controls to reflect how the controls aid in reducing the risk to as low as reasonably practicable (ALARP).

Some preventative and mitigative controls are deemed key or critical controls. Critical controls are those that, if absent, would increase the risk of an impact.

Critical controls are identified in the risk assessment for inherent consequence levels of Low and above and will be monitored as reflected in **Section 8.7** of the **EMP** (Environmental Outcomes, Performance Standards & Measurement Criteria).

4. Risk Assessment

After controls are identified, the residual Likelihood (**Table 4—1**) and residual consequence (**Table 4—2**) are assessed to determine residual risk rating.

Table 4—1 Likelihood

Level	Criteria
Almost Certain	**<4 monthly** Occurs in almost all circumstances OR could occur within days to weeks.
Likely	**4 monthly – 1 yearly** Occurs in most circumstances OR could occur within weeks to months.
Occasional	**1 – 3 yearly** Has occurred before at Santos OR could occur within months to years.
Possible	**3– 10 yearly** Has occurred elsewhere OR could occur within years.
Unlikely	**10 – 30 yearly** Has occurred elsewhere OR could occur within decades.
Remote	**30 – 100 yearly** Required exceptional circumstances and is unlikely even in the long term OR only occurs as a 'one in 100-year event'.

Table 4—2 Consequence

		Environment	Community and Reputation
Irreversible Impact	**VI**	• Irreversible impact on Environmental Values (EV(s)).	• Sustained national community criticism or widespread protest. • Industry reputation and approvals impacted. • Changes at executive/board level of long-term share price impact (>month).
Extensive Impact	**V**	• Extensive population or community scale impact on EV(s) of conservation significance.* • Extensive impact on other EV(s).	• National community criticism of large-scale protest. • Company reputation and approvals impacted. • Shareholder intervention or short-term share price impact (<month).
Severe Harm	**IV**	• Large-scale impact to EV(s) of conservation significance.*. • Moderate-scale surface water impact. • Localised impact on groundwater with potential or known beneficial use.	• State-level community criticism or protest over multiple days/locations. • State-based company reputation impacted. • Very short-term share price impact (<week).
Moderate Harm	**III**	• Moderate-scale impact on EV(s) of conservation significance. • Localised surface or groundwater impact.	• Local community criticism (>week) or one-day community protest. • Local company reputation impacted.
Minor Harm	**II**	• Small-scale impact to EV(s) of conservation significance.* • Potential surface of groundwater impact.	• Minor level local community criticism (<week). • No reputation impacts.
Negligible Harm	**I**	• No impact on EV(s).	• No actual or potential community criticism. • Details remain with the Interest Holder's sites and/or offices. • Incident reporting according to routine protocols.

*A conservation significant value is subject to legal protection through regulation or has been identified as a priority by government in terms of special protection or management.

Residual risk is determined by the combination of likelihood and consequence classification using the Risk Matrix (**Table 4—3**).

The assessment of environmental risk depends on the nature of the receiving environment. Therefore, not all elements under each category will be applicable. A significant conservation value is subject to legal protection through regulation or has been identified as a priority by the government in terms of special protection or management.

Table 4—3 Risk Matrix

Consequence / Likelihood		Negligible	Minor Harm	Moderate Harm	Severe Harm	Extensive Impact	Irreversible Impact
		I	II	III	IV	V	VI
Almost Certain	f	Low	Medium	High	Very High	Very High	Very High
Likely	e	Low	Medium	High	High	Very High	Very High
Occasional	d	Low	Low	Medium	High	High	Very High
Possible	c	Very Low	Low	Low	Medium	High	Very High
Unlikely	b	Very Low	Very Low	Low	Low	Medium	High
Remote	a	Very Low	Very Low	Very Low	Low	Medium	Medium

5. Risk Level and Acceptability

The resulting risk level of the assessment determines the actions and control development requirements as per **Table 5—1**. As Low As Reasonably Practical (ALARP) is referred to as So Far as Is Reasonably Practicable (SFAIRP) in **Table 5—1**.

Table 5—1 Risk Level, Action, Control Development

Risk Level	Action	Control Development and Timeframe
Very Low	• Risk to be managed as stipulated by the related work processes.	• Manage and monitor risk efficiently in accordance with business management plans.
Low	• Assess risk to determine SFAIRP. • If SFAIRP, works related to the maintenance of controls will be prioritised and managed. • If not SFAIRP, improve existing controls and/or implement new control(s) • Incidents are assessed using Mining the Diamond and investigated relative to the incident potential.	• Manage and monitor risk efficiently in accordance with the business management plan.
Medium	• Assess risk to determine if SFAIRP. • If SFAIRP, works related to the maintenance of controls will be prioritised and managed. • If not SFAIRP, improve existing controls and/or implement new control(s). • Incidents are assessed using Mining the Diamond and investigated relative to the incident potential.	• Manage and monitor risk efficiently in accordance with business management plans.

Risk Level	Action	Control Development and Timeframe
High **Very High**	• Following verification of the risk as 'Very High', the Activity must stop. • Activity cannot recommence until controls are implemented to reduce risk to 'High' or lower. • For incidents, a dedicated multi-disciplinary incident investigation team will be formed. • Level 3 Manager or ExCom member will be included in the investigation team. • Assess risk to determine if it is reduced to So Far As Is Reasonably Practicable (SFAIRP). • If SFAIRP, works related to the maintenance of controls will be prioritised and managed. • If not SFAIRP, improve existing controls and/or implement new control/s. • For incidents, a dedicated multi-disciplinary incident investigation team will be formed.	• Intolerable Risk Level. • Develop and implement controls urgently to reduce risk to 'High' or lower as soon as practicable. • Involve a multi-disciplinary team to review the plan prior to commencing any Activity. • Action to reduce risk level to 'Medium' or below.

Risk level acceptance criteria comprise:

- Very High level of risk is unacceptable.
- Low to High risk levels, if reduced to SFAIRP, are acceptable when risks are being managed and monitored in accordance with business management plans.
- Very Low risk levels are acceptable.

6. As Low As Reasonably Practicable (ALARP)

A risk is reduced to ALARP when all the requirements of the Code have been met, all reasonably practicable risk management controls have been identified and implemented, and the cost of further reducing the risk is disproportionate to the benefit. ALARP is referred to as So Far as Is Reasonably Practicable (SFAIRP) in **Table 5—1**.

To assist in the determination of ALARP, the below are considered:

- **Good Practice Control Measures:** Legislation, codes, and standards identify the requirements of legislation, codes and standards that are to be complied with for the Activity.
- **Good Industry Practice:** Risk management controls, standards and guidelines that may be applied over and above those required to meet the legislation, codes, and standards.
- **Professional Judgement:** Alternative controls identified by personnel with relevant knowledge and experience. The hierarchy of controls philosophy is a system used in the industry to identify effective controls to minimise or eliminate exposure to impacts or risks. This philosophy is applied when formulating control measures for each potential environmental impact or risk.
- **Risk-based Tools such as Cost-based Analysis or Modelling:** Probabilistic analyses, such as modelling, quantitative risk assessment and/or cost-benefit analysis to support the selection of control measures identified during the risk assessment process.
- **Precautionary Approach:** Uncertain analysis is replaced by conservative assumptions that will make control measures more likely to be implemented.
- Based on the identified impacts, and the ranking of their pre-treatment risk, control measures were identified in accordance with the defined environmental performance outcomes, to eliminate, prevent, reduce or mitigate consequences associated with each of the identified environmental impacts. Control measures were identified through previous surveys, in workshops and through review of best practice techniques across the industry. When determining whether the risk or impact has been reduced to ALARP, it must be asked whether environmental risks can be lowered further without a grossly disproportionate increase in impost.

7. Scientific Uncertainty

The Petroleum (Environment) Regulations require an assessment of Scientific Uncertainty. The evaluation of potential impacts and effectiveness of controls must demonstrate that the works are carried out according to the Ecologically Sustainable Development principles (ESD) to ensure that all works conducted do not impact the environment's future amenities [NT Government, 2016b].

Uncertainty is high where confidence in the available information is low in identifying risk or the effectiveness of management control.

Per the EMP Guidelines, scientific certainty is qualitatively assessed using a generic means of ranking the data available in **Table 7—1** [Northern Territory Government, 2021].

Table 7—1 Acceptability and Scientific Uncertainty

Score (Uncertainty Type)	Acceptability	Uncertainty Description [EFSA, 2009]
Low	• Residual risk is acceptable, and it is assumed that ALARP has been achieved. • Risks are well understood and established practice.	• Comprehensive data with strong evidence in multiple peer-reviewed data. • Little disagreement between authors or experts. • Considerable and consistent on-ground experience and/or monitoring.
Medium	• Residual risk is acceptable, provided that ALARP has been achieved and demonstrated. • Risk type B are typically in areas of increased environmental sensitivity with some stakeholder concerns.	• Some or incomplete data is available. • Evidence provided based on a small number of references. • Authors' and experts' conclusions vary. • Limited on-ground experience and/or monitoring.
High	• Residual risk is intolerable and must not be accepted or approved by Management. • This risk will typically involve sufficient complexity, high potential impact, uncertainty, or stakeholder interest.	• Scarce or no data available; evidence provided in unpublished reports. • Few on-ground observations. • Authors' and experts' conclusions vary considerably.

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Risk Assessment

Appendix 04

Amadeus Basin: Jacko Bore 1DW1 Drill and Test Program

EP125

Santos QNT Pty Ltd

Date	Rev	Description	Initiated	Reviewed	Approved
14/02/2023	1	Approved for Use	KR	TS, JG, JH, LH, LD, VC	MD
16/06/2023	2	Approved for Use	TS	PS, NF	MD
15/12/2023	3	Approved for Use	TS	PS, NF	MD
03/05/2024	4	Approved for Use	NF	TS	DG
28/06/2024	5	Approved for Use for STO5-5	NF	TS	DG

Risk #	Environmental Factor	Risk Source	Impacts	INHERENT Consequence rating	Relevant Code of Practice Section	Risk Management Controls (inc. Prevention, Detection and Mitigation) Hierarchy of Controls - Elimination (Eli), Substitution (Sub), Engineering (Eng), Administrative (Admn), Personal Protective Measures (PPE)	Residual Risk			Acceptable Criteria Achieved	Scientific Uncertainty Ranking
							C	L	R		
AIR QUALITY AND ATMOSPHERIC PROCESSES											
1	Air Quality and Atmospheric Processes	Emissions from well infrastructure during and post activity completion (inc. flaring).	Reduction in air quality.	IV	D.5.1 Methane Emissions Management Plan D.5.2 Inspection Frequency and Procedure D.5.3 Standard Leak Detection Instruments D.5.9.4 Other Fugitive Emission Sources Mandatory Requirements	• Diesel use by stationary plant recorded and flaring volumes estimated for reporting in the National Greenhouse and Energy Reporting Scheme. (Detection) (Admn) • Well-designed per the Code of Practice: Onshore Petroleum Activities in the Northern Territory (the Code) and API standards. (Prevention) (Eng) • Gas encountered during the extended production test will be flared whenever possible in accordance with the Code. (Prevention) (Sub) - Critical Control • Flare designed and operated to achieve 98% combustion efficiency in line with US EPA 40. (Prevention) (Eng) • Identified leaks rectified as per the Methane Emissions Management Plan (Appendix 10) and/or escalated as per the Emergency Response Plan. (Appendix 13) (Mitigation) (Admn)	IV	C	M	Yes	Medium
2	Air Quality and Atmospheric Processes	Emissions from vehicles, machinery	Reduction in air quality.	IV	No section directly applicable	• Vehicles and stationary machinery maintained in accordance with the Original Equipment Manufacturer's procedures. (Prevention) (Admn) - Critical Control • Diesel use recorded for reporting in the National Greenhouse and Energy Reporting Scheme. (Detection) (Admn) • Water bore/s located on the well pad, or within close proximity to the well pad, to reduce vehicle movements for drilling make up water. (Prevention) (Eng)	IV	C	M	Yes	Low
3	Air Quality and Atmospheric Processes	Nuisance (dust) from vehicle movements, slashing and construction-related works.	Reduction in air quality.	II	A.3.1 Site selection and Planning	• The Interest Holder will use a water truck to manage dust as necessary during dry and windy weather. (Prevention) (Eli) • Begin site rehabilitation at the cessation of activity. (Prevention) (Eli) • Limited civil construction is required for campsite location or gravel / borrow pit/s for construction materials (Prevention) (Sub) • 60km/hr speed limits on unsealed roads and project access tracks. (Prevention) (Admn)	II	B	VL	Yes	Low
COMMUNITY AND ECONOMY											
4	Community and Economy	Movement of vehicles and machinery on public and private roads to and from the Project Area.	Degradation of public and private roads/infrastructure.	II	A.3.1 Site Selection and Planning A.3.2 Well Pad Site Selection Requirements A.3.9 Rehabilitation	• Engagement with stakeholders is detailed in the Stakeholder Engagement Log (Appendix 11), with any feedback, objections, or complaints reviewed with either Santos Management System (SMS) SMS-ESG-OS01-PD03 (Community and Landholder Complaints Procedure) or SMS-GXA-OS01-PD02 (External Stakeholder Procedure for Environment Approvals) for action (Prevention) (Admn) - Critical Control • Implementation of the Erosion and Sediment Control Plan (Appendix 05). (Prevention) (Eng) - Critical Control • 60 km/h speed limit on unsealed roads, and adhering to speed limit on public roads, to limit degradation of roads (Prevention) (Eng) - Critical Control • Dust suppression (by water truck) will be used as necessary during dry and windy weather. (Prevention) (Eli) • Traffic impact assessment has been completed, and no road upgrades are required. (Detection) (Admn)	II	C	L	Yes	Low
5	Community and Economy	Nuisance (noise) from Project Activity, inc. vehicle movements, construction, drilling, completions, and EPT-related works.	Disturbance to people.	II	A.3.1 Site Selection and Planning A.3.3 Noise	• Engagement with stakeholders is detailed in the Stakeholder Engagement Log (Appendix 11), with any feedback, objections, or complaints reviewed with either Santos Management System (SMS) SMS-ESG-OS01-PD03 (Community and Landholder Complaints Procedure) or SMS-GXA-OS01-PD02 (External Stakeholder Procedure for Environment Approvals) for action (Mitigation) (Admn) - Critical Control. • Engines/machinery, including existing attenuation, will be maintained in accordance with the Original Equipment Manufacturer's procedures. • The Interest Holder will conduct noise monitoring to inform the nature of controls (shielding, mufflers, etc.) if deemed required to resolve any complaint received from the rural residential/ sensitive receptor to maintain noise levels in line with the project intrusiveness table of the Northern Territory Noise Management Framework Guideline (Prevention) (Eng) • Adhere to and clearly communicate working hours to all personnel and contractors (civils restricted to daylight hours). (Mitigation) (Admn)	II	B	VL	Yes	Low
6	Community and Economy	Nuisance (light) from Project Activity, inc. vehicle movements, construction, drilling, completions, and EPT-related works.	Disturbance to people.	II	A.3.1 Site Selection and Planning	• Consultation with the community and landowners on the Activity is detailed in the Stakeholder Engagement Log (Appendix 11). (Prevention) (Admn) - Critical Control • Task-focused lighting will be used, and all boundary lighting will be positioned inwards at the drill site and camp. (Prevention) (Admn) • Adhere to and clearly communicate working hours to all personnel and contractors (civils restricted to daylight hours). (Mitigation) (Admn)	II	B	VL	Yes	Low
7	Community and Economy	Completion of ancillary and regulated works without input/involvement of local businesses or people (e.g., environmental assessments, drilling, monitoring).	Loss of potential revenue.	III	No section directly applicable	• Providing opportunities for employment through tender and procurement processes for locals and indigenous business. (Prevention) (Admn) - Critical Control • Preferential use of local businesses, facilities and suppliers, where practicable and the locals capable. (Prevention) (Admn) • Santos commitment to ensure 20% of project spend is locally within the NT. (Prevention) (Admn)	III	C	L	Yes	Low
8	Community and Economy	Ignition sources from people, plant, machinery, or flaring causing bushfires.	Loss of pasture, dwellings, infrastructure or stock.	IV	A.3.7 Fire Management	• The implementation of the site-specific Fire Management Plan (Appendix 08), which includes preparation and planning information, action and mitigation measures, and stakeholder and emergency contact information. (Mitigation) (Admn) • Consultation and coordination with pastoralists regarding fire management obligations. (Prevention) (Admn) • Clearing of fire breaks or access trails of ~10 m around the campsite and well pad (Mitigation) (Eng) - Critical Control • Fire break monitored yearly and kept clear of bushfire risk material (Mitigation) (Eng) • Monitoring and inspection to align with the annual works calendar in the Fire Management 1-pager. (Prevention) (Eng) • Daily checks of BOM fire and weather forecasts during operations (Detection) (Admn) • Training and inductions will cover designated smoking areas, the location of fire fighting equipment, and emergency response. (Prevention) (Admn) • Flaring to occur within a 25m vegetation exclusion zone radius. (Prevention) (Admn) - Critical control • Fire extinguishers and operational radios will be fitted to vehicles, and fire extinguishers located at the campsite. (Mitigation) (Admn) • Water will be available (water bores, turkey nest, tanks, etc.) available for firefighting during operations. (Mitigation) (Eng)	IV	B	L	Yes	Low
9	Community and Economy	The addition of constructed infrastructure (e.g., expanded well pad, new access tracks, re-established gravel/borrow pit/s and campsite) to the land.	Restriction to pastoral use of land.	I	A.3.1 Site Selection and Planning A.3.2 Well Pad Site Selection Requirements A.3.9 Rehabilitation	• Use of pre-existing access tracks, well pad, campsite, and gravel pit/s limits new infrastructure being added to the landscape and reduces the need to disturb mature and established vegetation. (Prevention) (Sub) • The landholder has agreed to placement of the infrastructure as stipulated in the Land Access agreements. (Prevention) (Admn) • Consultation with pastoralists is undertaken to identify potential impacts on their works and agree on mitigation evidenced in the Stakeholder communication log. (Mitigation) (Admn) • Upon project completion, drilling pits will be re-instated when no longer required. (Prevention) (Eng) • Sites no longer required for the Activity of future Activity are rehabilitated to pre-disturbance conditions as per the Rehabilitation Management Plan (Appendix 12). (Mitigation) (Eng)	I	C	VL	Yes	Low
CULTURE AND HERITAGE											

Risk #	Environmental Factor	Risk Source	Impacts	INHERENT Consequence rating	Relevant Code of Practice Section	Risk Management Controls (inc. Prevention, Detection and Mitigation) Hierarchy of Controls - Elimination (Eli), Substitution (Sub), Engineering (Eng), Administrative (Admn), Personal Protective Measures (PPE)	Residual Risk			Acceptable Criteria Achieved	Scientific Uncertainty Ranking
							C	L	R		
10	Culture and Heritage	Ground disturbance from the construction, or use of infrastructure (e.g., expanded well pad and new access track, existing waterway crossingwater extraction).	Damage to Aboriginal artefacts and/or cultural heritage and sacred sites.	IV	A.3.1 Site selection and Planning	• Use of pre-existing access tracks, campsite, gravel pit/s and well pad to limit new disturbance. (Prevention) (Eng) • Existence of restricted areas are to be checked prior to the Activity to verify restricted areas will not be breached during the Activity as per the prescribed management conditions of the AAPA certificate. (Prevention) (Admn) • After the construction phase, all vehicles must stay on designated access tracks. (Prevention) (Admn) • An AAPA Authority Certificate has been obtained and the Proposed Activity must comply with the conditions in the Certificate. (Detection) (Admn) • Recommendations from the Historical Heritage Archaeological Report (Appendix 01.01) will be assessed before all works. (Prevention) (Admn) • Inductions are to cover the importance of reporting all potential artefacts or cultural heritage sites. (Prevention) (Admn) • ESC measures in place as per the Erosion and Sediment Control Plan (Appendix 05). (Prevention) (Eng) - Critical Control • During the wet season, chemicals or wastewater is not to be transported during a significant rain event (>150 mm over 4 days forecast). (Prevention) (Eli) • During the wet season, if chemicals or wastewater is to be transported, a Santos road status report detailing road condition advice will be completed for unsealed roads within the Project Area (Prevention) (Admn) • In the event of a chemical or wastewater transport fuel transport vehicle becoming bogged, Section 7.2 of the Spill Management Plan (Appendix 07) is to be followed so extraction works are conducted safely and prevent loss of contents. If contents are lost, the Emergency Response Plan is to be activated (Section 8 - Communication) (Mitigation) (Eng) - Critical Control • If chemicals or wastewater are to be transported, watercourse crossings will not have >30 cm of flowing water in them at the time of the proposed transport. • All significantly disturbed associated with the Activity rehabilitated as per the Rehabilitation Management Plan (Appendix 12) to a stable and self-sustaining landform. (Mitigation) (Eng) • Groundwater extraction licence in place, from bore/s assessed not to impact groundwater-dependent ecosystems, and volumes used recorded in accordance with ground water extraction licence (Prevention) (Eng). • All unexpected finds will be managed in accordance with Santos Management System (SMS) 'SMS-EXA-OS02-PD02 – Cultural Heritage Procedure (Detection) (Admin)	IV	B	L	Yes	Low
HUMAN HEALTH											
11	Human Health	Nuisance (dust) from the Activity	Health of landowners and/or community.	II	A.3.1 Site Selection and Planning	• Use of pre-existing tracks to access the well pad, campsite, and gravel pit/s to avoid clearing associated dust. (Prevention) (Sub) • A 60 km/hr speed limit on unsealed roads and project access tracks will be implemented. (Prevention) (Admn) • Dust suppression measures will be implemented in the Project Area during periods of high traffic. (Prevention) (Eli) - Critical Control • Engagement with stakeholders is detailed in Stakeholder Engagement Log (Appendix 11) feedback, objections, or complaints reviewed in accordance with either Santos Management System (SMS) SMS-ESG-OS01-PD03 (Community and Landholder Complaints Procedure) or SMS-GXA-OS01-PD02 (External Stakeholder Consultation Procedure for Environment Approvals) for action. (Mitigate) (Admn)	II	D	L	Yes	Low
INLAND WATER ENVIRONMENTAL QUALITY											
12	Inland Water Environmental Quality	Loss of well circulation while drilling.	Reduced quality of groundwater and contamination of aquifers.	III	B.4.2 Aquifer Protection B.4.10 Drilling Fluids B.4.3 Well Design and Well Barriers B.4.6 Casing and Tubing B.4.7 Primary Cementing B.4.9 Well Control B.5 BTEX Limits	• Well design and hole size informed by Jacko Bore 1. (Prevention) (Eng) • Drilling fluid and Loss Circulation Material additives are to be available to maintain mud weight/consistency to prevent or remediate losses. (Mitigation) (Eng) • A groundwater pit or storage tank will be located on the well pad. Water bores will be located on the well pad where possible, otherwise located in close proximity to the well pad for drilling fluid make up water during losses. (Mitigation) (Eng) • Monitoring of drilling fluids for gains/losses and mitigation measures. (Detection) (Eng) • Drilling additives selected and utilised based on manufacturer's recommendations and safety data sheets. (Prevention) (Admn) • Drilling fluid additive name, type and quantity utilised recorded in daily well drilling reports. (Mitigation) (Admn) • Drilling will be completed using water-based, not oil-based, drilling fluid additives. (Mitigation) (Eng) • When drilling through freshwater aquifers, non-ecologically toxic additives will be utilised. (Mitigation) (Eng) - Critical Control • Aquifers isolated behind casing and cement barriers before drilling of the target formation. (Prevention) (Eng) • Drilling fluid additives not to contain BTEX above the levels prescribed in B.5 of the Code. (Prevention) (Eng)	III	C	L	Yes	Low
13	Inland Water Environmental Quality	Loss of well control (subsurface).	Reduced quality of groundwater and contamination of aquifers.	V	B.4.1 Well Integrity Management B.4.2 Aquifer Protection B.4.10 Drilling Fluids B.4.3 Well Design and Well Barriers B.4.6 Casing and Tubing B.4.7 Primary Cementing B.4.9 Well Control	• The approved Well Operations Management Plan (WOMP) implemented. (Prevention) (Eng) - Critical Control • The well plan is informed by the Jacko Bore 1 well, including the mud weight design above pore pressure. Fluid additives are mixed on-site to increase mud weight if required, the use of industry-recognised fluid suppliers, well control training and well control procedures in place. (Prevention) (Eng) • The Interest Holder's well control standard is based on conventional well control methods using the Driller's Method to remove an influx and counter an overbalance, is adequate to manage any situation that can be realistically expected to arise in terms of well control. (Prevention) (Admn) • Well control-related Emergency Response Drills to be conducted in line with the Emergency Response Plan (Appendix 13). (Mitigation) (Admn)	V	A	M	Yes	Low
14	Inland Water Environmental Quality	Leak in the drilling by-product storage pit liner.	Reduced quality of groundwater and reduced soil productivity and viability.	III	A.3.8 Containment of Contaminants B.4.16 Site material and Fluids Management	• Drilling pits will be lined with an impermeable membrane (Prevention) (Eng) - Critical Control • During use, the drilling pits (sumps) will be monitored and inspected daily during the wet season and weekly during the dry season. (Detection) (Admn) • Post drilling and testing, fluid level monitoring will be daily during the wet season and weekly during the dry season level monitoring via telemetry/cameras. (Detection) (Admn) • Drilling pits (sumps) to be re-instated post drilling activity (when no longer required) as per the Rehabilitation Management Plan (Appendix 12). (Prevention) (Admn)	III	C	L	Yes	Low
15	Inland Water Environmental Quality	Use of groundwater for construction and drilling works.	Reduced groundwater availability.	III	C.6.1 Water and wastewater tracking and reporting requirements	• Compliance with conditions of water take licences, granted in accordance with NT Water Act [DEPWS, 1992] under Water Extraction Licence. (Prevention) (Admn) - Critical Control • Residual drilling fluids generated during well drilling works will be re-used by the use of solids control equipment (shakers and centrifuges). They will be stored in a drilling pit for settling out solids for ease in recycling. (Prevention) (Sub) - Critical Control	III	B	L	Yes	Low
LANDFORMS											
16	Landforms	The addition of constructed infrastructure (e.g., expanded well pad, new access tracks, re-established gravel/borrow pit/s and campsite) to the land.	Reduced visual amenity/ aesthetic.	I	A.3.1 Site selection and Planning A.3.2 Well Pad Site Selection Requirements A.3.9 Rehabilitation	• Use of pre-existing tracks to access the well pad, campsite and gravel pit/s to avoid clearing. (Prevention) (Sub) • The Landholder has agreed to the placement of infrastructure as evidenced in the Land access agreements before regulated operations commence. (Prevention) (Admn) • In terms of distance to the nearest sensitive receptor, the well pad and campsite are approximately 8.5 km from the closest settlement, Lyndavale homestead (Mitigation) (Eng).	I	A	VL	Yes	Low
TERRESTRIAL AND INLAND WATER ENVIRONMENTAL QUALITY											
17	Terrestrial and Inland Water Environmental Quality	Sediment release from cleared infrastructure during project operations.	Reduced quality of surface water, reduced soil productivity and viability.	III	A.3.4 Erosion and Sediment Control and Hydrology	• Inspection of ESC measures post >10 mm of rain in 24 hours to check that devices are not impacted (if site access available) during operations. Until deemed unnecessary by an (Certified Professional in Erosion and Sediment Controls) CPESC or until commencement of site rehabilitation (Prevention) (Eng). • Monitoring to occur annually, at the end of the wet season, until rehabilitation success criteria are met, deemed unnecessary by a CPESC or at the completion of rehabilitation. (Prevention) (Admn) • Sediment control measures are to be maintained such that their capacity does not fall below 70% (Prevention) (Eng) • Inductions will cover the importance of reporting all environmental incidents, inc. spills and sediment releases. (Prevention) (Eng) • The well pad will be designed with a slope (<2%) so rainfall collected on the well pad will runoff from the compacted areas in a controlled manner. (Mitigation) (Eng) Rehabilitation will include respreading topsoil where pits are rehabilitated due to material being exhausted temporary erosion and sediment control measures that will be maintained until final rehabilitation. (Detection) (Eng)	III	B	L	Yes	Low

Risk #	Environmental Factor	Risk Source	Impacts	INHERENT Consequence rating	Relevant Code of Practice Section	Risk Management Controls (inc. Prevention, Detection and Mitigation) Hierarchy of Controls - Elimination (Eli), Substitution (Sub), Engineering (Eng), Administrative (Admn), Personal Protective Measures (PPE)	Residual Risk			Acceptable Criteria Achieved	Scientific Uncertainty Ranking
							C	L	R		
18	Terrestrial and Inland Water Environmental Quality	Land disturbance from construction of infrastructure	Increased sediment load in rain water runoff.	II	A.3.1 Site selection and planning A.3.4 Erosion and Sediment Control and Hydrology A.3.9 Rehabilitation	• Well pad constructed with bund/berms to divert water from going on-site and facilitate water flow from on-site to erosion and sediment control measures per the Erosion and Sediment Control Plan (Appendix 05) during rainfall events. • Storm water collected on site diverted through Type 3 erosion and sediment control measures as per the Erosion and Sediment Control Plan (Appendix 05) . (Prevention) (Eng) - (Critical Control) • Inspection of ESC measures post >10 mm of rain in 24 hours to check that devices are not impacted (if site access available) during operations. Until deemed unnecessary by a (Certified Professional in Erosion and Sediment Controls) CPESC or until the commencement of site rehabilitation (Prevention) (Eng). • Monitoring to occur annually, at the end of the wet season, until rehabilitation success criteria are met, deemed unnecessary by a CPESC or at the completion of rehabilitation. (Prevention) (Admn) • Sediment control measures are to be maintained such that their capacity does not fall below 70% (Prevention) (Eng) • Infrastructure designed in accordance with the NT Land Clearing Guidelines [DEPWS, 2020, 2021]. (Prevention) (Eng)	II	B	VL	Yes	Low
19	Terrestrial and Inland Water Environmental Quality	Overflow of drilling by-product storage pit or tanks, or failure of embankment from flooding or inundation.	Reduced quality of surface water, reduced soil productivity and viability.	III	A.3.8 Containment of Contaminants C.5.2 Drilling Materials C.7.1 Wastewater Management Plan C.7.2 Spill Management Plan	• Well pad constructed with bund/berms (up to 1.5 m) to divert water from going on-site and facilitate water flow from on-site to erosion and sediment control measures during rainfall events. (Prevention) (Eng) • On-site pit for storage of drilling by-products constructed with a perimeter bund of 500 mm to prevent water entry from overland flow. (Prevention) (Eng) - Critical Control • Drilling material storage pit is designed with a target freeboard level (distance from the top of the pit to the level of the drilling by-products) of 400 mm and, a minimum freeboard of 300 mm to ensure the pit does not overflow. (Prevention) (Eng) - Critical Control • Pit and tank fluid levels will be monitored daily in the wet season and weekly in the dry season. (Prevention) (Eng) • Drilling pit will be re-instated and stabilised as per the Rehabilitation and Waste Water Management Plans (Appendix 12 and 06) at the cessation of Activity (when no longer required) during the dry season. (Prevention) (Eng) • Implementation of the Spill Management Plan (Appendix 07). (Detection) (Admn) • Emergency Response Plan (Appendix 13 Section 8 Emergency Communications) to be enacted if a breach is identified. (Mitigation) (Eng)	III	C	L	Yes	Low
20	Terrestrial and Inland Water Environmental Quality	Spills of fluid additives, chemicals, produced fluid or fuel at storage at handling points.	Reduced quality of surface water, reduced soil productivity and viability.	II	A.3.8 Containment of Contaminants B.4.16 Site Material and Fluid Management C.3 Wastewater Management Framework C.7.1 Wastewater Management Plan C.7.2 Spill Management Plan	• Bunds/drip trays used when re-fuelling and placed under hose connections and valves. (Prevention) (Eli) • Secondary containment used at fluid additive, oil, and fuel storage areas. Secondary containment will have the capacity to hold 100% of the volume of the largest container stored in the area plus 10% unless the container is already equipped with individual secondary containment. (Prevention) (Eli) • Secondary containment will be monitored daily during the wet season and weekly during the dry season (when in use) and damages repaired as soon as practicable when identified. (Prevention) (Admn). • Above-ground tanks remotely monitored for leaks. (Prevention) (Admn) - Critical Control • All liquid storage will be inspected daily during the wet season and weekly during the dry season during operations. Post operations monitoring remotely with telemetry/camera until tanks and pits removed.(Prevention) (Admn) - Critical Control • Construction of overland flow bunded and compacted tank pads for above-ground tanks for produced fluid, and condensate storage during Extended Production Testing (EPT). The tank pad surface will be compacted to above-ground tank vendor requirements to ensure stability and reduce infiltration. (Prevention) (Eng) • Above-ground tanks to have secondary containment compliant with A.3.8 of *the Code* . Above-ground tanks will be double-lined/walled or bunded to 110% capacity of the largest tank (Prevention) (Eng) • Spill kits stocked and available on-site to respond to spills. (Mitigation) (PM) • Training and induction covering the importance of notifying of all spills and locations of spill kits. (Prevention) (Admn) • Implementation of the Wastewater and Spills Management Plans (Appendix 06 and 07) that describe levels of spills and associated response and incident reporting guidance. (Detection) (Admn) • Spill specific Emergency Response Drills to be conducted in line with the Emergency Response Plan (Appendix 13). (Mitigation) (Eng)	II	C	L	Yes	Low
21	Terrestrial and Inland Water Environmental Quality	Spills of fluid additives, chemicals, produced fluid or fuel during transport e.g. within SOC/SOB	Reduced quality of surface water, soil productivity, viability and habitat.	III	A.3.8 Containment of Contaminants C.7.1 Wastewater Management Plan C.7.2 Spill Management Plan	• Vehicles and equipment maintained as per Original Equipment Manufacturer's specifications. (Prevention) (Admn) • Drilling, completions, and cementing additives are correctly labelled and transported within suitable containers. (Prevention) (Admn) • Residual drilling, completions fluids and wastewater re-used during operations where practicable to minimise transport to off-site disposal facilities as detailed in the Waste Water Management Plan (Appendix 06). (Prevention) (Sub) - Critical Control • Heavy vehicle operators are trained and licensed to transport chemicals and wastes as per the Dangerous Goods [Justice, 1998] and Waste Management and Pollution Control Act [DEPWS, 1998]. (Prevention) (Admn) • Manifests, certificates, and Safety Data Sheets accompany all loads to aid in spill response and reporting in accordance with the Spill Management Plan (Appendix 07). (Mitigation) (Admn) • Saturated solid, extracted from tanks or drilling by-product pits will be covered when transported. (Prevention) (Eli) • During the wet season, chemicals or wastewater is not to be transported during a significant rain event (>150 mm over 4 days forecast). (Prevention) (Eli) • During the wet season, if chemicals or wastewater is to be transported a Santos road status report detailing road condition advice will be completed for unsealed roads within the Project Area (Prevention) (Admn) • In the event of a chemical or wastewater transport vehicle becoming bogged, Section 7.2 of the Spill Management Plan (Appendix 07) is to be followed so extraction works are conducted safely and prevent loss of contents. If contents lost the Emergency Response Plan is to be activated (Section 8 - Communication) (Mitigation) (Eng) - Critical Control • If chemicals or wastewater is to be transported, watercourse crossings will not have >30 cm of flowing water in them at the time of the proposed transport. • Implementation of Wastewater and Spills Management Plans (Appendix 06 and 07) that describes levels of spills and associated response and incident reporting guidance. (Prevention) (Admn) • Transport unsealed roads speed limited to 60 km/hr (Prevention) (Admin) • No storage, set down, transfer of chemicals (including re-fuelling) will occur within the SOCS located within the Project Area. (Prevention) (Eli)	III	B	L	Yes	Low
22	Terrestrial and Inland Water Environmental Quality	Vegetation and soil stripping for well pad expansion, new access tracks and re-establishment of campsite gravel/borrow pit/s and access tracks increases soil erosion and sediment loss.	Reduced quality of surface water and reduced soil productivity and viability.	III	A.3.1 Site Selection and Planning A.3.4 Erosion and Sediment Control and Hydrology A.3.9 Rehabilitation	• Site selection of Jacko Bore 1 on existing well pad instead of new pad. (Prevention) (Sub) • Primary access to the well pad, gravel pit and campsite via existing tracks to limit new clearing. (Prevention) (Admn) • Erosion and sediment controls for all project infrastructure (inc. pre-existing tracks) will be installed, maintained, and monitored as per the site-specific Erosion and Sediment Control Plan (Appendix 05) (Prevention) (Eng) - Critical Control • Ecologists utilised to ground-truth locations in advance of any ground disturbance to ensure: o The actual riparian zones and the buffers for drainage depressions, stream orders 1 to 4, and the location and density of hollow-bearing trees and their buffers are identified and avoided. (Prevention) (Eng) o The location of the well pad and gravel pit is already established and will not require the clearing of riparian zones or their buffers (Prevention) (Eng) • Training and inductions to cover the importance of reporting all environmental incidents, inc. spills and sediment releases. (Prevention) (Admn) • The Interest Holder will avoid clearing larger trees (utilising the Decision tree). (Prevention) (Eli) • Topsoil stripped and stockpiled <1.5m high to preserve seed bank. (Mitigation) (Eng) • Rehabilitation of drilling by-product pits, the campsite and gravel pits to stable landforms when no longer required for operations. (Prevention) (Admn) • Progressive rehabilitation of sites at the cessation of activity (when infrastructure is deemed to be no longer required) to include temporary erosion and sediment control measures that will be monitored until final rehabilitation (Appendix 12). (Prevention) (Eng) • Monitoring and maintenance of ESC measures and management of weeds until final rehabilitation complete, inc. site inspections pre and post-rainfall. (Prevention) (Eng) • Where producing groundwater bores cannot be established on the well pad, an alternative location will be located in naturally clear areas adjacent to access tracks within the well corridor. (Prevention) (Eng)	III	B	L	Yes	Low
TERRESTRIAL ECOSYSTEMS											
23	Terrestrial Ecosystems	Entrapment of fauna or stock in drilling by-product storage pit.	Injury or death of fauna or stock.	II	A.3.5 Biodiversity Protection A.3.8. Containment of Contaminants C.2 Water and wastewater to which this Code Applies	• Well pad will be fenced to keep wildlife from entering the site. (Prevention) (Eng) • Fauna ladder will be installed to provide an exit for fauna from the pit if they fall in. (Mitigation) (Eng) - Critical Control • Daily monitoring of the drilling pits during operations by the site team. (Prevention) (Eng) - Critical Control • Post operations pit monitoring remotely with telemetry/camera. (Prevention) (Admn) • Fauna spotters to assist if trapped fauna are identified (where available). (Prevention) (Admn)	II	C	L	Yes	Low

Risk #	Environmental Factor	Risk Source	Impacts	INHERENT Consequence rating	Relevant Code of Practice Section	Risk Management Controls (inc. Prevention, Detection and Mitigation) Hierarchy of Controls - Elimination (Eli), Substitution (Sub), Engineering (Eng), Administrative (Admn), Personal Protective Measures (PPE)	Residual Risk			Acceptable Criteria Achieved	Scientific Uncertainty Ranking
							C	L	R		
24	Terrestrial Ecosystems	Nuisance (noise) from the Activity, inc. vehicle movements, construction, drilling, completion and EPT-related works.	Restriction of fauna or stock movements.	I	A.3.1 Site Selection and Planning A.3.2 Well Pad Site Selection Requirements A.3.5 Biodiversity Protection	• Well pad, campsite, and gravel/borrow pit/s and new access tracks will be located outside Sites of Conservation Significance and Botanical Significance (Karinga Creek Paleodrainage system). (Prevention) (Sub) • Well pad, access track, gravel pit/s and campsite construction to occur during daylight hours. (Prevention) (Admn) • Speed limit of 60 km/hr on unsealed roads within Project Area. (Prevention) (Admn) • Maintain existing noise attenuation on all equipment (Prevention) (Admn) • Maintain all equipment to manufacturer's standard (Prevention) (Admn)	I	B	VL	Yes	Medium
25	Terrestrial Ecosystems	Nuisance (light) from the Activity, inc. vehicle movements, construction, drilling, completion and EPT-related works.	Restriction of fauna or stock movements.	I	A.3.1 Site Selection and Planning A.3.2 Well Pad Site Selection Requirements A.3.5 Biodiversity Protection	• Well pad, campsite, and gravel/borrow pit/s and new access tracks are located outside Sites of Conservation Significance and Botanical Significance (Karinga Creek Paleodrainage system). (Prevention) (Sub) • Well pad, access track, gravel pit/s and campsite construction to occur during daylight hours. (Prevention) (Admn) • Well pad and campsite lighting towers positioned inward toward the location centre. (Prevention) (Admn) • Task-focused lighting will be used, and all boundary lighting will be positioned inwards at the drill site and camp. (Prevention) (Admn) • Maintain all equipment to manufacturer's standard (Prevention) (Admn)	I	B	VL	Yes	Medium
26	Terrestrial Ecosystems	Land disturbance from construction of infrastructure i.e. well pad, access tracks, gravel/borrow pit/s and campsite.	Disturbance of habitat features/areas for flora and fauna.	III	A.3.1 Site selection and Planning A.3.5 Biodiversity Protection A.3.6 Weed Management	• Well pad, campsite, and gravel/borrow pits and new access tracks are located outside Sites of Conservation Significance and Botanical Significance (Karinga Creek Paleodrainage system). (Prevention) (Sub) • Utilising and re-establishing existing access tracks to travel between sites to minimise new disturbance. (Prevention) (Sub) • For spills, the Spill Management Plan (Appendix 07) and Emergency Response Plan (Appendix 13) will be used and actioned. (Mitigation) (Eng) • An ecologist will complete a survey prior to clearing operations to undertake ground-truthing before any ground disturbance to ensure civil works avoid clearance of mature vegetation. (Prevention) (Eng) - Critical Control • Avoid disturbance of previously undisturbed native vegetation by utilising previously cleared areas to limit disturbance to foraging areas for the Grey Falcon. (Prevention) (Eng) - Critical Control • Topsoil will be stockpiled <1.5 meters in height to maintain a seed bank to facilitate natural regeneration when re-spread during progressive rehabilitation. (Prevention) (Eng)	III	B	L	Yes	Medium
27	Terrestrial Ecosystems	Storage of waste attracts fauna or stock.	Fauna or stock accessing inappropriate food sources.	I	C.7.1 Wastewater Management Plan	• Drilling by-product pits will have fauna ladders and that will be verified in place during daily monitoring checks when pits contain drilling by-products. (Prevention) (Eng) • Covered kitchen waste containment bins. (Prevention) (Eli)	I	B	VL	Yes	Low
28	Terrestrial Ecosystems	Irrigation of greywater and treated sewage effluent attracts fauna or stock.	Fauna or stock accessing inappropriate food sources.	I	C.7.1 Wastewater Management Plan	• Greywater and treated sewage effluent irrigated with dispersion hoses and/or sprinklers to prevent pooling. (Prevention) (Admn) • Treated sewage effluent and greywater irrigation will occur >200 m from a water body, within a fenced vegetated area, with a slope of <5%. (Prevention) (Eng)	I	B	VL	Yes	Low
TERRESTRIAL ENVIRONMENTAL QUALITY											
29	Terrestrial Environmental Quality	Compaction from vehicle and machinery movements on access tracks and the well pad.	Restriction to successful site rehabilitation.	III	A.3.1 Site Selection and Planning A.3.4 Erosion and Sediment Control and Hydrology A.3.9 Rehabilitation	• I Use of pre-existing tracks to access the well pad and campsite which limits compaction by the nature of limiting new areas being open to compaction. (Prevention) (Admn) • Topsoil removed from the well pad stockpiled (<1.5m in height) and compacted soil on the well pad scarified before topsoil is respread. (Mitigation) (Eng) - Critical Control • Additional seeding if required by the Rehabilitation Management Plan (Appendix 12) (Mitigation) (Eng) Progressive rehabilitation of sites at the cessation of activity to be cultivated/harrowed to alleviate soil compaction before seeding. (Mitigation) (Eng)	III	B	L	Yes	Low
30	Terrestrial Environmental Quality	Pooling or runoff of greywater and treated sewage effluent from irrigation areas.	Reduced quality of surface water and reduced soil productivity and viability.	III	A.3.1 Site Selection and Planning A.3.5 Biodiversity Protection	• Irrigation completed by use of sprinklers or dispersion hoses to prevent pooling and runoff/attractants to fauna or stock. (Prevention) (Eli) - Critical Control • The Interest Holder will ensure that the surface irrigation disposal area has a slope of <5%, is vegetated and has no vehicle access. (Prevention) (Eli) - Critical Control • Sewerage wastewater will be irrigated as per the Department of Health Code of Practice for On-site Wastewater Management. (Prevention) (Admn) • Areas will be appropriately sized to accommodate irrigation volume. (Prevention) (Eli) • Irrigation areas will be located away from watercourse (>200 m). (Prevention) (Eli) • Waste and Wastewater monitoring will be implemented as per WWMP (Appendix 06). (Prevention) (Admn) • The wastewater system performance will be monitored according to the Original Manufacturer's requirements. (Prevention) (Admn)	III	B	L	Yes	Low
31	Terrestrial Environmental Quality	Spread of biosecurity risk material (e.g., weed and seed) to, or within the Project Area during operations.	Competition with native vegetation.	IV	A.3.1 Site selection and Planning A.3.5 Biodiversity Protection A.3.6 Weed Management	• Weed survey conducted before clearing operations for the identification and management of weeds. (Mitigation) (Eli) - Critical Control • All personnel and contractors will be made aware of any identified infestations and to avoid infestation areas. (Mitigation) (Eli) • Training and inductions for project staff and contractors will cover vehicle weed hygiene requirements. (Prevention) (Eli) • Vehicle and machinery will be cleaned down and inspected before mobilisation to the Project Area. (Prevention) (Eli) - Critical Control • Vehicles will stay on cleared/formed access tracks unless involved in the clearing. (Mitigation) (Eli) • Where declared weeds are identified, weed control measures in line with Northern Territory Weed Management Handbook will be implemented [DEPWS, 2021]. (Mitigation) (Eng) • Annual weed survey of the well pad, access tracks, campsite and gravel/borrow pits for weeds. (Mitigation) (Eng) • Record weed monitoring and survey works in accordance with the NT Weed Data Collection Guidelines. The NT Weed Management Branch will be notified of any new weed incursions. (Mitigation) (Eng) • Implementation of the site-specific Weed Management Plan (Appendix 09). (Prevention) (Admn)	IV	C	M	Yes	Low
32	Terrestrial Environmental Quality	Ignition sources from people, plant, machinery, or flaring causing bushfire.	Damage to flora and fauna ecosystems.	III	A.3.5 Biodiversity Protection A.3.7 Fire Management	• Clearing of fire breaks or access trails of ~10 m around the campsite and well pad to include a vegetation clear zone (Mitigation) (Eng) - Critical Control • Fire break monitored yearly and kept clear of bushfire risk material (Mitigation) (Eng) • Monitoring and maintenance to align with the annual works calendar in the Fire Management 1 pager. (Prevention) (Eng) • Daily checks of BOM fire and weather forecasts during operations (Prevention) (Eli) - Critical Control • Implementation of the site-specific Fire Management Plan (Appendix 08). (Prevention) (Admn) • Flaring to occur within a 25m vegetation exclusion zone radius. (Prevention) (Eng) • Weather and fire danger rating monitoring via BOM. (Prevention) (Admn) • Fire extinguishers and operational radios will be fitted to all vehicles and equipment. (Mitigation) (Admn) • No burning of waste on-site. (Elimination) (Admn) • Training and inductions cover designated smoking areas, location of firefighting equipment, and emergency response. (Elimination) (Admn) • Designated smoking areas established with appropriate waste receptacles. (Elimination) (Admn) • Machinery and vehicles should be parked in areas of low fire risk. (Elimination) (Admn) • Water availability e.g., on-site fresh groundwater pit, tanks, tanker, or nearby water bores available to pump to water trucks to be available for firefighting during high fire risk periods. (Mitigation) (Eng)	III	B	L	Yes	Low

Erosion and Sediment Control Plan

Appendix 05

Amadeus Basis: Jacko Bore 1DW1 Drill and Test Program

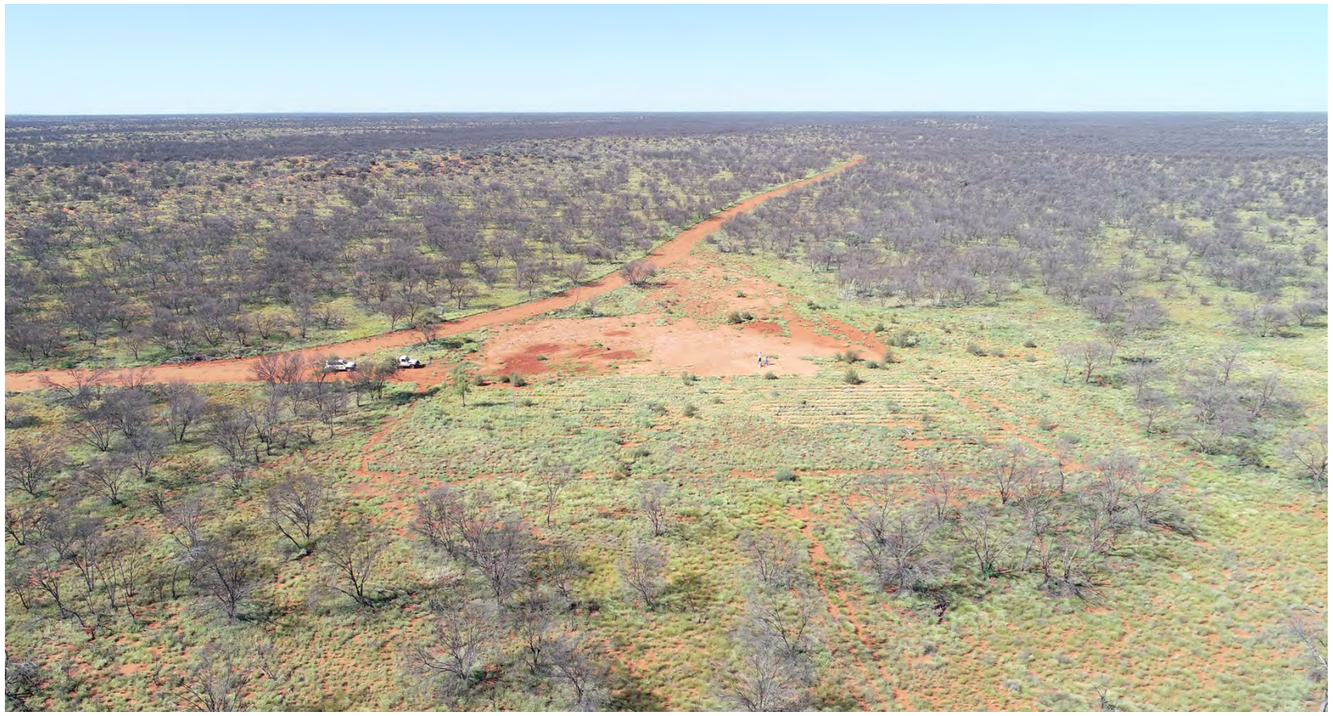
EP125

Santos QNT Pty Ltd

Jacko Bore 1DW1 Drilling and Test Program

Erosion and Sediment Control Plan

Prepared by EcOz Environmental Consultants on behalf of Santos.



DISCLAIMER

This plan has been prepared with information provided to EcOz by Ingauge and Santos at the time of development. No site inspection was conducted by a CPESC.

REVISION	DATE	DRAWN	APPROVED	DESCRIPTION
3	03/06/2023	JD	AF	Issued to client
4	08/06/2023	JD	AF	Issued to client
5	22/11/2023	JD	AF	Issued to client
6	7/12/2023	JD	AF	Issued to client
7	28/3/24	JD	AF	Issued to client
8	25/6/24	JD	AF	Issued to client

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CPESC ENVIROCERT

PREPARED FOR:

Santos

JACKO BORE 1DW1 – Drilling and Test Program

EROSION & SEDIMENT CONTROL PLAN

December 2023 – September 2025

Project Description

1. The project is the Jacko Bore 1DW1 Drilling and Test Program, where Santos propose to expand on the Jacko Bore exploration well (conventional gas).
2. The project is situated in the Amadeus Basin, approximately 200 km south-west of Alice Springs, Northern Territory (NT), where Santos operates Exploration Permit (EP) 125.
3. Specific details which have been referred to in this ESCP are provided within the following listed project documentation:
   - *Supporting Document to Erosion and Sediment Control Plan (EcOz 2023) – Appendix A of this document*
   - *Environmental Management Plan (Santos 2023)*
4. Duration of project is August 2024 – September 2025.

ESCP Purpose

5. This ESCP has been prepared to limit the potential for soil erosion and sedimentation associated with
   - The re-establishment of the previously cleared Well Pad area, access track and campsite.
   - Expansion of the Well Pad and clearing of new access tracks.
   - Drilling, Completion and Extended Production Testing of a horizontal well.
   - Construction of water bore/s.
   - Use of existing Gravel/Borrow Pit/s.
   - Maintenance and monitoring of the access track, well pad and well up to, and including, abandonment and rehabilitation.
6. Recommendations of this ESCP are in accordance with:
   - *IECA (2008). Best Practice Erosion and Sediment Control Guidelines*
   - *NT Department of Infrastructure (2019). Standard Specification for Environmental Management V2. NT Government, Palmerston.*
   - *Landcom (2004). Managing Urban Stormwater: Soils and Construction, Volume 1. NSW Government, Sydney.*
7. This ESCP has been reviewed by a Certified Professional in Erosion and Sediment Control (CPESC) – Adele Faraone, CPESC #11426
8. Aboriginal Areas Protection Authority (AAPA) Certificate C2023/054 variation to C2023/018 includes the following conditions:
   - No works shall occur that could impede surface water flows in natural creek channels.
   - Ground water extraction will not impact the salt lakes.

How to read this ESCP

9. This is ESCP and has been prepared to show the works and controls that will be required for activities listed above in point 5. It is the first plan developed for the site and is to be read in conjunction with the Supporting Document to Erosion and Sediment Control Plan (EcOz 2023) (Appendix A).
10. This ESCP will need to be read in conjunction with any Environmental Management Plan (EMP), environmental risk assessment and any relevant engineering documentation associated to the works occurring for this project.
11. The figures of this report are listed as follows:
    - Figure 1. Existing water crossings along access road
    - Figure 2 a & b. Site layout plan showing construction buffer around new access track, bores and gravel pits
    - Figure 3. Site layout showing Jacko Bore 1DW1 Well Pad, Camp location and construction buffer.
    - Figure 4. Jacko Bore 1DW1 Well Pad layout.
    - Figure 5. Camp Layout
    - Figure 6. Gravel pit ESCP controls

Site Characteristics

12. The project area is located within the arid zone of Central Australia, with little / no rainfall throughout the year and high diurnal and seasonal temperature fluctuations.
13. The nearest weather station with Bureau of Meteorology regional climatic data is the Kulgera weather station, which lies approximately 95 km to the south-east of the project area. Average annual rainfall for Kulgera is 249.9 mm.
14. The project area occurs in dune field with parallel linear dunes, reticulate dunes and irregular or aligned short dunes, that is primarily red sands. The site falls within two land units, which were assessed under the Lyndavale Station survey. These land units are described below in Table 1.

Table 1. Land units within project area

Land unit	Landform class	Landform description	Soil	Soil description
5.6	Dune fields	Sandy dunefield, dune side slopes 6% with gently inclined plains	Tenosols	Earthy sands (red-orthic tenosols)
4.2	Plains	Level plains, often occurring as swales within the southern dunefield	Kandosols	Red earths (red kandosols)

Erosion Hazard and Risk

15. Erosion hazard is assessed using the Revised Universal Soil Loss Equation – RUSLE (IECA 2008).
16. Potential soil loss for the project areas is provided within **Table 2**.

Table 2. Soil loss calculations

Factor	Well Pad	Access Track	Camp	Gravel Pits	Comment
Disturbed catchment area (ha)	5.3	2	1 (pre-existing)	4 (pre-existing)	These figures from Environmental Management Plan – Amadeus Basin: Jacko Bore 1DW1 Drilling and Test Program. EP125. (Santos 2023)
R = Rainfall erosivity	880	880	880	880	Based on 0.5EY AEP for site, which is strongly correlated to the 2-year Average Recurrence Interval (ARI), 6-hour storm event (Landcom 2004) (Section 3.1.1).
K = Soil erodibility	0.043	0.043	0.043	0.043	Based on landform description in Table 1. Worst case scenario adopted in the absence of site-specific soil information.
LS = Length-slope factor	1.35	1.35	1.35	1.35	The highest LS-factor on erodible soils is represented by topography with slope gradient < 5%, and slope length < 100m.
P = Erosion Control Practice	1.3	1.3	1.3	1.3	Compacted & smooth
C = Groundcover	0.37	0.37	0.37	0.37	hardstand surface equivalent to a minimum 25% cover
A = Soil Loss (t/ha/yr)	25 t/ha/yr	25 t/ha/yr	25 t/ha/yr	25 t/ha/yr	Maximum as calculated
Sediment control standard	Type 3	Type 3	Type 3	Type 3	Clean water diversion berms, vegetated buffer, sediment fence, rock berms, dust suppression. Isolate in-stream work activities (i.e culvert installation)

Monthly Erosion Risk

17. Erosion risk refers to the evaluation of the "risk" of soil erosion when consideration is given to both the degree of erosion and the likelihood of the erosion occurring (IECA 2008). In the absence of a site specific risk assessment procedure, erosion risk rating is determined from the average monthly rainfall for Kulgera. Erosion risk ratings are low in December and February, and very low for all other months. See Table 3.

Table 3. Monthly erosion risk rating and construction ESC requirements

(based on mean monthly rainfall total, sourced from BoM - Kulgera weather station #015603)

Erosion Risk Rating (refer to IECA Table 4.4.2)	Months	Mean Monthly Rainfall	Erosion & Sediment Control Requirements
Very Low / negligible	March, April , May, June, July August, September, October, November	29.1 13.3 12.3 15.5 11.4 8.4 14.8 19.7 24.9	• Sediment control to be installed around areas of erosion risk prior to 1st October (wet season commencement). • Dust suppression to be implemented as required
Low	January, Feb, Dec	30.2 31.8 32.1	• Sediment control to be installed around areas of erosion risk prior to 1st October (wet season commencement). • Dust suppression to be implemented as required
Notes:	[1] Areas of erosion risk may be protected using the following types of cover: hardstand (concrete, bitumen, gravel, buildings), placement of mats, blankets (e.g. geotextile).		

General Requirements

18. Groundcover disturbance to be to the minimum extent necessary for site access and associated construction.
19. Construction personnel to be adequately trained (toolbox/induction) in erosion and sediment control.
20. This ESCP is be read in conjunction with the project Environmental Management Plan (EMP) and ESCP and any other relevant project documentation and/or written instructions issued in relation to works on site.
21. The provided drawings are indicative of appropriate controls and practices to be implemented onsite.
22. Weather conditions are to be monitored during the proposed period of construction activities. Major construction activities are to be scheduled to avoid significant rain events as far as practicable.
23. Erosion and sediment controls to be implemented as per site layout plans and typical designs specified within this ESCP. Controls should always be adjusted to suit conditions and achieve the desired outcomes.
24. Erosion and sediment controls are to remain in place until permanent site stabilisation has been achieved (to be determined by erosion control specialist).
25. Clean water from areas surrounding the project area to be diverted around work areas wherever possible.
26. No cleaning of tools or equipment is to occur within 50 m of any watercourse.
27. All fill introduced to the project area is to be inspected to ensure it is clean (i.e. free of weeds, building waste etc.).
28. Spill kits are to be placed in all work areas and appropriately stocked for effective spill response.

Construction Staging

29. Construction staging will be as per the project construction schedule included in the EMP.
30. Works will be staged as follows:

- Civil Construction – August to September 2024 (56 days)
- Drilling and Completion –September to October 2024 (57 days)
- Extended Production Testing – October 2024 to November 2025 (up to 365 days over a period of 12-18 months)

Site Access

31. Access to the well pad, camp, laydowns, gravel pits, bores and stockpiles will be along the existing road alignment.
32. All areas external to the construction buffer are no-go areas at all times.
33. Sediment tracking onto sealed roadways outside of the project area to be minimised by maintaining compaction along the alignment.

Vegetation Clearing

34. Clearing zones and no-go areas to be clearly delineated prior to commencement of clearing activities.
35. Clearing to be within approved construction buffer and to be to the minimum extent necessary.
36. Cleared vegetation to be disposed of as per project approvals and relevant plans.
37. Clearing works to be undertaken progressively (as far as practical) to minimise overall disturbed area.

Dust suppression and management

39. Dust to be suppressed via the use of water carts or soil cover (e.g. hardstand, pavement, vegetation, erosion control mats)
40. Common practices when operating and managing dust controls include:

- Minimise the area of soil exposed to the wind by staging works across the site.
- Limit traffic to established roads and optimise the site layout to minimise travel distances (as per site design). This will also involve controlling vehicle speeds across the site.
- Maintain the surface of roads and initiate repairs in the first instance when degradation is observed.
- Minimise the dirt that is being tracked out on vehicle wheels onto paved surfaces (if observed).
- Limit the height of stockpiles, shelter stockpiles from the wind, cover unstabilised surfaces and stockpiles with mulch, binders or vegetation and consolidate loose surface material.

41. When maintaining dust controls:

- Monitor dust emissions continuously (emphasis on monitoring in the Dry Season)
- Reapply water/mist as required to effectively manage levels of dust generation, as soil moisture levels will become low during hot and windy conditions.
- Progressively rehabilitate exposed areas as construction activities are completed.

Gravel pit design (existing pit)

42. Gravel extraction is to occur only from the designated existing pit as per the EMP (located adjacent to the well pad).
43. Gravel pit access is to be via existing formed access roads/tracks. Access is to avoid drainage depressions/low lying areas.
44. Extension of groundcover disturbance beyond existing pit disturbance area to be as per regulator approval.
45. Perimeter bunds are to be formed from unsuitable overburden (min 0.5 m height). These are to be managed so as to promote the re-establishment of vegetation (e.g. incorporate seed bank and organic matter).
46. Perimeter bunds are to be located to contain internal pit runoff during rainfall events.
47. In cases where borrow pits have side slopes of 1:1 slopes, must require perimeter/diversion bund, which are regularly maintained and monitored as per Table 4 in Appendix B of this document. Rehabilitation should be undertaken progressively once borrow pit is deemed to have provided the material required for the project.
48. Final voids created by gravel extraction are to be designed and located to receive internal pit drainage. Areas external to voids to be maintained at slopes < 2% as far as practical.
49. Where runoff from within pit cannot be directed internally (i.e. to voids, contained by perimeter bunds), Type 2 sediment controls are required at outlet areas to treat runoff prior to discharge. Type 2 controls include rock check dams wrapped in geotextile, mulch berms, sediment bags, coir logs.

Gravel Pit - Rehabilitation

50. Rehabilitation of gravel pits is to be undertaken progressively and as per direction from regulator.

51. Where pits (or sections within pits) are no longer to be used, final rehabilitation is to incorporate:

- Contouring to ensure drainage of disturbed area is directed to shallow, low-sloped voids (internal).
- Removal of stockpiled subsoil material.
- Light contour ripping of reshaped surface.
- Respreading of topsoil across disturbed surface at 50-100 mm depth. Handle topsoil in damp condition and avoid an over-compacted or smooth surface (rough is preferred).
- Placement of residual organic matter across reshaped landform.
- Hand seeding/broadcasting of local native grass species is encouraged.
- Prevention of vehicle traffic entering topsoiled areas.

52. For pits which are anticipated to be utilised again in the future, rehabilitation is to incorporate:

- Contouring to ensure drainage of disturbed area is directed to shallow, low-sloped voids (internal).
- Consolidation of stockpiled subsoil material (to occupy minimal area).
- Light contour ripping of reshaped surface.
- Retention of perimeter bunds (topsoil).

Gravel Pit - Monitoring of Performance

53. Monitoring of gravel pits is to be undertaken:

- Following rainfall events (>10mm in 24 hours) to check that controls are not impacted (if site access available) during operations. Until deemed unnecessary by an CPESC or until commencement of site rehabilitation.
- Annually, at the end of the wet season, until rehabilitation success criteria are met, deemed unnecessary by a CPESC or at the completion of rehabilitation. Noting that the responsibility for disturbed areas will continue until the Minister is satisfied that all environmental outcomes are met.

54. Additional erosion and sediment control measures to be implemented where required (observation of rilling/gullying and/or evidence of sedimentation of external drainage areas).

55. Vegetation is to be monitored for establishment and weed infestation. Weed control to be carried out as required.

Laydown areas

56. Laydown areas to be stabilised i.e. compacted surface or gravel.

57. Clean water to be diverted around laydown areas as much as practical (i.e. diversion bunds or channels).

58. Downslope boundary of laydown areas to have appropriate sediment control (i.e. sediment fence).

Flood response

59. Where significant rain event (as defined in EMP) is forecast and/or flooding of work areas is anticipated, the following steps are required:

- Removal of all plant and equipment from within drainage channels, including rock platforms.
- Securing of all erosion and sediment control measures.
- Removal of any temporary stockpiled material from within drainage channels (or covering with geotextile and securing with sandbags).
- Erosion protection of any additional disturbed areas adjacent to or within drainage channels (i.e. abutments).

Spoil and Stockpile Management

60. Designated stockpile locations are to be clearly identified on site.

61. Topsoil identified for removal is to be stripped (nominal depth of 100 mm) immediately prior to commencement of further earthwork activities; and preserved for reuse.

62. Avoid mixing topsoil with subsoil material.

63. Stripped topsoil to be stockpiled in mounds not exceeding 1.5 m in height, used in construction of diversion bunds, or removed from site.

64. Excavated subsoils are to be stockpiled separately from topsoil material; or removed from site.

65. All stockpiles are to be protected upslope by earth diversion banks to divert run-on water, and downslope by an appropriate sediment control measure (e.g. mulch berm, sediment fence) as per the typical design in Figure A.

66. No stockpiling of materials within, or directly adjacent to, watercourses, drainage lines, flood zones or any area otherwise likely to be inundated with water (minimum buffer of 50 m).

67. No stockpiling of materials within protected areas of vegetation or driplines of trees.

Dewatering (if required)

68. Clean water diversion bunds are to be installed around any excavations or areas of potential ponding to minimise dewatering activities.

69. All dewatering to be directed to onsite storage for treatment or removal from site.

Site Stabilisation

70. Permanent stabilisation to be achieved by combination of hardstand and establishment of suitable self-sustaining groundcover species (e.g. reseeding with appropriate groundcover species).

71. All compounds, laydowns, access and detour tracks are to be rehabilitated to pre-construction conditions once works are complete. Where the contract does not stipulate rehabilitation requirements, revegetation is required as per three items listed below.

- Where revegetation is to occur, subsoils are to be scarified to a depth of at least 50mm prior to topsoil placement.
- Topsoil stockpiled from clearing operations to be respreads across disturbed areas (if available)
- Spread topsoil to a lightly compacted (firm) depth of 50-100mm. After spreading ensure surface is left roughened to assist moisture infiltration and inhibit soil erosion. Apply seed mix (if required) to promote regrowth.

72. Sediment controls are to remain in place until minimum 75% stabilised groundcover (or groundcover % consistent with adjacent undisturbed areas) is achieved for disturbed areas, or determined by a CPESC.

Water Crossings

73. As per condition of AAPA certificate C2023/054 variation to C2023/018; no works shall occur that could impede surface water flows in natural creek channels.

74. The flows of natural creek channels are not to be impacted by any works.

75. Outside of the road corridor, creek banks should be no-go zones.

76. Any damage that occurs to the banks of the creeks/waterholes are to be repaired immediately, including any pads or tracks that are likely to contribute to erosion on site.

Monitoring of Performance

77. All temporary erosion and sediment control measures must be fully operational and maintained in proper working order until permanent stabilisation is achieved.

78. All erosion and sediment control measures to be inspected:

- Following rainfall events (>10mm in 24 hours) to check that controls are not impacted (if site access available) during operations. Until deemed unnecessary by an CPESC or until commencement of site rehabilitation.
- Annually, at the end of the wet season, until rehabilitation success criteria are met, deemed unnecessary by a CPESC or at the completion of rehabilitation. Noting that the responsibility for disturbed areas will continue until the Minister is satisfied that all environmental outcomes are met.

79. Sediment control measures are to be maintained such that their capacity does not fall below 70%.

80. Sediment removed from areas of deposition is to be incorporated within subsoil stockpile areas and stabilised, or otherwise removed from site.

81. Where practical, foot and vehicular traffic to be kept away from all recently stabilised areas.

82. Revegetation (where undertaken) is to be monitored for establishment and weed infestation, with control carried out as required (refer to project CEMP).

ESCP Updates and Variations

83. As per *Best Practice Guidelines* (IECA 2008), a revised ESCP may be required where:

- controls require alteration due to change in work practices or new stage of works is commenced
- changes occur in slope gradients and drainage paths, with their exact form unpredictable before works start
- a change in the design occurs that materially affects the site works; or
- the desired outcome (e.g. protection of receiving environments) is clearly not being achieved.

84. This ESCP forms part of the overall soil and water management strategy (as per the EMP), with other aspects being appropriate implementation, monitoring and corrective action.

Responsibilities

89. Details of responsibilities in relation to ESC:

- Plan preparation and certification – EcOz Environmental Consultants, 08 8981 1100
- Ensuring ESCP is appropriate for scope and schedule of work –
  - Richard Bennett, Senior Supervisor Civil Works, 0408 812 204
  - James Laverty, Construction Supervisor Field Development, 0407 584 908
- Implementation and maintenance of controls
  - Richard Bennett, Senior Supervisor Civil Works, 0408 812 204
  - James Laverty, Construction Supervisor Field Development, 0407 584 908
- 24 hour emergency contact for ESC related issues:
  - Richard Bennett, Senior Supervisor Civil Works, 0408 812 204
  - James Laverty, Construction Supervisor Field Development, 0407 584 908

90. Table 4 outlines the responsibilities and timing associated with the identified ESC mitigation measures. These measures are to be read and actioned in conjunction with the Rehabilitation Management Plan.

Table 4. Responsibilities and timing

Mitigation measure	Timing	Responsibility
ESCPs shall be prepared by a suitably qualified person. These shall be updated regularly to reflect progressive work phases and potential risk changes.	Prior to and during Works	HSE Manager
Erosion and sediment controls will be designed based upon historical rainfall data for the period (i.e. dry season or wet season) for which the controls are required to be operational, having regard to the IECA guidelines or equivalent best practice guidelines.	Prior to and during Works	HSE Manager
Erosion and sediment controls will be installed to minimise erosion and maximise sediment retention within the project area. All necessary works will be undertaken to provide adequate drainage of stormwater runoff and prevent erosion and sedimentation.	Prior to and during Works	Supervisor
Clean surface-water run-on will be diverted around the perimeter of construction areas where applicable. Dirty water will be diverted to appropriate sediment controls in accordance with the current ESCP.	At all times	Supervisor
All erosion and sediment controls are to be implemented prior to the commencement of works for which they have been designed. Where possible, works will be staged to minimise exposure of soils to erosion	Prior to works	Supervisor
Temporary erosion controls will be maintained in place until the corresponding catchment work areas are stabilised in accordance with the ESCP.	At all times	Supervisor
If soil erosion is evident, exposed surfaces at the affected area will be stabilised with whatever means is considered practicable and satisfactory (e.g. matting, soil stabiliser) to mitigate and stabilise the area in accordance with the relevant ESCP.	At all times	Supervisor
ESCPs are to be maintained and up to date for the current site conditions	At all times	Supervisor
Sediment and erosion controls shall not be removed from their respective locations without prior consent of the HSE Manager	At all times	Supervisor
Erosion and sediment control devices will be inspected regularly to check they are maintained and are in good working order. Inspections should also be undertaken following rainfall events to assess the requirements for maintenance or upgrades to sediment and erosion control devices. Sediment shall be removed from al sediment control where the capacity of the sediment control becomes less than 70%.	following rainfall events (>10mm in 24 hours)	HSE Manager
Visual monitoring for evidence of soil erosion within the site will be conducted. Indicators will include: • build-up of sediment in sediment control devices (i.e. capacity of sediment control becomes less than 70%) • uncontrolled discharge from the project area • damaged or failed erosion and/or sediment control devices.	following rainfall events (>10mm in 24 hours)	HSE Manager

References

Catchments and Creeks Pty Ltd. (2010). *Check dam sediment traps.* Available at: https://www.catchmentsandcreeks.com.au/docs/CDT-1.pdf [Accessed 9 November 2022]

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(IECA) International Erosion Control Association (2008). *Best Practice Erosion and Sediment Control*. International Erosion Control Association (Australasia), Picton NSW.

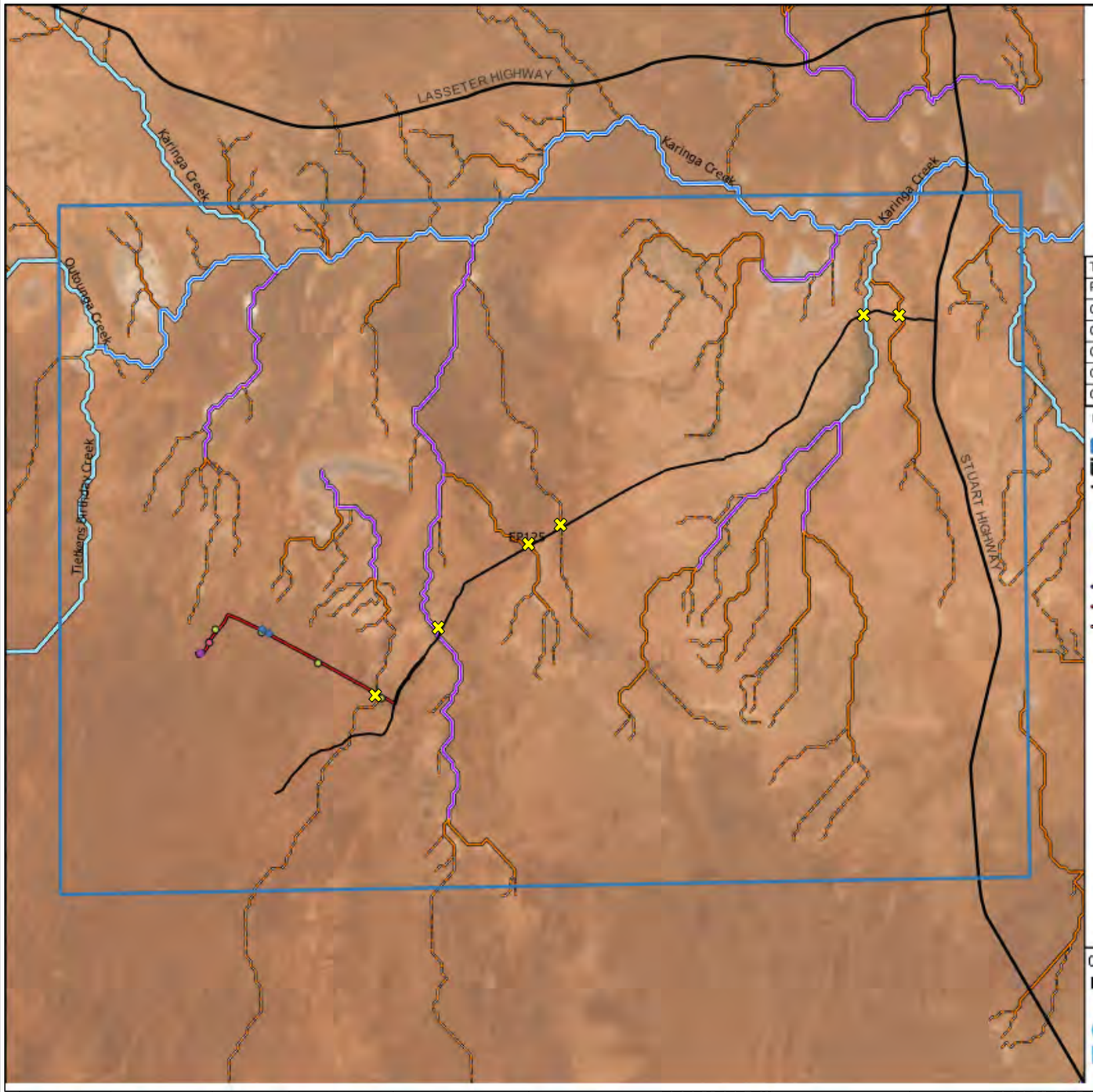
Landcom (2004). *Managing Urban Stormwater: Soils and Construction, Volume 1*. NSW Government, Sydney.

NT Department of Infrastructure (2019). *Standard Specification for Environmental Management*. Version 2. NT Government, Palmerston.

EcOz (2023). *Jacko Bore 1DW1 – Drilling and Test Program - Erosion and Sediment Control Plan.*

Santos (2023). *Environmental Management Plan.*

Figure 1. Existing water crossings along access road



Title:	Surface Streams
Project name:	EP125 | Jacko Bore 1DW1
CRS:	WGS 84 / UTM zone 53S
Created by:	Artur Shapoval
Company name:	inGauge
Client name:	Santos
Created on:	2023-05-03

Legend:

- Project Area
- EP Boundary
- Principal Road
- Campsite Indicative Location
- Well Pad Indicative Location
- Waterbore Indicative Location
- Gravel Pits Indicative Locations
- Access track - Proposed
- Access track - Existing
- Access track - Existing (re-established)

NT_Stream_Order - Projected: 1, 2, 3, 4, 5

Stream Orders Buffered to NT LCG

0 3 6 9 12 15 km

Santos INGAUGE

Construction Notes:

- Site plan base maps adopted from Supporting Document to ESCP (EcOz 2023).
- Disturbance to existing groundcover to be minimised.
- Recommendations apply to all active construction areas.
- Location of measures broadly indicative only. Exact location to be determined on site, considering prevailing site conditions.
- Uncontrolled discharge of site runoff into watercourses/drainage lines to be avoided.
- Dust to be suppressed via the use of water carts.
- Measures to be monitored;
  - Following rainfall events (>10mm in 24 hours) to check that controls are not impacted (if site access available) during operations. Until deemed unnecessary by an CPESC or until commencement of site rehabilitation.
  - Annually, at the end of the wet season, until rehabilitation success criteria are met, deemed unnecessary by a CPESC or at the completion of rehabilitation. Noting that the responsibility for disturbed areas will continue until the Minister is satisfied that all environmental outcomes are met.
- Measures to be repaired/modified as required to ensure they are performing to their design standard.
- Erosion and sediment control measures indicated by this plan to be in place prior to 1st October (or appropriate alternative measures).

Notes on water crossings

- No works shall occur that could disturb natural creek channels or prevent the accumulation of water in the salt lakes.
- The flows of natural creek channels are not to be blocked by any works.
- Outside of the road corridor, creek banks should be no-go zones.

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3	03/06/2023	JD	AF	Issued to client
4	08/06/2023	JD	AF	Issued to client
5	22/11/2023	JD	AF	Issued to client
6	7/12/2023	JD	AF	Issued to client
7	28/3/24	JD	AF	Issued to client
8	25/6/24	JD	AF	Issued to client

PREPARED BY: EcOz ENVIRONMENTAL CONSULTANTS TERRITORY PROUD; CPESC ENVIROCERT

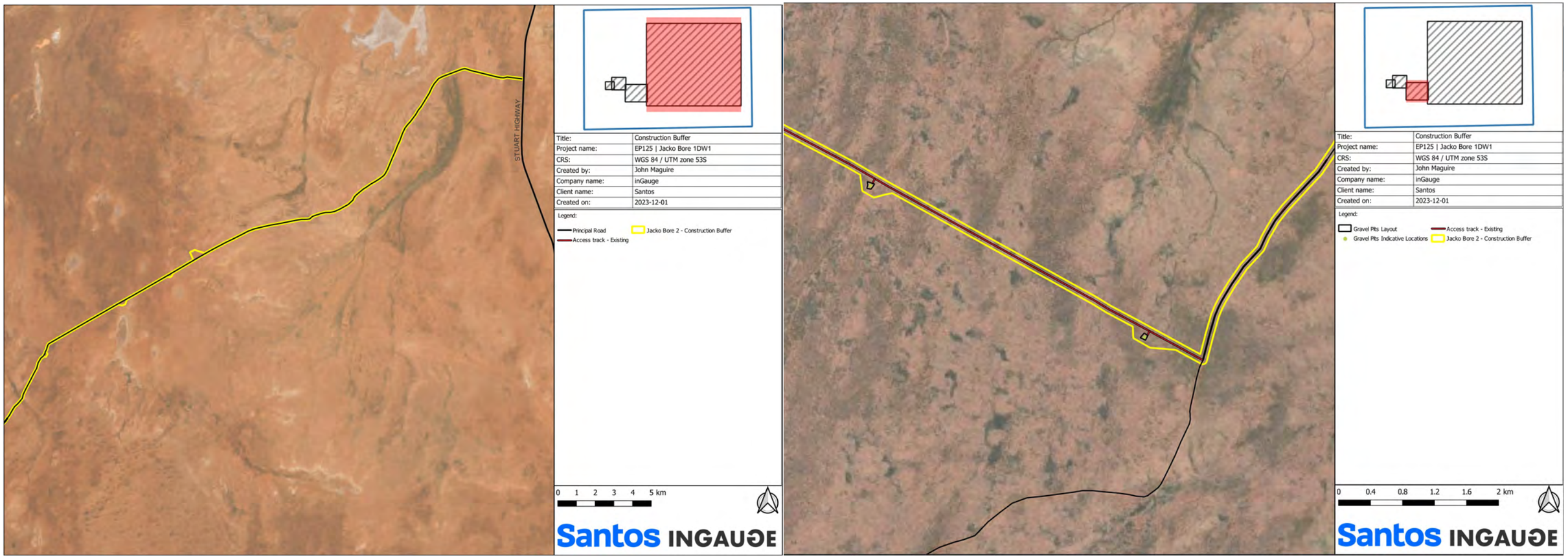
PREPARED FOR: Santos

JACKO BORE 1DW1 – Drilling and Test Program

EROSION & SEDIMENT CONTROL PLAN

December 2023 – September 2025

Figure 2a. Site layout plan showing construction buffer around new access track, bores and gravel pits



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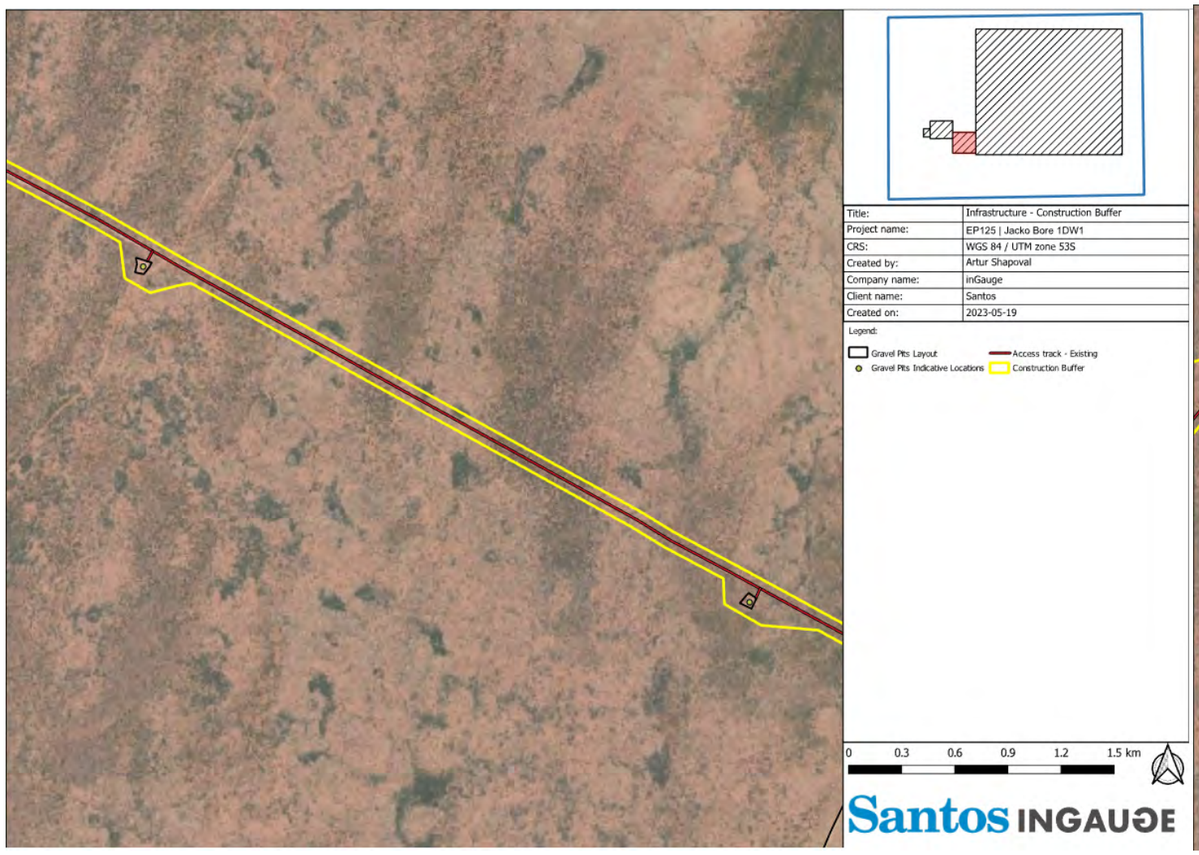
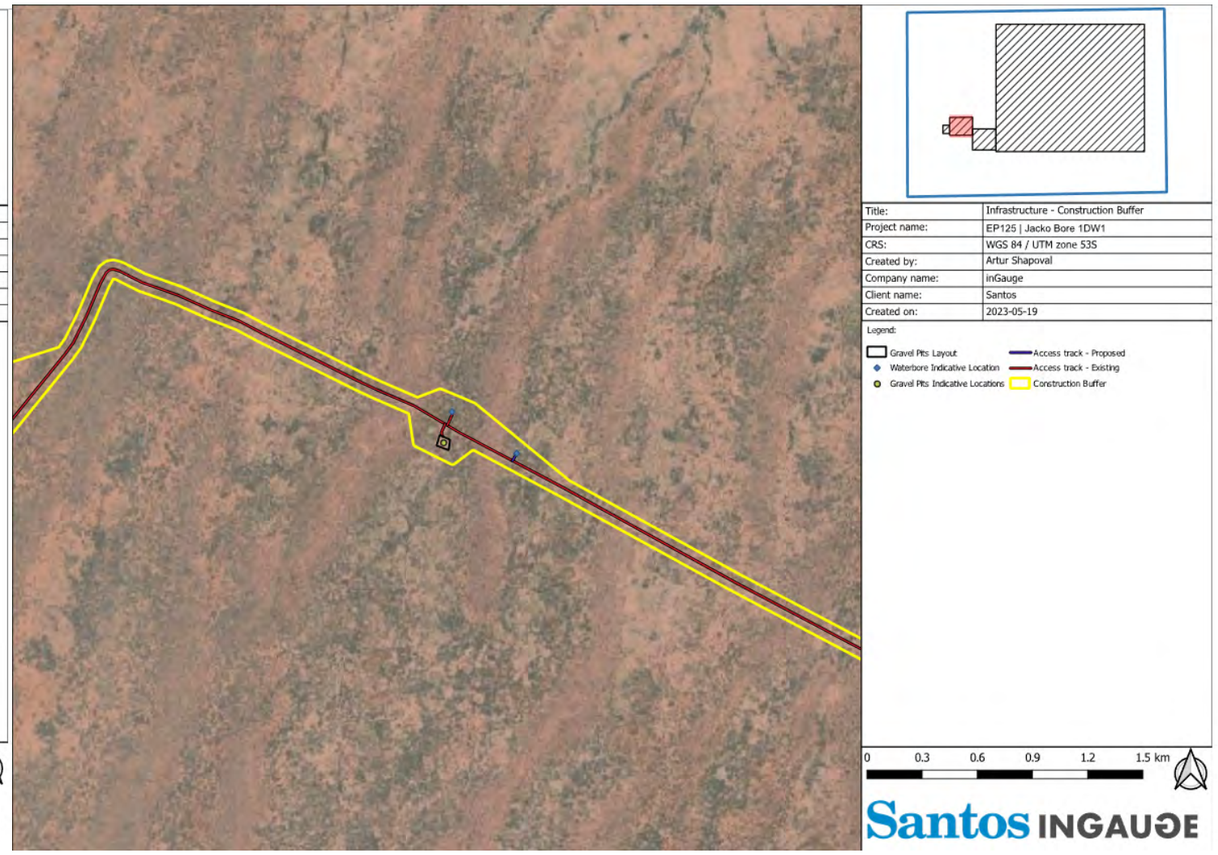
JACKO BORE 1DW1 – Drilling and Test Program

EROSION & SEDIMENT CONTROL PLAN

December 2023 – September 2025

Figure 2b. Site layout plan showing construction buffer around new access track, bores and gravel pits





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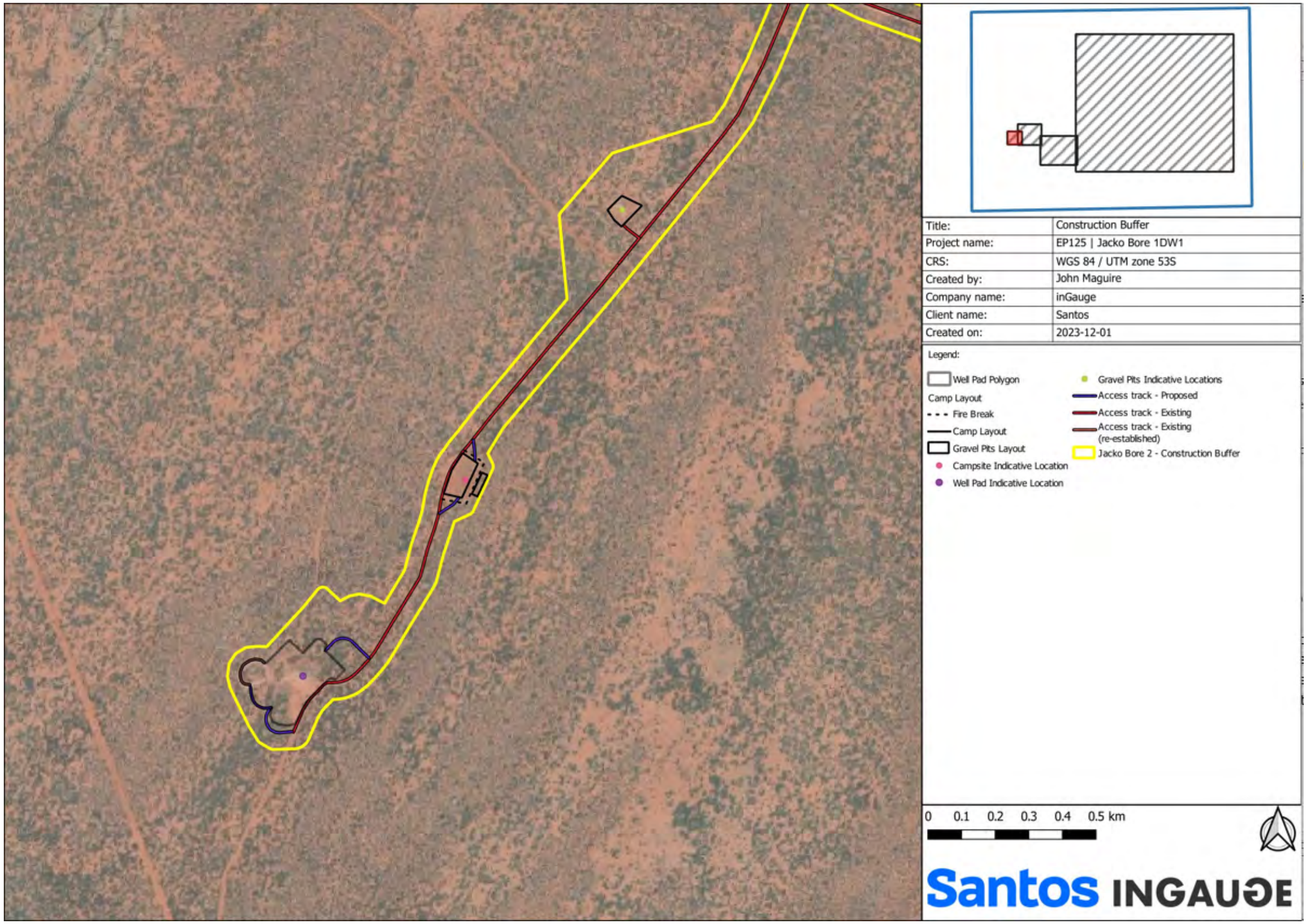
PREPARED FOR: Santos

JACKO BORE 1DW1 – Drilling and Test Program

EROSION & SEDIMENT CONTROL PLAN

December 2023 – September 2025

Figure 3. Site layout showing Jacko Bore 1DW1 Well Pad, camp location and construction buffer



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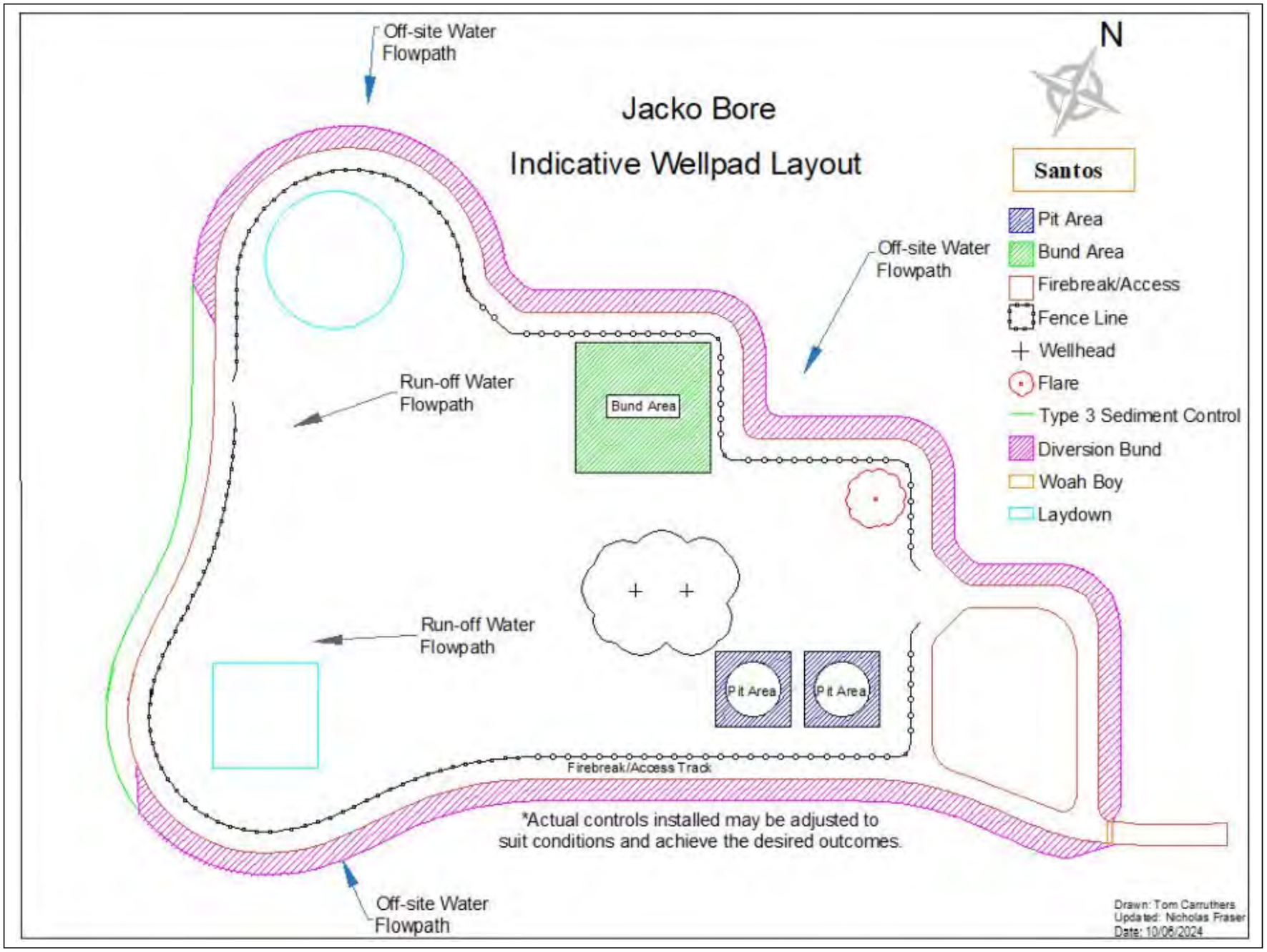
PREPARED FOR: Santos

JACKO BORE 1DW1 – Drilling and Test Program

EROSION & SEDIMENT CONTROL PLAN

December 2023 – September 2025

Figure 4. Jacko Bore 1DW1 Well Pad layout.



Construction Notes:

- Site plan base maps adopted from Supporting Document to ESCP (EcOz 2023).
- Disturbance to existing groundcover to be minimised.
- Recommendations apply to all active construction areas.
- **Location of measures broadly indicative only. Exact location to be determined on site, considering prevailing site conditions.**
- Uncontrolled discharge of site runoff into watercourses/drainage lines to be avoided.
- Dust to be suppressed via the use of water carts.
- Measures to be monitored regularly:
  - Following rainfall events (>10mm in 24 hours) to check that controls are not impacted (if site access available) during operations. Until deemed unnecessary by an CPESC or until commencement of site rehabilitation.
  - Annually, at the end of the wet season, until rehabilitation success criteria are met, deemed unnecessary by a CPESC or at the completion of rehabilitation. Noting that the responsibility for disturbed areas will continue until the Minister is satisfied that all environmental outcomes are met.
- Measures to be repaired/modified as required to ensure they are performing to their design standard.
- Erosion and sediment control measures indicated by this plan to be in place prior to 1st October (or appropriate alternative measures).

Notes on controls at Well Pad:

- Earth diversion bunds to be constructed upslope to divert clean water around Pad.
- Sediment fences to be constructed downslope to capture sediment before leaving the disturbance footprint.
- If concentrated flow occurs, or spoon drains are installed these will include rock check dams / coir logs at appropriate spacing.
- Pits / ponds and bunded storage to be above flood level.

Legend

Clean water

Dirty water

REVISION	DATE	DRAWN	APPROVED	DESCRIPTION
3	03/06/2023	JD	AF	Issued to client
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6	7/12/2023	JD	AF	Issued to client
7	28/3/24	JD	AF	Issued to client
8	25/6/24	JD	AF	Issued to client

PREPARED BY: EcOz ENVIRONMENTAL CONSULTANTS TERRITORY PROUD; CPESC ENVIROCERT

PREPARED FOR: Santos

JACKO BORE 1DW1 – Drilling and Test Program

EROSION & SEDIMENT CONTROL PLAN

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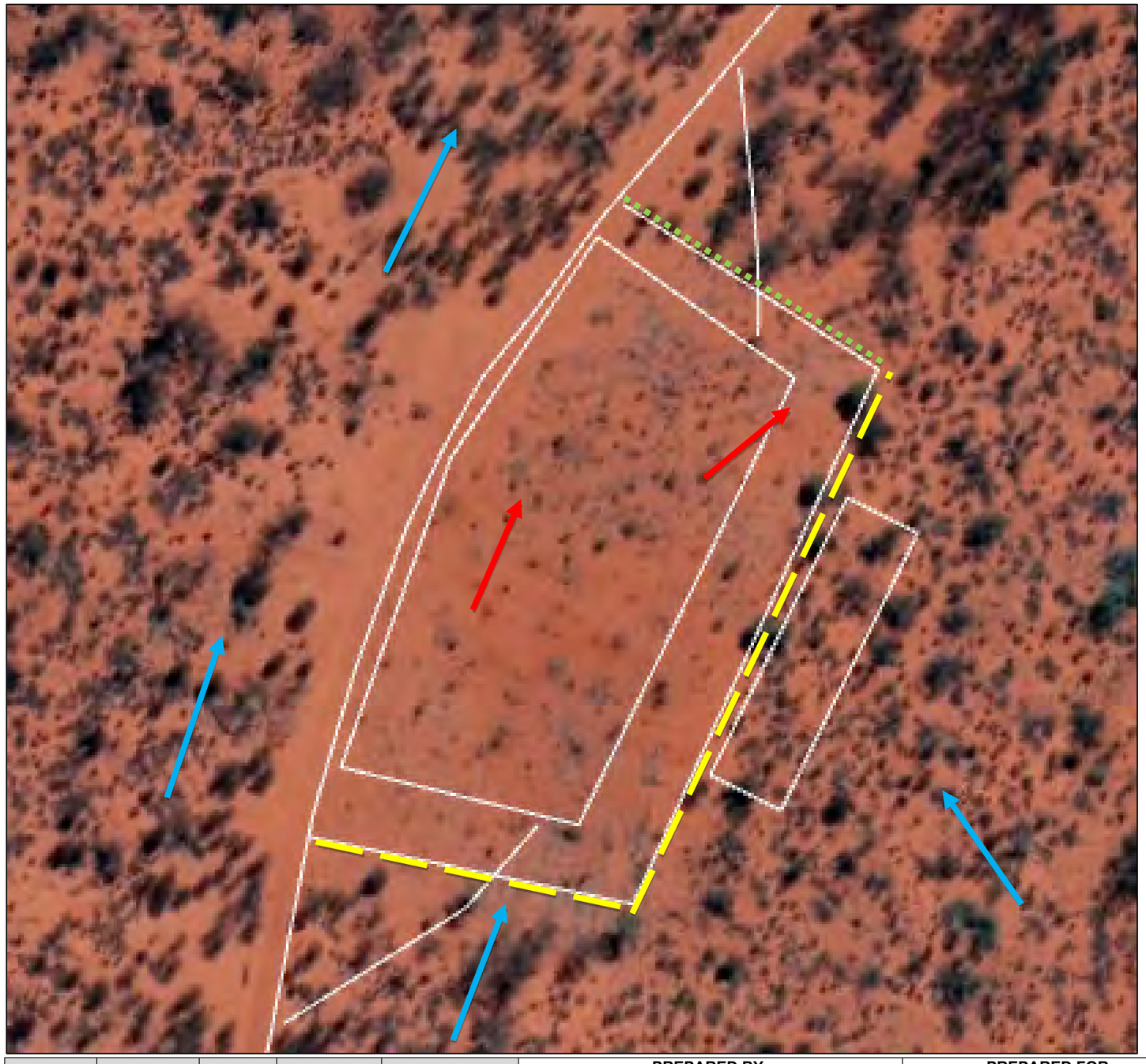
Figure 5. Camp layout



Construction Notes:

- Site plan base maps adopted from Supporting Document to ESCP (EcOz 2023).
- Disturbance to existing groundcover to be minimised.
- Recommendations apply to all active construction areas.
- Location of measures broadly indicative only. Exact location to be determined on site, considering prevailing site conditions.
- Uncontrolled discharge of site runoff into watercourses/drainage lines to be avoided.

- Areas of high vehicle traffic to use a combination of crushed rock and watercarts for dust suppression.
- Laydown area (if required) to utilise water cart as dust suppression.
- Areas of low traffic and within the fire break surrounding the camp are to be controlled by the regular use of water carts.
- Measures to be monitored:
  - Following rainfall events (>10mm in 24 hours) to check that controls are not impacted (if site access available) during operations. Until deemed unnecessary by an CPESC or until commencement of site rehabilitation.
  - Annually, at the end of the wet season, until rehabilitation success criteria are met, deemed unnecessary by a CPESC or at the completion of rehabilitation. Noting that the responsibility for disturbed areas will continue until the Minister is satisfied that all environmental outcomes are met.
- Measures to be repaired/modified as required to ensure they are performing to their design standard.
- Erosion and sediment control measures indicated by this plan to be in place prior to 1st October (or appropriate alternative measures).

Notes on controls at camp:

- Earth diversion bunds to be constructed upslope to divert clean water around camp.
- Sediment fences to be constructed downslope to capture sediment before leaving the disturbance footprint.

Legend

- Clean water
- Dirty water
- Diversion bund
- Sediment fence

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8	25/6/24	JD	AF	Issued to client

PREPARED BY: EcOz ENVIRONMENTAL CONSULTANTS TERRITORY PROUD; CPESC ENVIROCERT

PREPARED FOR: Santos

JACKO BORE 1DW1 – Drilling and Test Program

EROSION & SEDIMENT CONTROL PLAN

December 2023 – September 2025

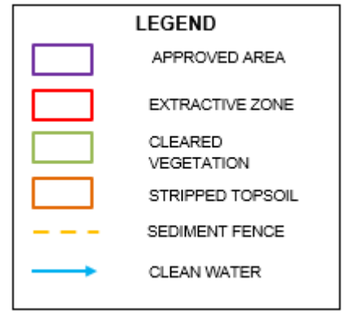
Figure 6. Typical gravel pit ESC controls

Construction Notes:

- Location of measures broadly indicative only. Exact location to be determined on site, considering prevailing site conditions.
- Measures should include upslope diversion of clean water around pits and sediment fence downslope of ground disturbance.
- Uncontrolled discharge of site runoff into watercourses/drainage lines to be avoided.
- Dust to be suppressed via the use of water carts.
- Measures to be monitored regularly. Measures to be repaired/modified as required to ensure they are performing to their design standard.
- Flows off the site to flow into vegetated buffer surrounding the compound.

Notes on controls at gravel pits:

- Measures to be monitored as per Gravel Pit - Monitoring of Performance.
- Measures to be repaired/modified as required to ensure they are performing to their design standard.
- Flows off the site to flow into vegetated buffer surrounding the compound.
- Perimeter bunds are to be formed from unsuitable overburden (min 0.5 m height).
- Perimeter bunds are to be constructed where required to contain internal pit runoff during rainfall events.
- Where runoff from within pit cannot be directed internally (i.e. to voids, contained by perimeter bunds), Type 2 sediment controls are required at outlet areas to treat runoff prior to discharge. Type 2 controls include rock check dams wrapped in geotextile, mulch berms, sediment bags, coir logs.



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PREPARED BY: EcOz ENVIRONMENTAL CONSULTANTS TERRITORY PROUD; CPESC ENVIROCERT

PREPARED FOR: Santos

JACKO BORE 1DW1 – Drilling and Test Program

EROSION & SEDIMENT CONTROL PLAN

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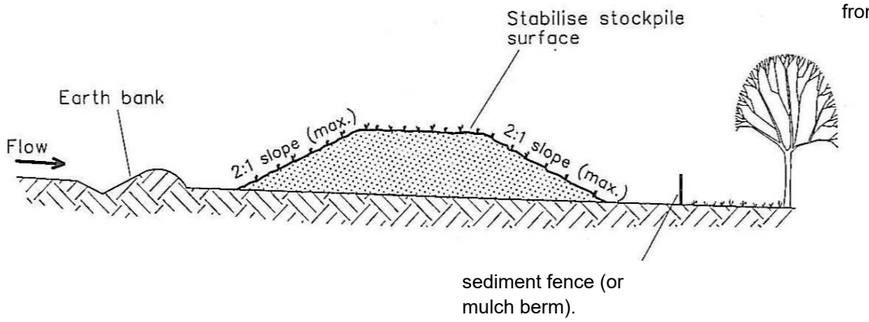
TYPICAL DESIGNS



Note: To be located > 50m from watercourse

Figure A. Stockpile site (Landcom 2004)

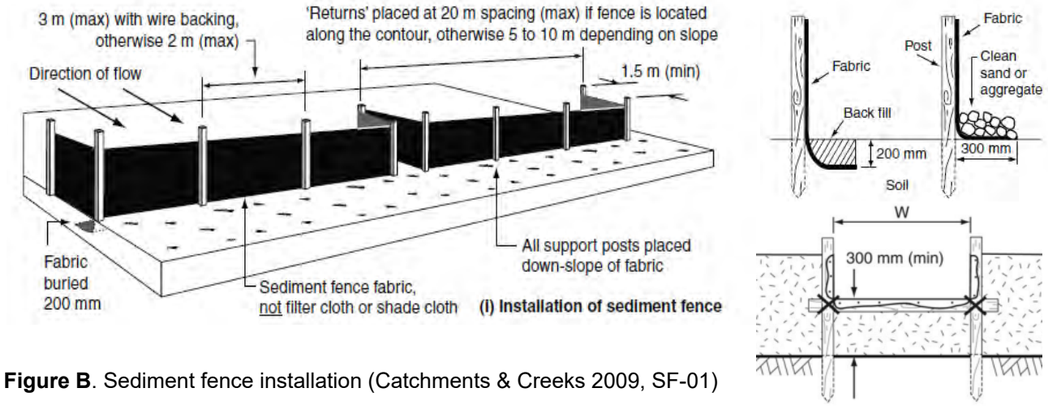


Figure B. Sediment fence installation (Catchments & Creeks 2009, SF-01)

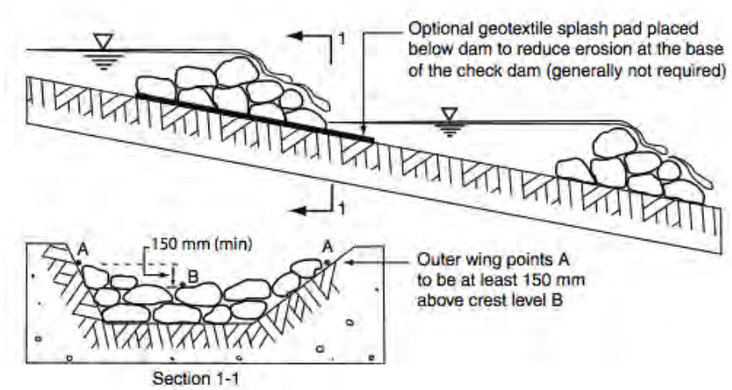


Figure C. Rock check dams (RCDs) (Catchments & Creeks 2009, RCD-01)

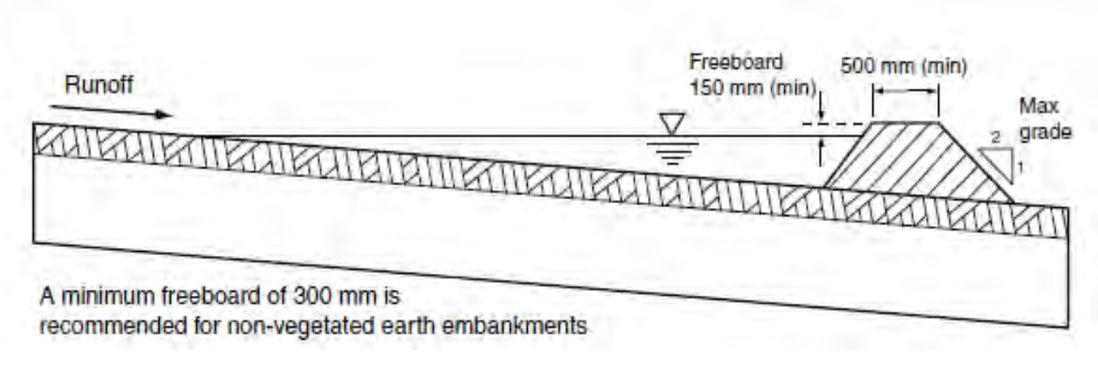


Figure D. Earth diversion bund (Catchments & Creeks 2009, DB-01)

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8	25/6/24	JD	AF	Issued to client

PREPARED BY: ENVIRONMENTAL CONSULTANTS TERRITORY PROUD (EcOz) CPESC ENVIROCERT

PREPARED FOR: Santos

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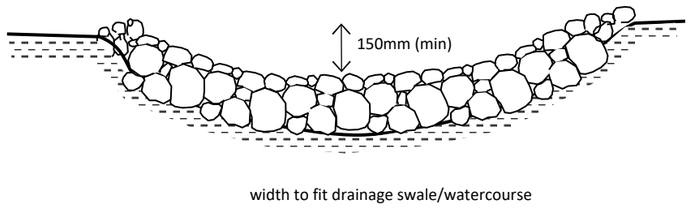
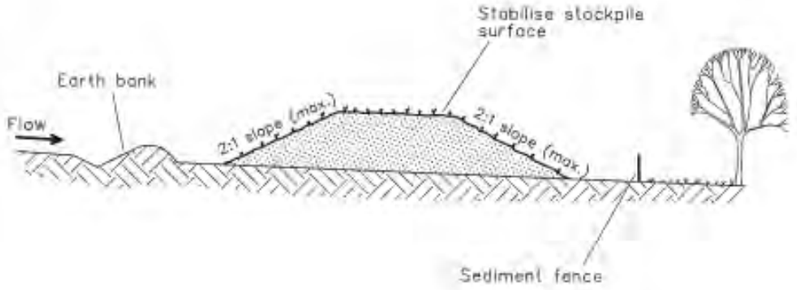


Figure F. Rock filter dam – typical design

Notes:

- Rock to be clean (zero fines), sized 200mm+ (approx.) and covered/wrapped in geotextile
- Extend across channel to prevent outflanking
- Construct with 150mm invert

CONSTRUCTION DETAILS OF TYPICAL DESIGNS



Construction Notes

1. Place stockpiles more than 2 (preferably 5) metres from existing vegetation, concentrated water flow, roads and hazard areas.
2. Construct on the contour as low, flat, elongated mounds.
3. Where there is sufficient area, topsoil stockpiles shall be less than 2 metres in height.
4. Where they are to be in place for more than 10 days, stabilise following the approved ESCP or SWMP to reduce the C-factor to less than 0.10.
5. Construct earth banks (Standard Drawing 5-5) on the upslope side to divert water around stockpiles and sediment fences (Standard Drawing 6-8) 1 to 2 metres downslope.

STOCKPILES **SD 4-1**

REVISION	DATE	DRAWN	APPROVED	DESCRIPTION	PREPARED BY:	PREPARED FOR:	JACKO BORE 1DW1 – Drilling and Test Program *EROSION & SEDIMENT CONTROL PLAN* December 2023 – September 2025			
3	03/06/2023	JD	AF	Issued to client	ENVIRONMENTAL CONSULTANTS TERRITORY PROUD EcOz CPESC ENVIROCERT	Santos	NOT TO SCALE	DOC ID: 226603	REVISION: 6	Page 15 of 25
4	08/06/2023	JD	AF	Issued to client						
5	22/11/2023	JD	AF	Issued to client						
6	7/12/2023	JD	AF	Issued to client						
7	28/3/24	JD	AF	Issued to client						
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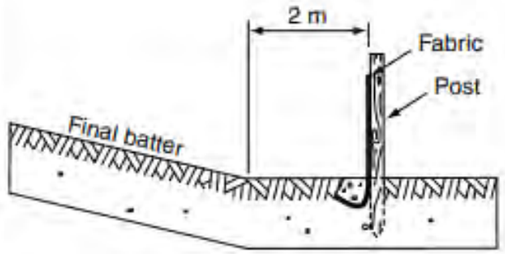
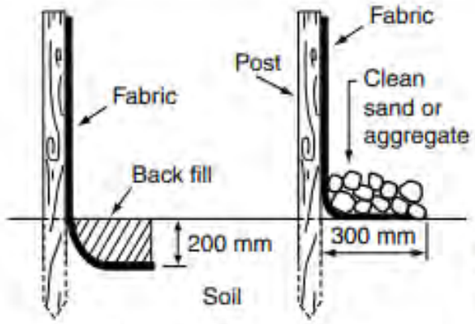
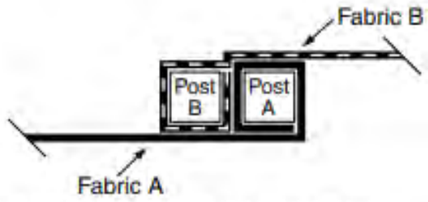


(a) Location of fence relative to base of slope

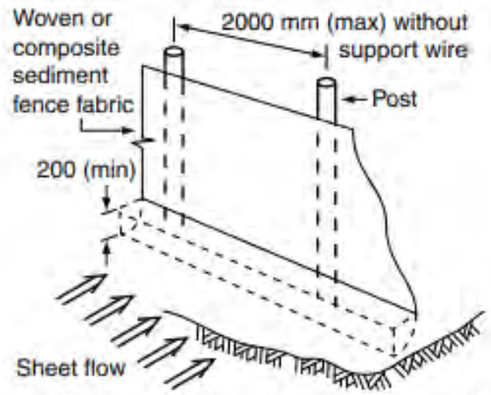


(b) Anchoring base of fabric

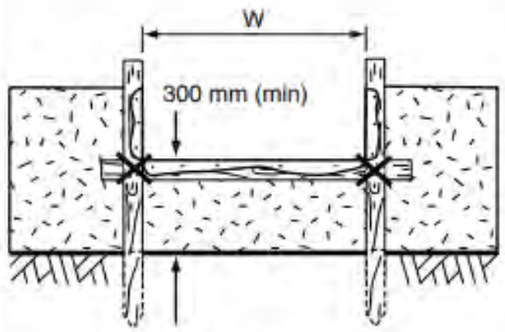


Fabric to fold around each stake one full turn.
Stake B to be drive tightly against Stake A.
The tops of both stakes to be secured with wire.

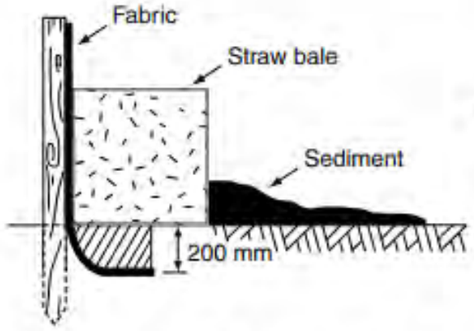
(c) Joining fabric - Method 1



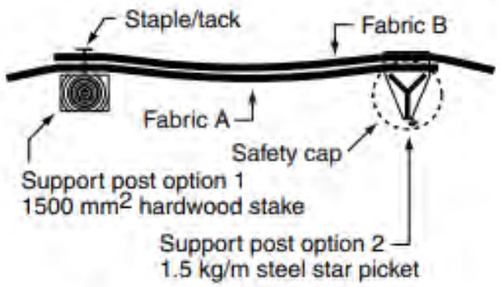
(d) Installation without backing support



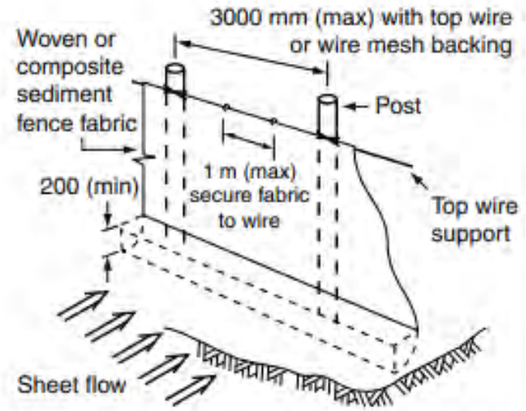
(e) Spill-through weir



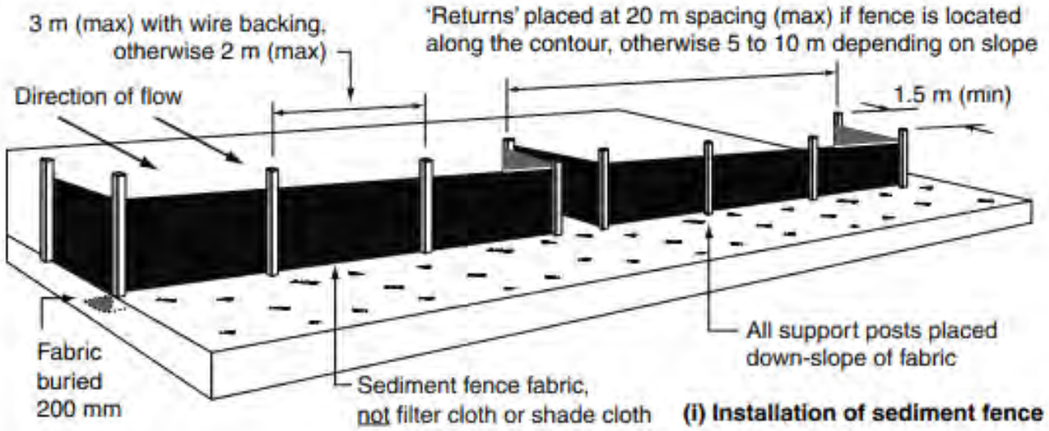
(f) Placement of up-slope straw bale



(g) Joining fabric - Method 2



(h) Installation with top wire support



(i) Installation of sediment fence

Notes:

1. Sediment fence to be installed along a line of constant ground elevation wherever practical.
2. Both end of the sediment fence to extend up the slope at least 1m.
3. Support post to be spaced a maximum 2m unless the fence is supported by a top wire or wire mesh backing, in which case 3m maximum spacing.
4. Fence 'returns' shall be installed at maximum 20m spacing if fence is installed along the contour, otherwise 5 to 10m maximum spacing.
5. Minimum 4 staples or tie wires per stake.

Drawn:	Date:		
GMW	Dec-09	Sediment Fence	SF-01

REVISION	DATE	DRAWN	APPROVED	DESCRIPTION
3	03/06/2023	JD	AF	Issued to client
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PREPARED BY: EcOz ENVIRONMENTAL CONSULTANTS TERRITORY PROUD; CPESC ENVIROCERT

PREPARED FOR: Santos

JACKO BORE 1DW1 – Drilling and Test Program

EROSION & SEDIMENT CONTROL PLAN

December 2023 – September 2025

MATERIALS

FABRIC: POLYPROPYLENE, POLYAMIDE, NYLON, POLYESTER, OR POLYETHYLENE WOVEN OR NON-WOVEN FABRIC, AT LEAST 700mm IN WIDTH AND A MINIMUM UNIT WEIGHT OF 140GSM. ALL FABRICS TO CONTAIN ULTRAVIOLET INHIBITORS AND STABILISERS TO PROVIDE A MINIMUM OF 6 MONTHS OF USEABLE CONSTRUCTION LIFE (ULTRAVIOLET STABILITY EXCEEDING 70%).

FABRIC REINFORCEMENT: WIRE OR STEEL MESH MINIMUM 14-GAUGE WITH A MAXIMUM MESH SPACING OF 200mm.

SUPPORT POSTS/STAKES: 1500mm^2 (MIN) HARDWOOD, 2500mm^2 (MIN) SOFTWOOD, OR 1.5kg/m (MIN) STEEL STAR PICKETS SUITABLE FOR ATTACHING FABRIC.

INSTALLATION

1. REFER TO APPROVED PLANS FOR LOCATION, EXTENT, AND REQUIRED TYPE OF FABRIC (IF SPECIFIED). IF THERE ARE QUESTIONS OR PROBLEMS WITH THE LOCATION, EXTENT, FABRIC TYPE, OR METHOD OF INSTALLATION CONTACT THE ENGINEER OR RESPONSIBLE ON-SITE OFFICER FOR ASSISTANCE.

2. TO THE MAXIMUM DEGREE PRACTICAL, AND WHERE THE PLANS ALLOW, ENSURE THE FENCE IS LOCATED:
(i) TOTALLY WITHIN THE PROPERTY BOUNDARIES;
(ii) ALONG A LINE OF CONSTANT ELEVATION WHEREVER PRACTICAL;
(iii) AT LEAST 2m FROM THE TOE OF ANY FILLING OPERATIONS THAT MAY RESULT IN SHIFTING SOIL/FILL DAMAGING THE FENCE.

3. INSTALL RETURNS WITHIN THE FENCE AT MAXIMUM 20m INTERVALS IF THE FENCE IS INSTALLED ALONG THE CONTOUR, OR 5 TO 10m MAXIMUM SPACING (DEPENDING ON SLOPE) IF THE FENCE IS INSTALLED AT AN ANGLE TO THE CONTOUR. THE 'RETURNS' SHALL CONSIST OF EITHER:
(i) V-SHAPED SECTION EXTENDING AT LEAST 1.5m UP THE SLOPE; OR
(ii) SANDBAG OR ROCK/AGGREGATE CHECK DAM A MINIMUM 1/3 AND MAXIMUM 1/2 FENCE HEIGHT, AND EXTENDING AT LEAST 1.5m UP THE SLOPE.

4. ENSURE THE EXTREME ENDS OF THE FENCE ARE TURNED UP THE SLOPE AT LEAST 1.5m, OR AS NECESSARY, TO MINIMISE WATER BYPASSING AROUND THE FENCE.

5. ENSURE THE SEDIMENT FENCE IS INSTALLED IN A MANNER THAT AVOIDS THE CONCENTRATION OF FLOW ALONG THE FENCE, AND THE UNDESIRABLE DISCHARGE OF WATER AROUND THE ENDS OF THE FENCE.

6. IF THE SEDIMENT FENCE IS TO BE INSTALLED ALONG THE EDGE OF EXISTING TREES, ENSURE CARE IS TAKEN TO PROTECT THE TREES AND THEIR ROOT SYSTEMS DURING INSTALLATION OF THE FENCE. DO NOT ATTACH THE FABRIC TO THE TREES.

7. UNLESS DIRECTED BY THE SITE SUPERVISOR OR THE APPROVED PLANS, EXCAVATE A 200mm WIDE BY 200mm DEEP TRENCH ALONG THE PROPOSED FENCE LINE, PLACING THE EXCAVATED MATERIAL ON THE UP-SLOPE SIDE OF THE TRENCH.

8. ALONG THE LOWER SIDE OF THE TRENCH, APPROPRIATELY SECURE THE STAKES INTO THE GROUND SPACED NO GREATER THAN 3m IF SUPPORTED BY A TOP SUPPORT WIRE OR WEIR MESH BACKING, OTHERWISE NO GREATER THAN 2m.

9. IF SPECIFIED, SECURELY ATTACH THE SUPPORT WIRE OR MESH TO THE UP-SLOPE SIDE OF THE STAKES WITH THE MESH EXTENDING AT LEAST 200mm INTO THE EXCAVATED TRENCH. ENSURE THE MESH AND FABRIC IS ATTACHED TO THE UP-SLOPE SIDE OF THE STAKES EVEN WHEN DIRECTING A FENCE AROUND A CORNER OR SHARP CHANGE OF DIRECTION.

10. WHEREVER POSSIBLE, CONSTRUCT THE SEDIMENT FENCE FROM A CONTINUOUS ROLL OF FABRIC. TO JOIN FABRIC EITHER:
(i) ATTACH EACH END TO TWO OVERLAPPING STAKES WITH THE FABRIC FOLDING AROUND THE ASSOCIATED STAKE ONE TURN, AND WITH THE TWO STAKES TIED TOGETHER WITH WIRE; OR
(ii) OVERLAP THE FABRIC TO THE NEXT ADJACENT SUPPORT POST.

11. SECURELY ATTACH THE FABRIC TO THE SUPPORT POSTS USING 25 X 12.5mm STAPLES, OR TIE WIRE AT MAXIMUM 150mm SPACING.

12. SECURELY ATTACH THE FABRIC TO THE SUPPORT WIRE/MESH (IF ANY) AT A MAXIMUM SPACING OF 1m.

13. ENSURE THE COMPLETED SEDIMENT FENCE IS AT LEAST 450mm, BUT NOT MORE THAN 700mm HIGH. IF A SPILL-THOUGH WEIR IS INSTALLED, ENSURE THE CREST OF THE WEIR IS AT LEAST 300mm ABOVE GROUND LEVEL.

14. BACKFILL THE TRENCH AND TAMP THE FILL TO FIRMLY ANCHOR THE BOTTOM OF THE FABRIC AND MESH TO PREVENT WATER FROM FLOWING UNDER THE FENCE.

ADDITIONAL REQUIREMENTS FOR THE INSTALLATION OF A SPILL-THROUGH WEIR

1. LOCATE THE SPILL-THROUGH WEIR SUCH THAT THE WEIR CREST WILL BE LOWER THAN THE GROUND LEVEL AT EACH END OF THE FENCE.

2. ENSURE THE CREST OF THE SPILL-THROUGH WEIR IS AT LEAST 300mm THE GROUND ELEVATION.

3. SECURELY TIE A HORIZONTAL CROSS MEMBER (WEIR) TO THE SUPPORT POSTS/ STAKES EACH SIDE OF THE WEIR. CUT THE FABRIC DOWN THE SIDE OF EACH POST AND FOLD THE FABRIC OVER THE CROSS MEMBER AND APPROPRIATELY SECURE THE FABRIC.

4. INSTALL A SUITABLE SPLASH PAD AND/OR CHUTE IMMEDIATELY DOWN-SLOPE OF THE SPILL-THROUGH WEIR TO CONTROL SOIL EROSION AND APPROPRIATELY DISCHARGE THE CONCENTRATED FLOW PASSING OVER THE WEIR.

MAINTENANCE

1. INSPECT THE SEDIMENT FENCE AT LEAST WEEKLY AND AFTER ANY SIGNIFICANT RAIN. MAKE NECESSARY REPAIRS IMMEDIATELY.

2. REPAIR ANY TORN SECTIONS WITH A CONTINUOUS PIECE OF FABRIC FROM POST TO POST.

3. WHEN MAKING REPAIRS, ALWAYS RESTORE THE SYSTEM TO ITS ORIGINAL CONFIGURATION UNLESS AN AMENDED LAYOUT IS REQUIRED OR SPECIFIED.

4. IF THE FENCE IS SAGGING BETWEEN STAKES, INSTALL ADDITIONAL SUPPORT POSTS.

5. REMOVE ACCUMULATED SEDIMENT IF THE SEDIMENT DEPOSIT EXCEEDS A DEPTH OF 1/3 THE HEIGHT OF THE FENCE.

6. DISPOSE OF SEDIMENT IN A SUITABLE MANNER THAT WILL NOT CAUSE AN EROSION OR POLLUTION HAZARD.

7. REPLACE THE FABRIC IF THE SERVICE LIFE OF THE EXISTING FABRIC EXCEEDS 6-MONTHS.

REMOVAL

1. WHEN DISTURBED AREAS UP-SLOPE OF THE SEDIMENT FENCE ARE SUFFICIENTLY STABILISED TO RESTRAIN EROSION, THE FENCE MUST BE REMOVED.

2. REMOVE MATERIALS AND COLLECTED SEDIMENT AND DISPOSE OF IN A SUITABLE MANNER THAT WILL NOT CAUSE AN EROSION OR POLLUTION HAZARD.

3. REHABILITATE/REVEGETATE THE DISTURBED GROUND AS NECESSARY TO MINIMISE THE EROSION HAZARD.

Drawn:	Date:		
GMW	Apr-10	Sediment Fence	SF-02

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3	03/06/2023	JD	AF	Issued to client
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PREPARED BY: ENVIRONMENTAL CONSULTANTS TERRITORY PROUD (EcOz) CPESC ENVIROCERT

PREPARED FOR: Santos

JACKO BORE 1DW1 – Drilling and Test Program

EROSION & SEDIMENT CONTROL PLAN

December 2023 – September 2025

MATERIALS

ROCK: 150 TO 300mm NOMINAL DIAMETER, HARD, EROSION RESISTANT ROCK. SMALLER ROCK MAY BE USED IF SUITABLE LARGE ROCK IS NOT AVAILABLE.

SANDBAGS: GEOTEXTILE BAGS (WOVEN SYNTHETIC, OR NON-WOVEN BIODEGRADABLE) FILLED WITH CLEAN COARSE SAND, CLEAN AGGREGATE, STRAW OR COMPOST.

INSTALLATION

1. REFER TO APPROVED PLANS FOR LOCATION AND INSTALLATION DETAILS. IF THERE ARE QUESTIONS OR PROBLEMS WITH THE LOCATION OR METHOD OF INSTALLATION, CONTACT THE ENGINEER OR RESPONSIBLE ON-SITE OFFICER FOR ASSISTANCE.

2. PRIOR TO PLACEMENT OF THE CHECK DAMS, ENSURE THE TYPE AND SIZE OF EACH CHECK DAMS WILL NOT CAUSE A SAFETY HAZARD OR CAUSE WATER TO SPILL OUT OF THE DRAIN.

3. LOCATE THE FIRST CHECK DAM AT THE DOWNSTREAM END OF THE SECTION OF CHANNEL BEING PROTECTED. LOCATE EACH SUCCESSIVE CHECK DAM SUCH THAT THE CREST OF THE IMMEDIATE DOWNSTREAM DAM IS LEVEL WITH THE TOE OF THE CHECK DAM BEING INSTALLED.

4. ENSURE THE CHANNEL SLOPE IS NO STEEPER THAN 10:1 (H:V). OTHERWISE CONSIDER THE USE OF A SUITABLE CHANNEL LINER INSTEAD OF THE CHECK DAMS.

5. CONSTRUCT THE CHECK DAM TO THE DIMENSIONS AND PROFILE SHOWN WITHIN THE APPROVED PLAN.

6. WHERE SPECIFIED, THE CHECK DAMS SHALL BE CONSTRUCTED ON A SHEET OF GEOTEXTILE FABRIC USED AS A DOWNSTREAM SPLASH PAD.

7. EACH CHECK DAM SHALL BE EXTENDED UP THE CHANNEL BANK (WHERE PRACTICABLE) TO AN ELEVATION AT LEAST 150mm ABOVE THE CREST LEVEL OF THE DAM.

MAINTENANCE

1. INSPECT EACH CHECK DAM AND THE DRAINAGE CHANNEL AT LEAST WEEKLY AND AFTER RUNOFF-PRODUCING RAINFALL.

2. CORRECT ALL DAMAGE IMMEDIATELY. IF SIGNIFICANT EROSION OCCURS BETWEEN ANY OF THE CHECK DAMS, THEN CHECK THE SPACING OF DAMS AND WHERE NECESSARY INSTALL INTERMEDIATE CHECK DAMS OR A SUITABLE CHANNEL LINER.

3. CHECK FOR DISPLACEMENT OF THE CHECK DAMS

4. CHECK FOR SOIL SCOUR AROUND THE ENDS OF EACH CHECK DAM. IF SUCH EROSION IS OCCURRING, CONSIDER EXTENDING THE WIDTH OF THE CHECK DAM TO AVOID SUCH PROBLEMS.

5. IF SEVERE SOIL EROSION OCCURS EITHER UNDER OR AROUND THE CHECK DAMS, THEN SEEK EXPERT ADVICE ON AN ALTERNATIVE TREATMENT MEASURE.

6. REMOVE ANY SEDIMENT ACCUMULATED BY THE CHECK DAMS, UNLESS IT IS INTENDED THAT THIS SEDIMENT WILL REMAIN WITHIN THE CHANNEL.

7. DISPOSE OF COLLECTED SEDIMENT IN A SUITABLE MANNER THAT WILL NOT CAUSE AN EROSION OR POLLUTION HAZARD.

REMOVAL

1. WHEN CONSTRUCTION WORK WITHIN THE DRAINAGE AREA ABOVE THE CHECK DAMS HAS BEEN COMPLETED, AND THE DISTURBED AREAS AND THE DRAINAGE CHANNEL ARE SUFFICIENTLY STABILISED TO RESTRAIN EROSION, ALL TEMPORARY CHECK DAMS MUST BE REMOVED.

2. REMOVE THE CHECK DAMS AND ASSOCIATED SEDIMENT AND DISPOSE OF IN A SUITABLE MANNER THAT WILL NOT CAUSE AN EROSION OR POLLUTION HAZARD.

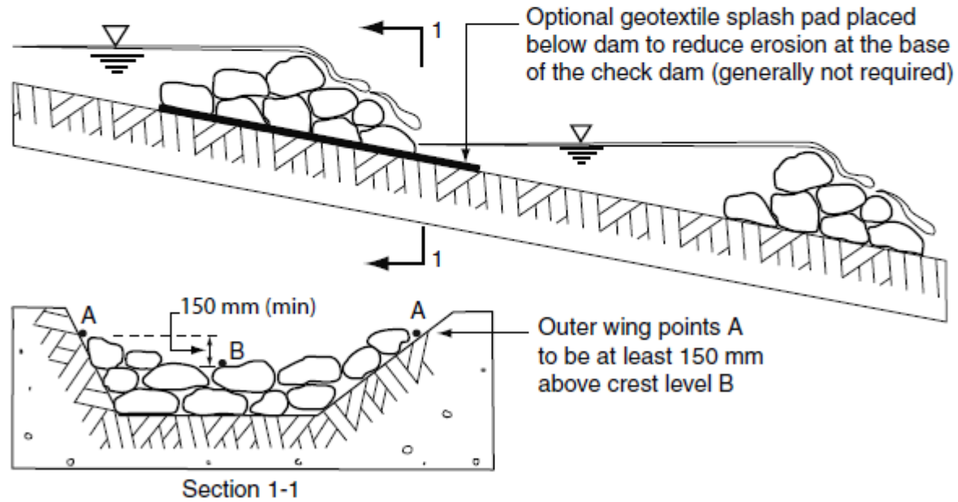

Figure 1 - Layout and profile of check dams (rock check dams shown)

Drawn:	Date:		
GMW	Dec-09	Check Dams	RCD-01

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REVISION	DATE	DRAWN	APPROVED	DESCRIPTION
3	03/06/2023	JD	AF	Issued to client
4	08/06/2023	JD	AF	Issued to client
5	22/11/2023	JD	AF	Issued to client
6	7/12/2023	JD	AF	Issued to client
7	28/3/24	JD	AF	Issued to client
8	25/6/24	JD	AF	Issued to client

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PREPARED FOR: Santos

INSTALLATION

1. REFER TO APPROVED PLANS FOR LOCATION, EXTENT, AND CONSTRUCTION DETAILS. IF THERE ARE QUESTIONS OR PROBLEMS WITH THE LOCATION, EXTENT, OR METHOD OF INSTALLATION, CONTACT THE ENGINEER OR RESPONSIBLE ON-SITE OFFICER FOR ASSISTANCE.

2. CLEAR THE LOCATION FOR THE BANK, CLEARING ONLY THE AREA THAT IS NEEDED TO PROVIDE ACCESS FOR PERSONNEL AND EQUIPMENT.

3. REMOVE ROOTS, STUMPS, AND OTHER DEBRIS AND DISPOSE OF THEM PROPERLY. DO NOT USE DEBRIS TO BUILD THE BANK.

4. FORM THE BANK FROM THE MATERIAL, AND TO THE DIMENSION SPECIFIED IN THE APPROVED PLANS.

5. IF EARTH IS USED, THEN ENSURE THE SIDES OF THE BANK ARE NO STEEPER THAN A 2:1 (H:V) SLOPE, AND THE COMPLETED BANK MUST BE AT LEAST 500mm HIGH.

6. IF FORMED FROM SANDBAGS, THEN ENSURE THE BAGS ARE TIGHTLY PACKED SUCH THAT WATER LEAKAGE THROUGH THE BAGS IS MINIMISED.

7. CHECK THE BANK ALIGNMENT TO ENSURE POSITIVE DRAINAGE IN THE DESIRED DIRECTION.

8. THE BANK SHOULD BE VEGETATED (TURFED, SEEDED AND MULCHED), OR OTHERWISE STABILISED IMMEDIATELY, UNLESS IT WILL OPERATE FOR LESS THAN 30 DAYS OR IF SIGNIFICANT RAINFALL IS NOT EXPECTED DURING THE LIFE OF THE BANK.

9. ENSURE THE EMBANKMENT DRAINS TO A STABLE OUTLET, AND DOES NOT DISCHARGE TO AN UNSTABLE FILL SLOPE.

MAINTENANCE

1. INSPECT FLOW DIVERSION BANKS AT LEAST WEEKLY AND AFTER RUNOFF-PRODUCING RAINFALL.

2. INSPECT THE BANK FOR ANY SLUMPS, WHEEL TRACK DAMAGE OR LOSS OF FREEBOARD. MAKE REPAIRS AS NECESSARY.

3. CHECK THAT FILL MATERIAL OR SEDIMENT HAS NOT PARTIALLY BLOCKED THE DRAINAGE PATH UP-SLOPE OF THE EMBANKMENT. WHERE NECESSARY, REMOVE ANY DEPOSITED MATERIAL TO ALLOW FREE DRAINAGE.

4. DISPOSE OF ANY COLLECTED SEDIMENT OR FILL IN A MANNER THAT WILL NOT CREATE AN EROSION OR POLLUTION HAZARD.

5. REPAIR ANY PLACES IN THE BANK THAT ARE WEAKENED OR IN RISK OF FAILURE.

REMOVAL

1. WHEN THE SOIL DISTURBANCE ABOVE THE BANK IS FINISHED AND THE AREA IS STABILISED, THE FLOW DIVERSION BANK SHOULD BE REMOVED, UNLESS IT IS TO REMAIN AS A PERMANENT DRAINAGE FEATURE.

2. DISPOSE OF ANY SEDIMENT OR EARTH IN A MANNER THAT WILL NOT CREATE AN EROSION OR POLLUTION HAZARD.

3. GRADE THE AREA AND SMOOTH IT OUT IN PREPARATION FOR STABILISATION.

4. STABILISE THE AREA BY GRASSING OR AS SPECIFIED IN THE APPROVED PLAN.

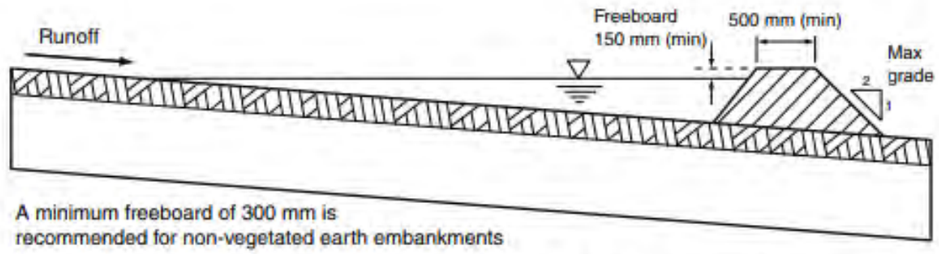

Figure 1 - Typical profile of flow diversion bank formed from earth

Table 1 - Recommended dimensions of flow diversion banks

Parameter	Earth banks	Vegetated banks	Compost berms	Sandbag berms
Height (min)	500 mm	500 mm	300 mm	N/A
Top width (min)	500 mm	500 mm	100 mm	N/A
Base width (min)	2500 mm	2500 mm	600 mm	N/A
Side slope (max)	2:1 (H:V)	2:1 (H:V)	1:1 (H:V)	N/A
Freeboard	300 mm	150 mm	100 mm	50 mm

Drawn:	Date:		
GMW	Dec-09	Flow Diversion Banks	DB-01

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5	22/11/2023	JD	AF	Issued to client
6	7/12/2023	JD	AF	Issued to client
7	28/3/24	JD	AF	Issued to client
8	25/6/24	JD	AF	Issued to client

PREPARED BY: EcOz ENVIRONMENTAL CONSULTANTS TERRITORY PROUD; CPESC ENVIROCERT

PREPARED FOR: Santos

MATERIALS

PRIMARY CORE ROCK: WELL GRADED, HARD, ANGULAR, EROSION RESISTANT ROCK, WITH MEAN SIZE AS SPECIFIED IN THE APPROVED PLAN, BUT NOT LESS THAN 225mm, OR GREATER THAN 350mm.

ARMOUR ROCK: WELL GRADED, HARD, ANGULAR, EROSION RESISTANT ROCK, WITH MEAN SIZE AS SPECIFIED IN THE APPROVED PLAN, BUT NOT LESS THAN 225mm.

AGGREGATE FILTER: 15 TO 25mm CLEAN AGGREGATE.

GEOTEXTILE FILTER FABRIC: HEAVY-DUTY NON-WOVEN, NEEDLE-PUNCHED FILTER FABRIC, MINIMUM 'BIDIM' A34 OR EQUIVALENT.

INSTALLATION

1. REFER TO APPROVED PLANS FOR LOCATION AND CONSTRUCTION DETAILS. IF THERE ARE QUESTIONS OR PROBLEMS WITH THE LOCATION, OR METHOD OF INSTALLATION, CONTACT THE ENGINEER OR RESPONSIBLE ON-SITE OFFICER FOR ASSISTANCE.

2. CLEAR THE FOUNDATION AREA OF THE ROCK FILTER DAM OF WOODY VEGETATION AND ORGANIC MATTER. DELAY CLEARING THE UP-SLOPE POND AREA UNTIL THE DAM IS FORMED AND IS ABLE TO ACT AS A SUITABLE SEDIMENT TRAP, OTHERWISE AN ALTERNATIVE TEMPORARY DOWNSTREAM SEDIMENT TRAP MAY BE REQUIRED DURING CONSTRUCTION OF THE ROCK FILTER DAM.

3. IF SPECIFIED ON THE PLANS, EXCAVATE A CUT-OFF TRENCH ALONG THE CENTRE-LINE OF THE DAM AND EARTH ABUTMENTS (IF ANY).

4. COVER THE FOUNDATION AREA AND CUT-OFF TRENCH WITH HEAVY-DUTY FILTER FABRIC BEFORE BACKFILLING WITH THE CORE ROCK. OVERLAP ADJOINING FABRIC SHEETS A MINIMUM OF 600mm.

5. CONSTRUCT THE ASSOCIATED EARTH ABUTMENT (IF ANY). ALL CUT AND FILL SLOPES SHOULD BE 2:1(H:V) OR FLATTER. THE DOWNSTREAM FACE OF EARTH ABUTMENTS SHOULD BE 3:1(H:V) OR FLATTER. EARTH ABUTMENTS SHOULD BE CONSTRUCTED OF WELL-COMPACTED, EROSION RESISTANT SOIL THAT IS FREE OF VEGETATION AND ROOTS. OVERFILL EARTH ABUTMENTS 150mm TO ALLOW FOR SETTLEMENT.

6. PLACE THE CORE ROCK FOR THE ROCK FILTER DAM. ENSURE THE UPSTREAM FACE IS 2:1(H:V) OR FLATTER, AND THE DOWNSTREAM FACE IS 3:1(H:V) OR FLATTER.

7. ENSURE THE ROCK IS MACHINE PLACED WITH THE SMALLER ROCKS WORKED INTO THE VOIDS OF THE LARGER ROCKS.

8. IF SPECIFIED, CONSTRUCT THE SPILLWAY SECTION USING THE SPECIFIED ARMOUR ROCK. THE SPILLWAY SHOULD HAVE A MINIMUM PROFILE DEPTH OF 300mm. THE SPILLWAY WEIR CREST MUST BE LEVEL ACROSS ITS FULL WIDTH. THE MAXIMUM LONGITUDINAL SLOPE OF THE ROCK SPILLWAY SHOULD BE 3:1(H:V). THE MINIMUM THICKNESS OF ARMOUR ROCK PROTECTION SHOULD BE 500mm, OR TWICE THE NOMINAL ROCK SIZE, WHICHEVER IS THE GREATER.

9. ENSURE THE SPILLWAY OUTLET SECTION EXTENDS DOWNSTREAM PAST THE TOE OF THE FORMED EMBANKMENT UNTIL STABLE CONDITIONS ARE REACHED, OR A DISTANCE EQUAL TO THE HEIGHT OF THE DAM, WHICHEVER IS THE GREATER. THE EDGES OF THE SPILLWAY SHOULD BE LEFT FLUSH WITH THE SURROUNDING GROUND.

10. INSTALL THE SPECIFIED FILTER (AGGREGATE AND/OR FILTER CLOTH) ON THE UPSTREAM FACE OF THE ROCK FILTER DAM.

11. IF FILTER CLOTH IS USED, THEN:
(i) EXTEND THE FABRIC OVER THE CREST OF THE ROCK FILTER DAM INTO THE SPILLWAY CHUTE;
(ii) CONSIDER THE PLACEMENT OF SEVERAL LAYERS OF OVERLAPPING FABRIC, THUS ALLOWING EACH LAYER TO BE REMOVED INDIVIDUALLY ONCE THE FABRIC BECOMES BLOCKED WITH SEDIMENT.

12. CLEAR THE SETTLING POND AREA OF WOODY VEGETATION AND ORGANIC MATTER TO THE DIMENSIONS SPECIFIED WITHIN THE PLANS.

13. WHERE NECESSARY, EXCAVATE THE UPSTREAM SETTLING POND AND/OR SEDIMENT STORAGE PIT IN ACCORDANCE WITH THE APPROVED PLANS. EXCAVATED PITS TYPICALLY HAVE SIDE SLOPES OF 2:1(H:V) OR FLATTER UNLESS STEEPER SLOPES ARE KNOWN TO BE STABLE.

14. STABILISE ANY ASSOCIATED EARTH EMBANKMENTS IMMEDIATELY AFTER CONSTRUCTION THROUGH APPROPRIATE COMPACTION, VEGETATION AND/OR EROSION CONTROL MATTING.

15. ESTABLISH ALL NECESSARY UP-SLOPE DRAINAGE CONTROL MEASURES TO ENSURE THAT SEDIMENT-LADEN RUNOFF IS APPROPRIATELY DIRECTED INTO THE SEDIMENT TRAP.

16. TAKE ALL NECESSARY MEASURE TO MINIMISE THE SAFETY RISK CAUSED BY THE STRUCTURE.

MAINTENANCE

1. CHECK ALL ROCK FILTER DAMS AFTER EACH RUNOFF EVENT AND MAKE REPAIRS IMMEDIATELY.

2. INSPECT ALL ROCK AND EARTH EMBANKMENTS FOR UNDERCUTTING OR UNDESIRABLE SEEPAGE FLOWS.

3. IDEALLY, ROCK FILTER DAMS SHOULD DISCHARGE (FROM FULL) OVER NO LESS THAN 8 HOURS. IF DRAINAGE IS TOO RAPID, THEN ADDITIONAL FILTER AGGREGATE MAYBE REQUIRED TO ACHIEVE OPTIMUM HYDRAULIC PERFORMANCE.

4. IF FLOW THROUGH THE STRUCTURE IS REDUCED TO AN UNACCEPTABLE LEVEL, THE UPSTREAM FILTER MEDIUM (AGGREGATE OR FILTER CLOTH) SHOULD BE REMOVED AND REPLACED.

5. IF A GREATER DEGREE OF WATER TREATMENT (FILTRATION) IS REQUIRED, EXTRA GEOTEXTILE FILTER FABRIC SHOULD BE PLACED OVER THE UPSTREAM FACE OF THE STRUCTURE.

6. CHECK THE STRUCTURE AND DOWNSTREAM CHANNEL BANKS FOR DAMAGE FROM OVERTOPPING FLOWS. MAKE REPAIRS AS NECESSARY.

7. IMMEDIATELY REPLACE ANY ROCK DISPLACED FROM THE SPILLWAY.

8. REMOVE SEDIMENT AND RESTORE ORIGINAL SEDIMENT STORAGE VOLUME WHEN COLLECTED SEDIMENT EXCEEDS 10% OF THE SPECIFIED STORAGE VOLUME.

9. DISPOSE OF SEDIMENT AND DEBRIS IN A MANNER THAT WILL NOT CREATE AN EROSION OR POLLUTION HAZARD.

REMOVAL

1. WHEN THE UP-SLOPE DRAINAGE AREA HAS BEEN STABILISED, REMOVE ALL MATERIALS INCLUDED DEPOSITED SEDIMENT AND DISPOSE OF IN A SUITABLE MANNER THAT WILL NOT CAUSE AN EROSION OR POLLUTION HAZARD.

2. ALL WATER AND SEDIMENT SHOULD BE REMOVED FROM THE SETTLING POND PRIOR TO THE DAM'S REMOVAL. DISPOSE OF SEDIMENT AND WATER IN A MANNER THAT WILL NOT CREATE AN EROSION OR POLLUTION HAZARD.

3. BRING THE DISTURBED AREA TO A PROPER GRADE, THEN SMOOTH, COMPACT AND STABILISE AND/OR REVEGETATE AS REQUIRED TO MINIMISE THE EROSION HAZARD.

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PREPARED FOR: Santos

JACKO BORE 1DW1 – Drilling and Test Program

EROSION & SEDIMENT CONTROL PLAN

December 2023 – September 2025

APPENDIX A – SUPPORTING DOCUMENTATION

Supporting Document to Erosion and Sediment Control Plan

Jacko Bore 1DW1 Drilling and Test Program

Prepared by EcOz for Santos

www.ecoz.com.au

DOCUMENT CONTROL RECORD

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3	Jack Dymalla	Adele Faraone CPESC #11426	InGauge Santos	29/05/2023
4	Jack Dymalla	Adele Faraone CPESC #11426	InGauge Santos	02/06/2023
4	Jack Dymalla	Adele Faraone CPESC #11426	InGauge Santos	08/06/2023
5	Jack Dymalla CPESC #15021	Adele Faraone CPESC #11426	InGauge Santos	07/12/23

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Appendices

Appendix A SANTOS Civil Standard Drawings – Class D Road

1 INTRODUCTION

Santos operates Exploration Permit (EP) 125, which is located approximately 200 km south-west of Alice Springs, in the NT. The company proposes to expand the Jacko Bore exploration well (conventional gas), known as the Jacko Bore 1DW1 Drilling and Testing Program, on EP 125, and have prepared an Environmental Management Plan (EMP) for the well expansion program. The existing Jacko Bore 1 well pad is to be expanded to support the drilling of an additional horizontal helium well. This report will herein reference the Jacko Bore 1DW1 Drilling and Testing program as Jacko Bore 1DW1.

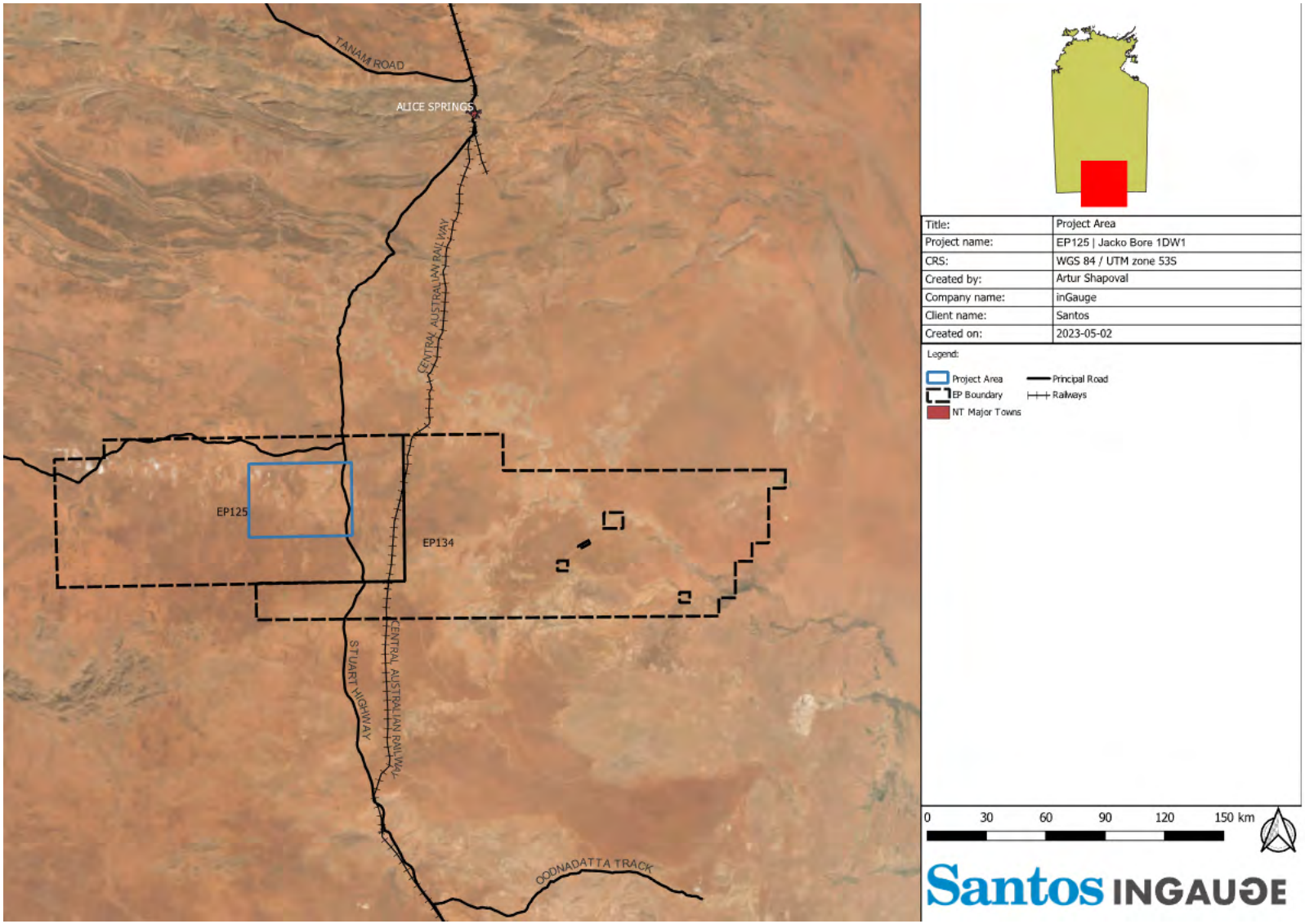
Santos have engaged EcOz Environmental Consultants (EcOz) to develop an Erosion and Sediment Control Plan (ESCP) associated with the proposed activities involved in the drilling and testing program of Jacko Bore 1DW1.

1.1 Scope and purpose

This document provides supporting information to the ESCP and has been prepared with input from a Certified Professional in Erosion and Sediment Control (CPESC). It incorporates the following elements, in accordance with accepted best practice erosion and sediment control:

- Identification of areas vulnerable to erosion and receiving waters.
- Inclusion of an overarching erosion risk and hazard assessment.
- Identification of the management strategy and controls to be implemented to effectively manage erosion, and subsequent sediment mobilisation during exploration activities.
- Provision of erosion and sediment control (ESC) recommendations and designs consistent with the guideline *Best Practice Erosion and Sediment Control* (IECA 2008).
- Details of measures to be implemented to effectively manage erosion, and potential sediment mobilisation associated with the project activities.

Figure 1-1. Project location



1.2 Well construction program overview and footprint

EP 125 is located in the Amadeus Basin in the south of the NT. Santos proposes to re-establish the previously cleared well pad, access track and campsite. The expansion of the well pad will require new access tracks and use and operation of existing gravel/borrow pits.

Key activities for the expansion of Jacko Bore 1DW1 include:

- The re-establishment of the previously cleared Well Pad area, access track and campsite.
- Expansion of the Well Pad and clearing of new access tracks.
- Drilling, Completion and Extended Production Testing of a horizontal well.
- Construction of water bore/s.
- Use of existing Gravel/Borrow Pit/s.
- Maintenance and monitoring of the access track, well pad and well up to, and including, abandonment and rehabilitation.

The location of the drilling program is shown in Figure 1-2. The project will be run in two stages. Stage 1 consists of preliminary civil works and water bore drilling and is required to facilitate the installation of a groundwater supply bore. Subject to the presence of the water, the bore will supply water for the project and provide a baseline water sample prior to the expansion of Jacko Bore 1DW1. Stage 2 consists of all activities associated with the drilling and completion of the well, including well suspension, maintenance and rehabilitation works.

Description	Total Amount of Required Land (incl. buffer)	Total Amount of Already Cleared Land (incl. buffer)	Remaining Clearance Required (incl. buffer)	Unit of Measure
Well Pad Expansion Area	5.3	0.8	4.5	ha
Access Tracks	36.7	34.7	2.0	ha
Gravel Pit/s	9.8	9.8	0.0	ha
Campsite (Including helicopter landing zone)	1.2	1.2	0.00	ha
Laydown	0.4	0.00	0.4	ha
Groundwater Bores	1.4	0.00	1.4	ha
Overburden Stockpiles	7.2	6.8	0.4	ha
Total	62.2	53.4	8.8	ha

1.2.1 Project timeframes

Table 1-2, below, outlines the anticipated timeframes for the project.

Table 1-1. Proposed project timeframes

Phase	Activity	Estimated timing
Civil Construction	56 days	December 2023 – January 2024
Drilling and Completion	58 days	February – March 2024
Extended Production Test	Up to 365 days over a period of 12-18 months	March 2024 – September 2025

Figure 1-2. Project footprint

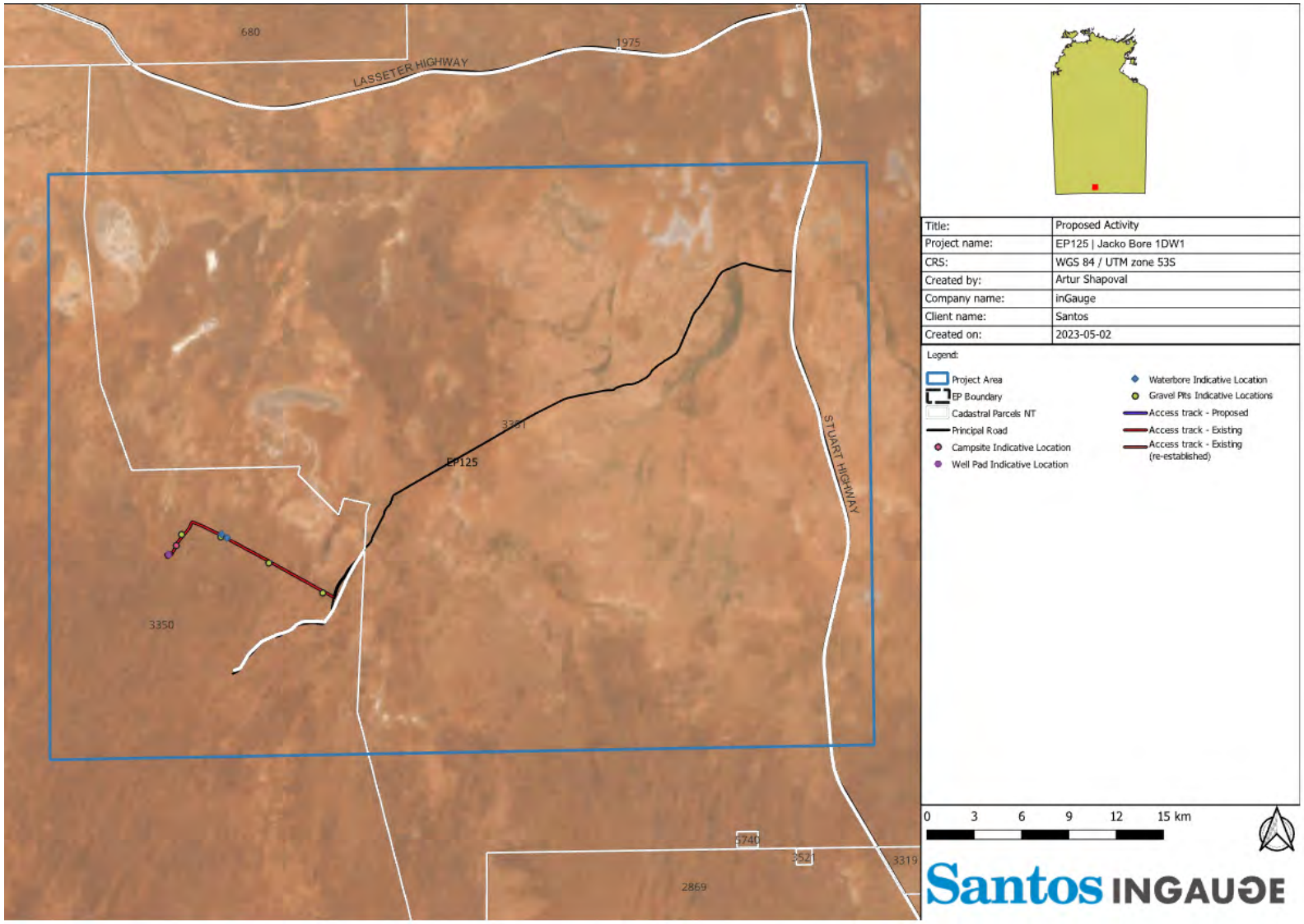


Figure 1-3. Project footprint (construction buffer) – Map 1 of 5

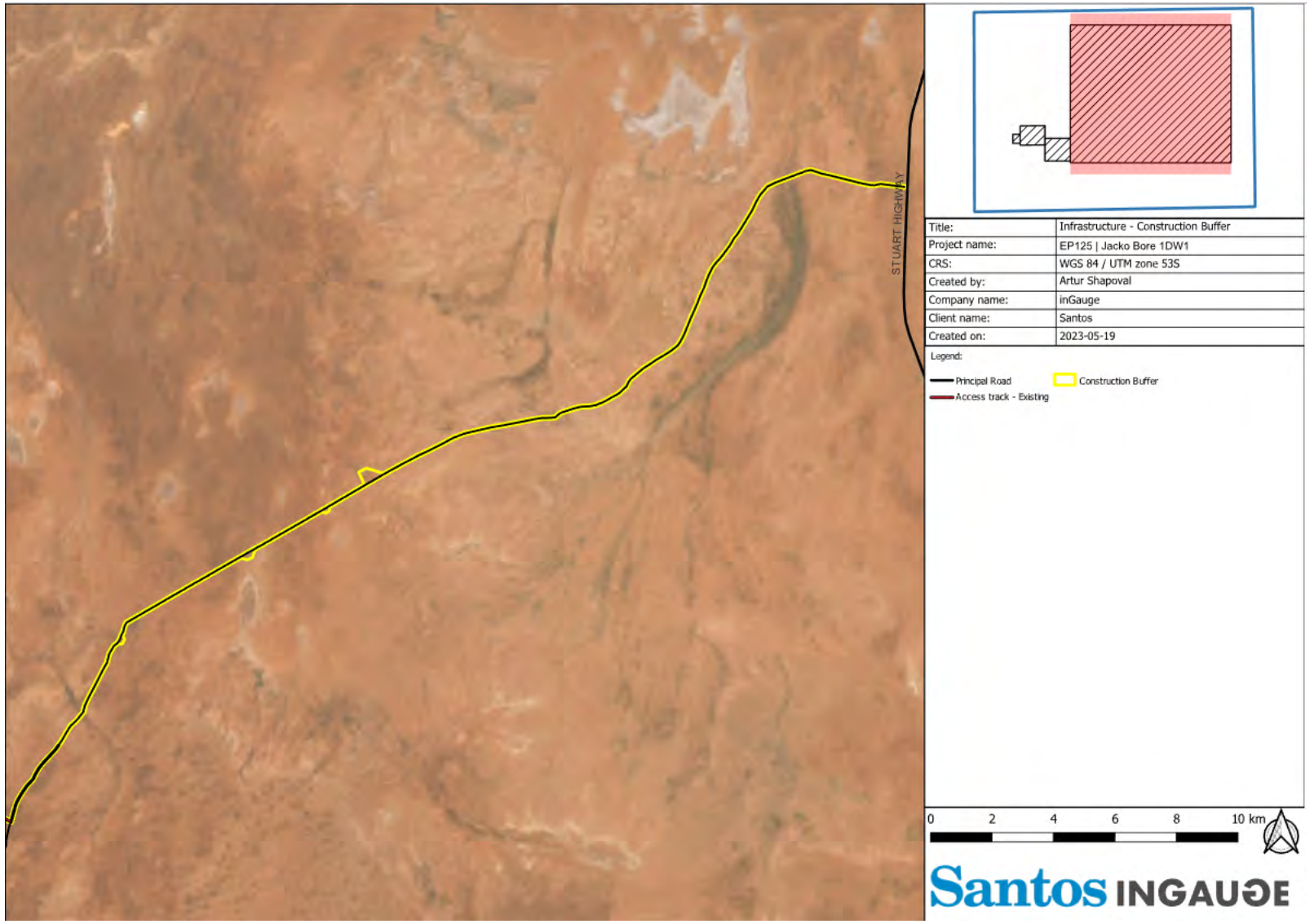


Figure 1-4. Project footprint (construction buffer) – Map 2 of 5

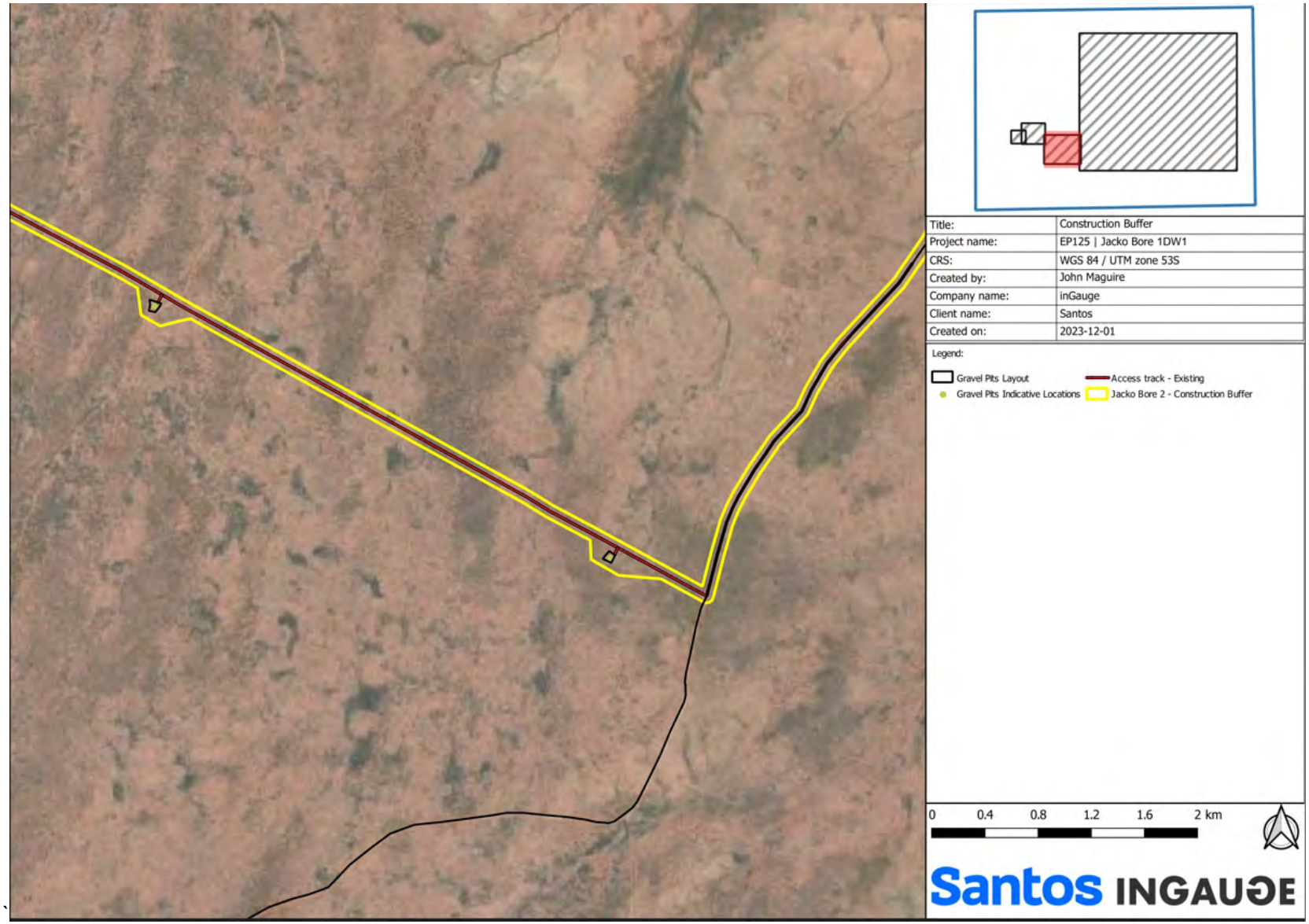


Figure 1-5. Project footprint (construction buffer) – Map 3 of 5

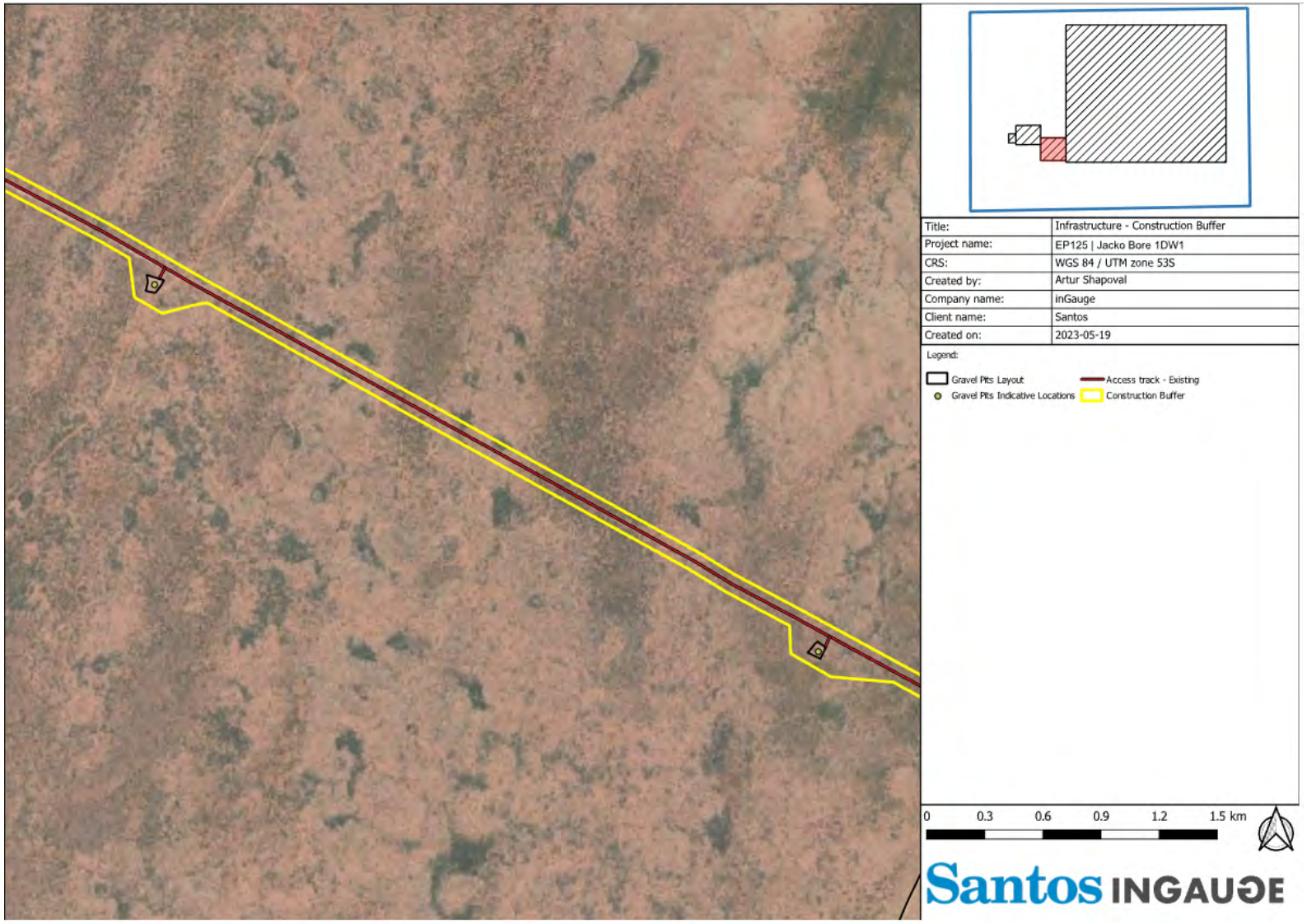


Figure 1-6. Project footprint (construction buffer) – Map 4 of 5

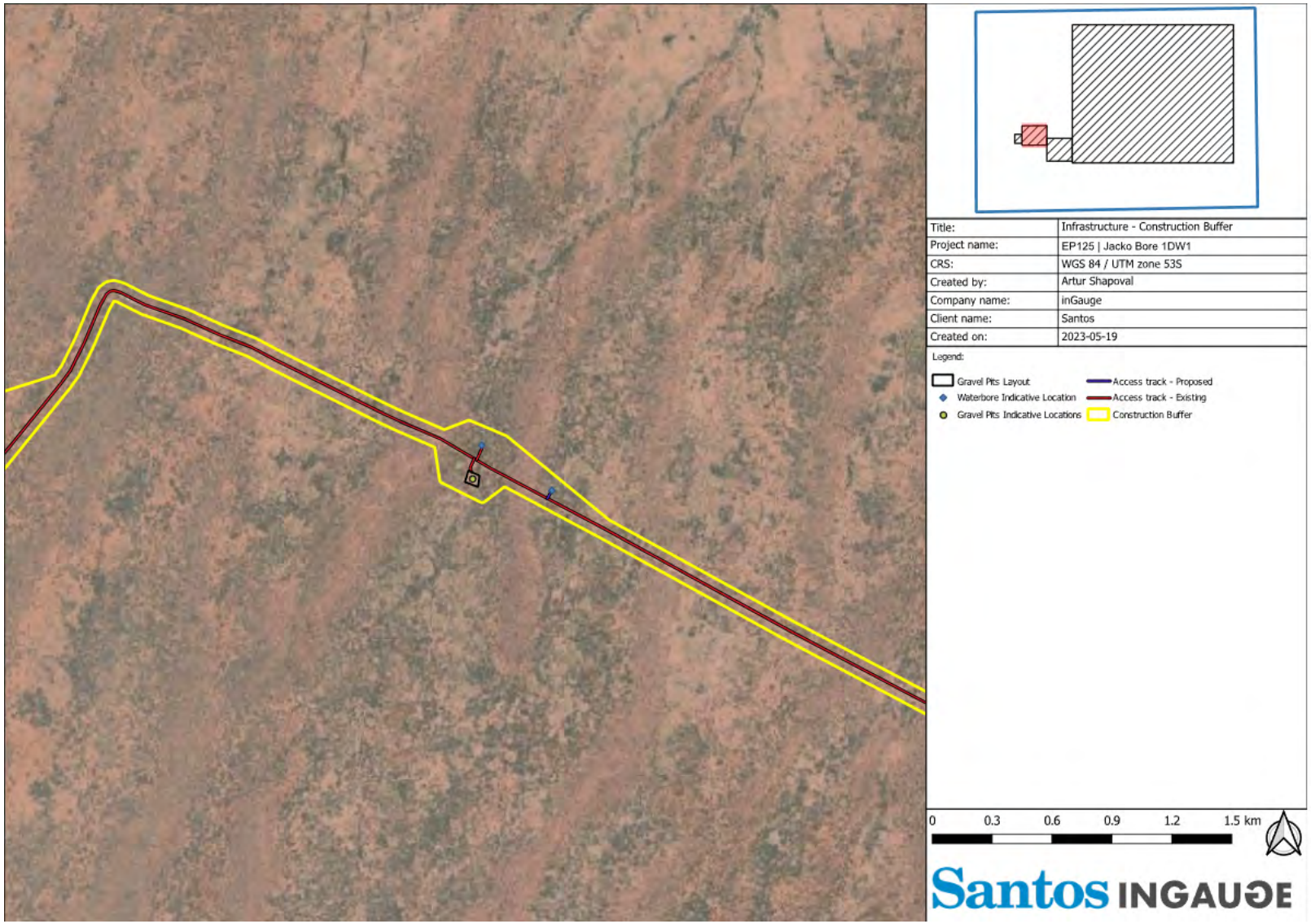
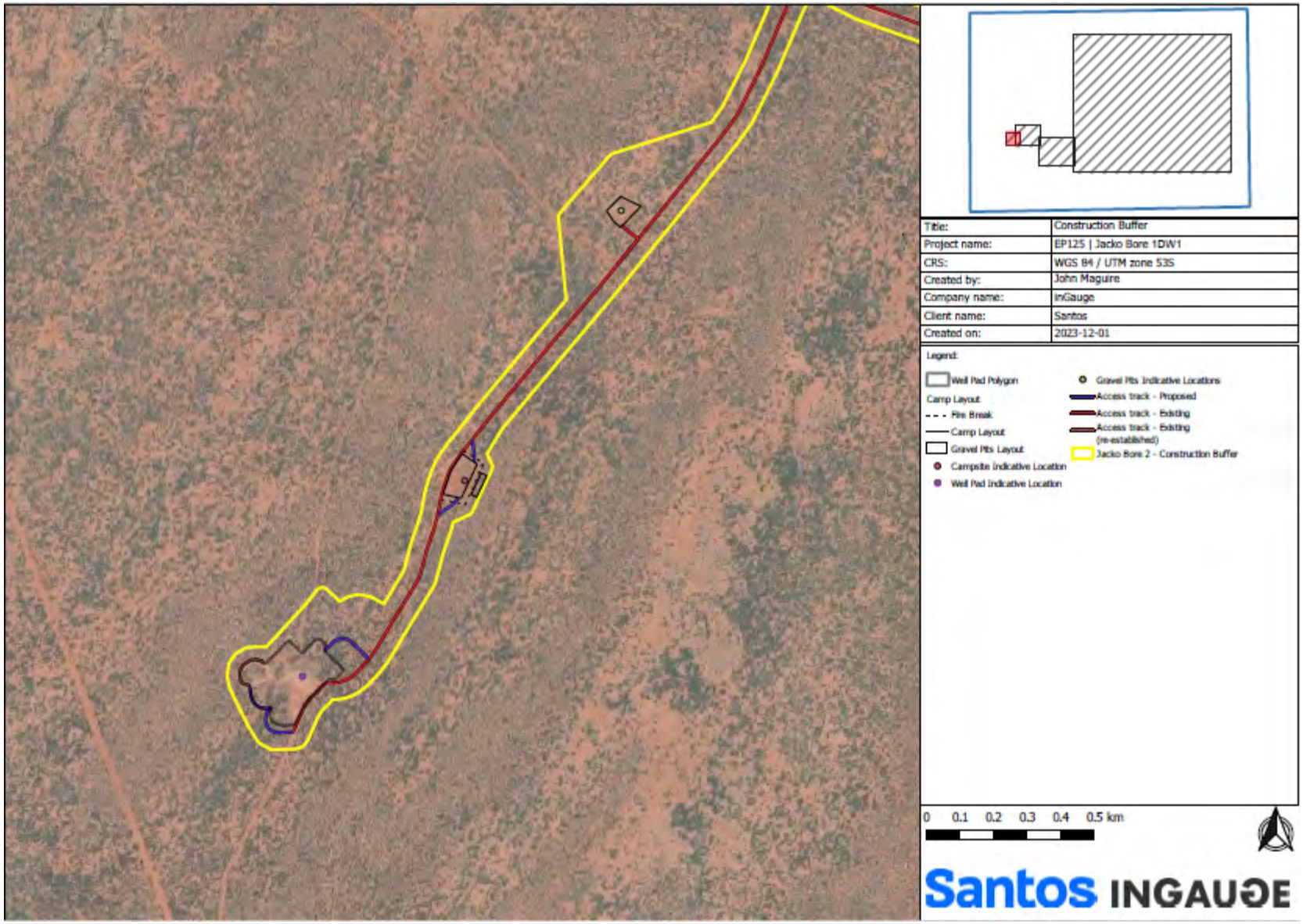


Figure 1-7. Project footprint (construction buffer) – Map 5 of 5



2 SITE CHARACTERISTICS

2.1 Climate and rainfall

The project area is located within the arid zone of Central Australia, with little / no rainfall throughout the year and high diurnal and seasonal temperature fluctuations. The nearest weather station with Bureau of Meteorology regional climatic data is the Kulgera weather station, which lies approximately 95 km to the south-east of the project area. Average annual rainfall for Kulgera is 249.9 mm.

Figure 2-1 provides a summary of climate information. December to March are the wettest months, with greater than 30 mm rainfall on average per year. June and July are the coolest months, with an average maximum of 19°C, whilst the hottest month of January has an average maximum temperature of 37°C.

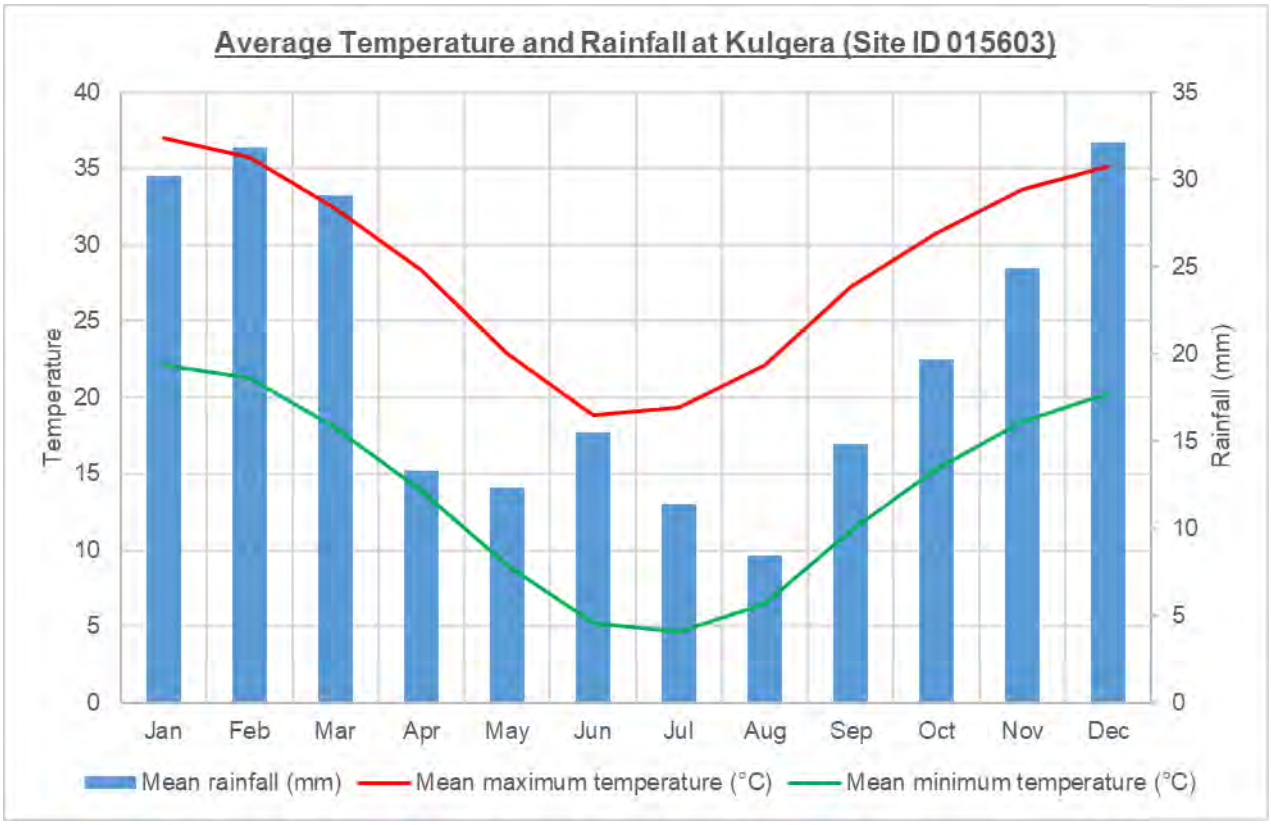


Figure 2-1. Mean monthly temperature and rainfall for Kulgera, NT.

2.2 Landform

2.2.1 Topography

The Project Area is in the Amadeus Basin, which is described as flat to gently undulating plains with slopes gradients and lengths of less than 5% and 100m, respectively (GHD, 2022). The immediate area of Jacko Bore 1DW1 comprises dunes and swales trending approximately south-west to north-east. The approach track to Jacko Bore 1DW1 avoids as much as possible crossings over the dunes.

2.2.2 Soils

The Project Area is mainly comprised of red clayey sands, with some sandy calcareous earths/stone mantles texture contrast soils. These clays are scalded red-brown and heavy-brown clay, respectively. There is a high volume of red sand to sandy red earth sands in the sandplains and soft red aeolian sands in the dunes.

In total seven soil types are present in the well pad area and the access to Jacko Bore 1DW1. Detail on the soil types in the Jacko Bore 1DW1 well pad area and access road is shown in Figure 2-2. The Jacko Bore 1DW1 well pad itself is located in an area with minor areas of mobile sands and irregular sand dunes.

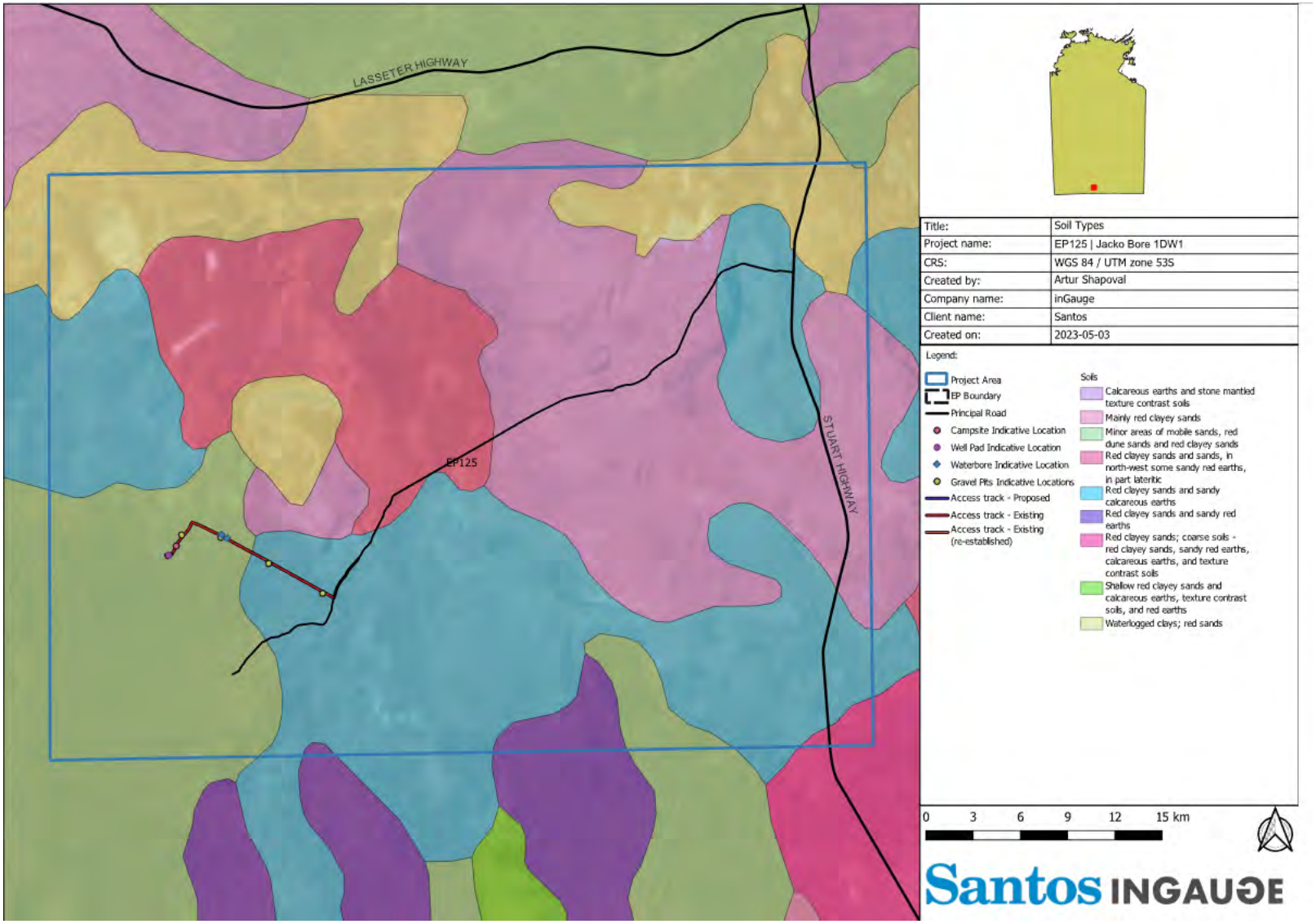
2.2.3 Land units

The project area occurs in dunefield with parallel linear dunes, reticulate dunes and irregular or aligned short dunes, that is primarily red sands. The site falls within two land units, which were assessed under the Lyndavale Station survey. These land units are described below in Table 2-1, below.

Table 2-1. Land units within project area

Land unit	Landform class	Landform description	Soil	Soil description
5.6	Dune fields	Sandy dunefield, dune side slopes 6% with gently inclined plains	Tenosols	Earthy sands (red-orthic tenosols)
4.2	Plains	Level plains, often occurring as swales within the southern dunefield	Kandosols	Red earths (red kandosols)

Figure 2-2. Soil types of the project area



2.3 Surface water

There are several watercourses throughout the Project Area, including small drainages, tributaries, and drainage gullies. Most of the watercourses follow the EP topography and occur to the north of the Project Area. The watercourses, including stream orders of the Project Area, are shown in Figure 2-7.

The main watercourse near the Project Area is Karinga Creek. Karinga Creek flows from west to east, draining into the Finke River, and is located approximately 20km north of the Jacko Bore 1DW1 well pad site. There are some ephemeral stream crossings along the existing public road access that leads to the Jacko Bore 1DW1 well pad site turnoff. These ephemeral streams ultimately flow to Karinga Creek. There is one crossing on the access track after the turn off from the public road to the well pad site.

The Karinga Creek Paleodrainage System (KCPS) consists of a chain of more than 100 saline lakes and is part of a larger chain of saline lakes that extend 500 km from Lake Hopkins in Western Australia to the Finke River. Karinga Creek flows after substantial rainfall, and the extensive lakes, claypans and saltpans are temporarily filled and provide important habitat for birdlife. The KCPS is both a Site of Conservation Significance and a Site of Botanical Significance, and this is discussed further in Section 5.7 of the EMP document.

Observation of the spring's spatial layer of the Natural Resource Maps indicates that there are springs within the Project Area but that they are isolated, approximately 9km from the well pad in the KCPS Sites of Conservation Significance (SOC) area to the northeast.

2.3.1 Flood modelling

The main watercourse near the Project Area is Karinga Creek. Several watercourses throughout the Project Area include small drainages, tributaries, and drainage gullies. All water channels and tributaries only flow after heavy rainfall, which is rare in this arid region. Almost all infrastructure is pre-existing on-site.

To estimate peak flood depths and flow rates, a Log Pearson III distribution was used to calculate the Annual Exceedance Probability (AEP) of a 1 in 100-year event flood event occurring in any year. A steady-state rainfall simulation was then developed over the catchment area using the TUFLOW hydraulic modelling suite and Shuttle Radar Topography Mission (SRTM) data to calculate peak flood depths and flow rates using the rainfall values from this event. The results are shown in Figures 2-3 to 2-6.

The modelling indicates the potential for some minor and isolated flooding at the well pad, and in patches along the swales in the local area, during a 1 in 100-year flood event. Erosion and sediment control measures will be built with this consideration. Almost all infrastructure is pre-existing on-site. The campsite is not within a flooding area.

Figure 2-3. Flood extents of the project area – Map 1 of 4

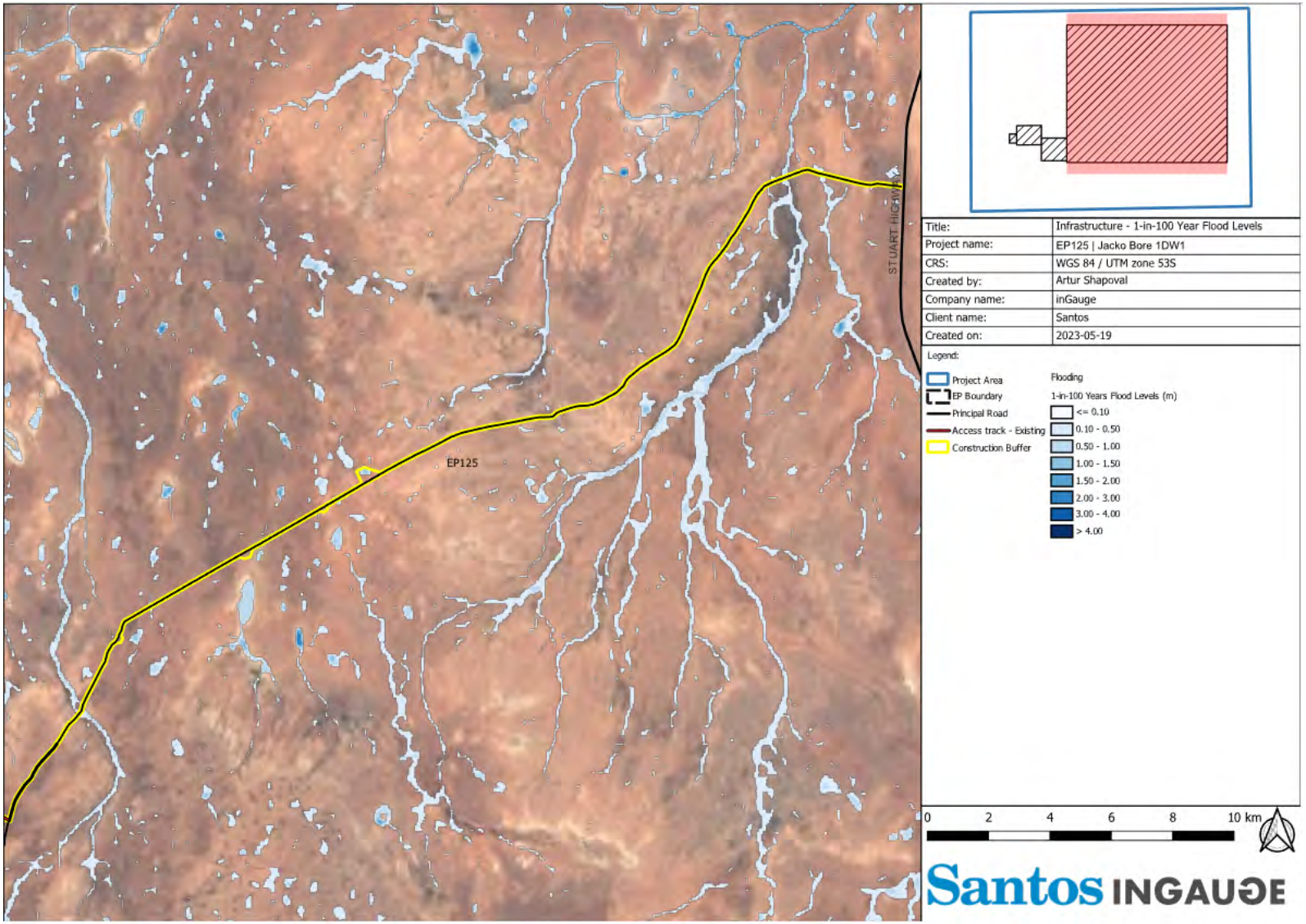


Figure 2-4. Flood extents of the project area – Map 2 of 4

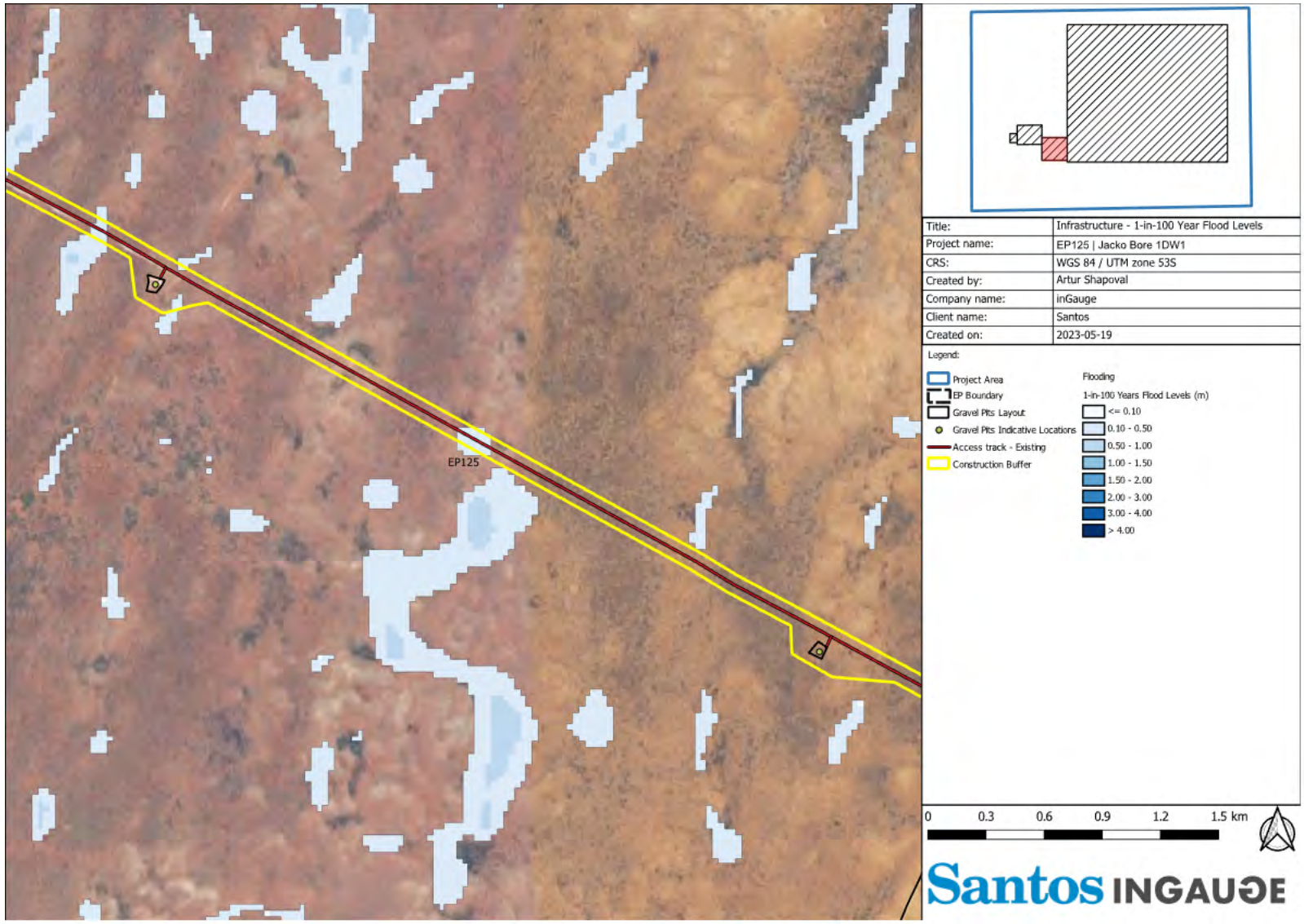


Figure 2-5. Flood extents of the project area – Map 3 of 4

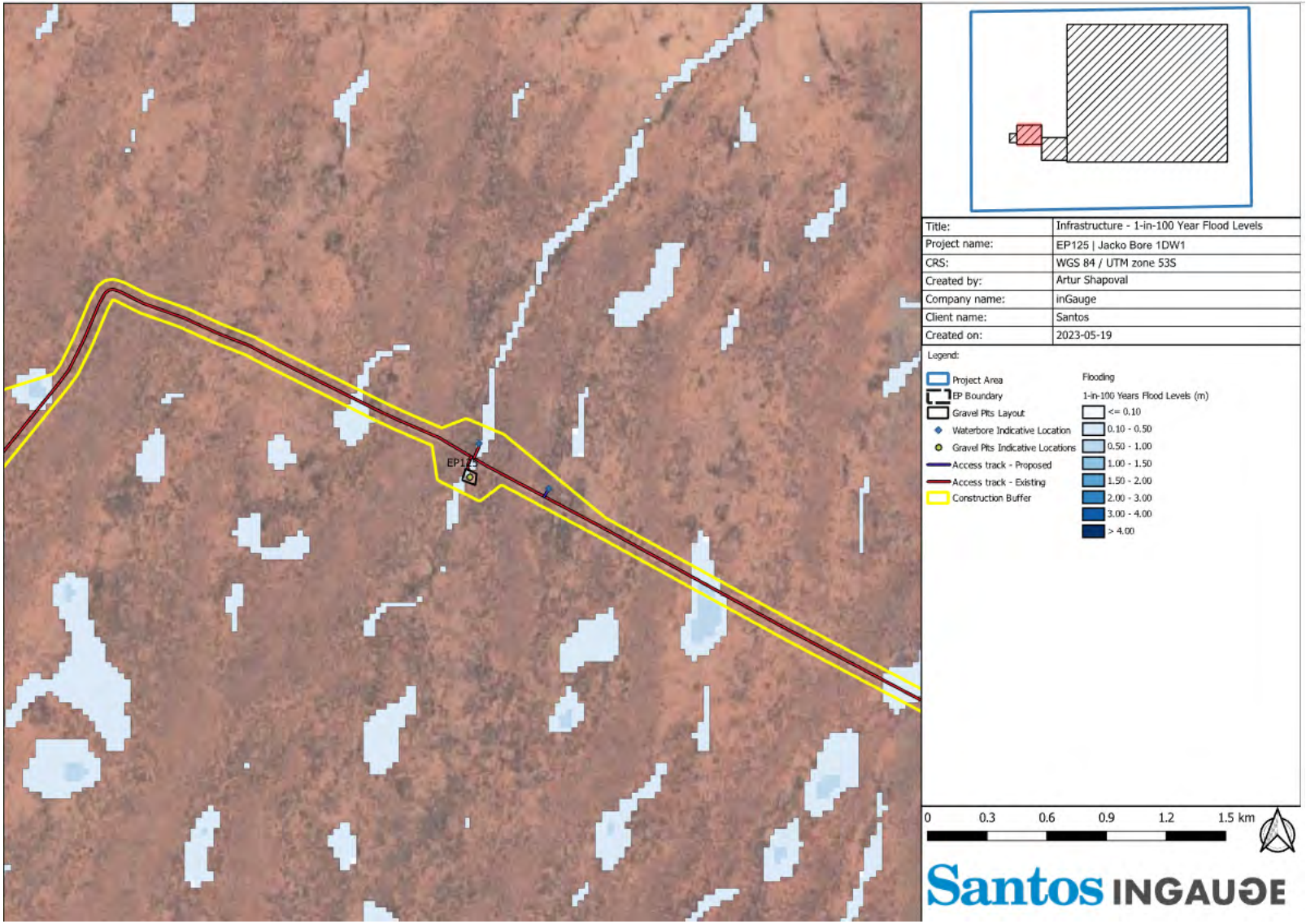


Figure 2-6. Flood extents of the project area – Map 4 of 4

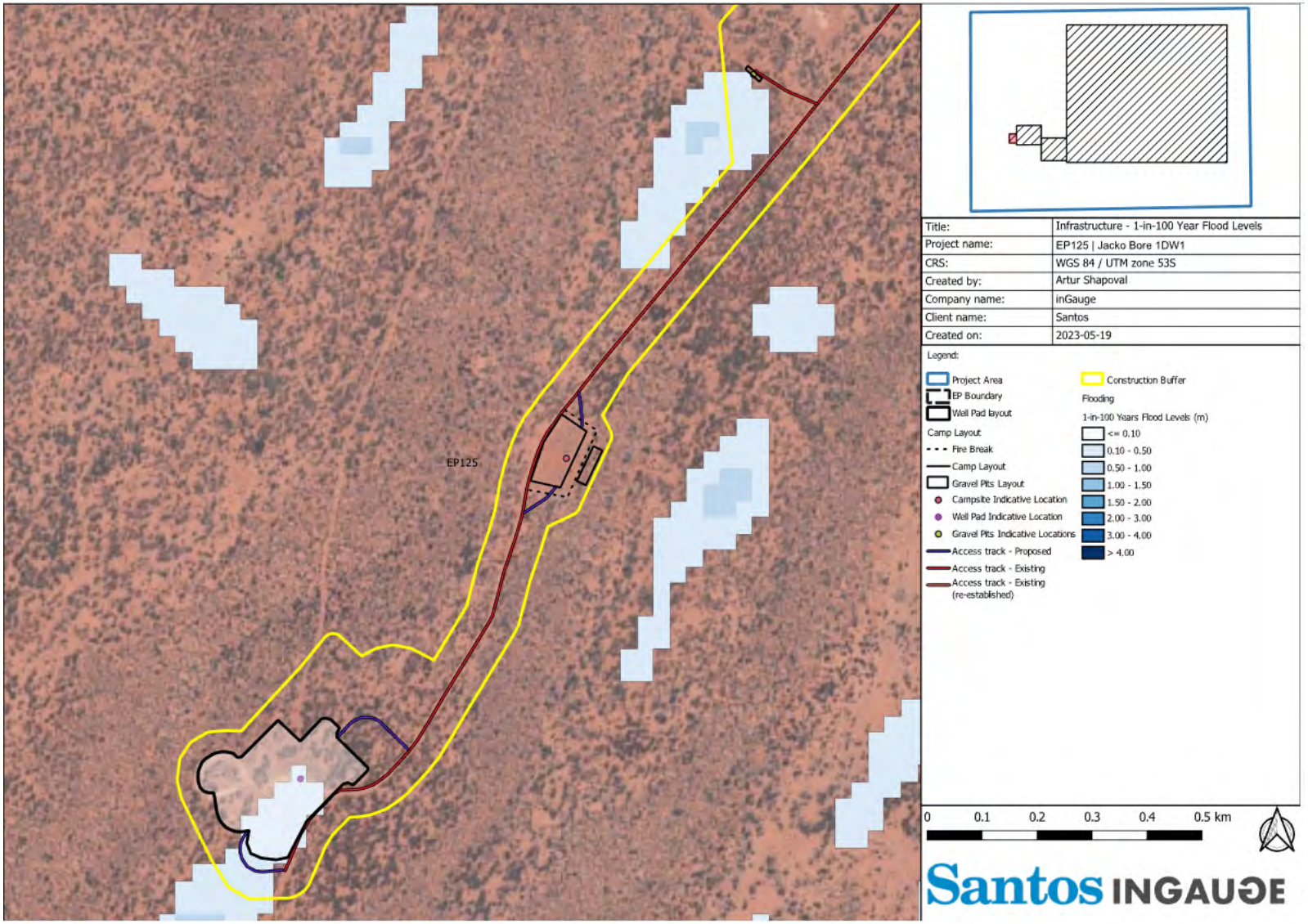
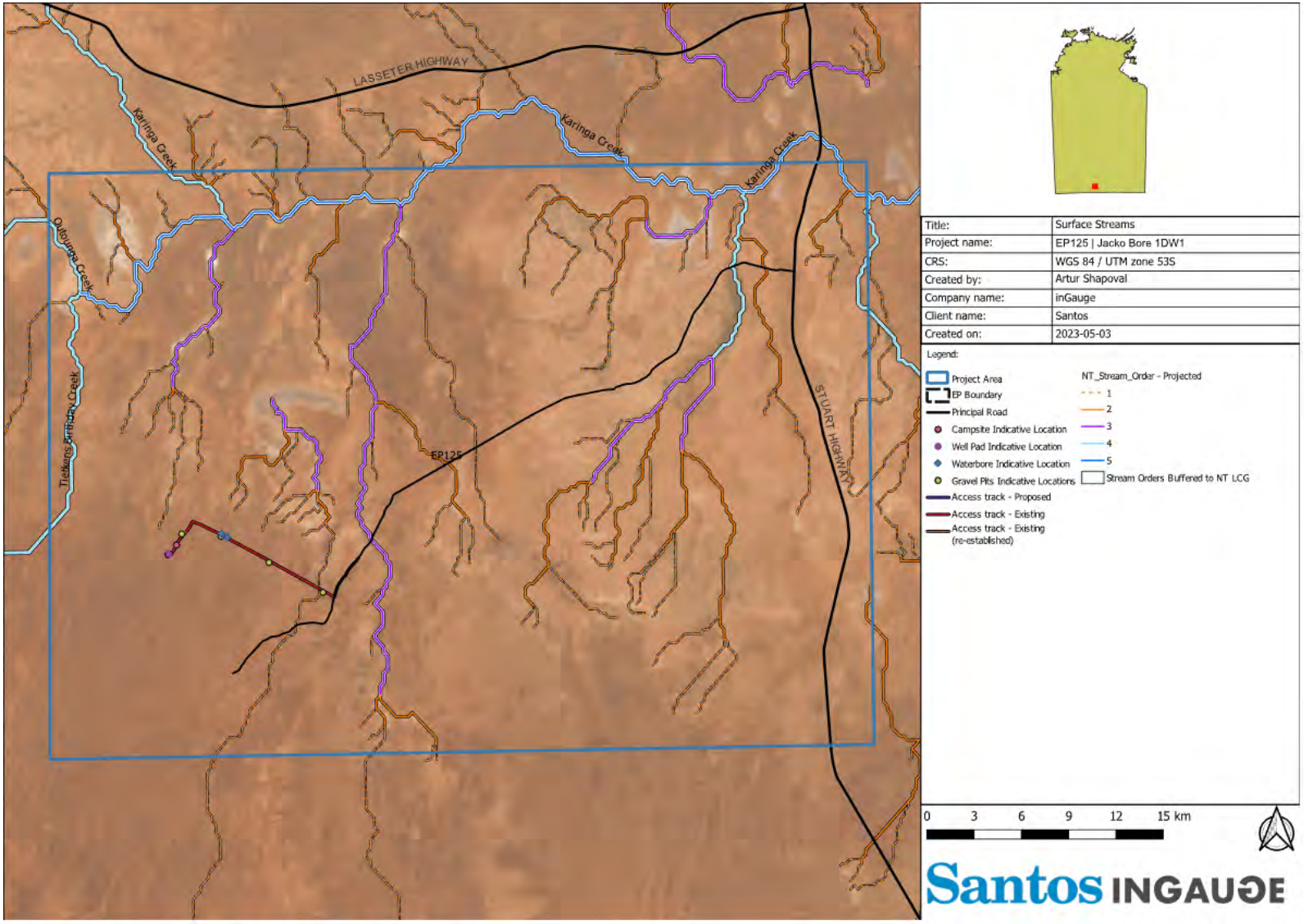


Figure 2-7. Drainage features of the project area



2.4 Sensitive areas

The areas around watercourses are sensitive to erosion and other disturbances such as weed invasion. Maintaining good water quality in these watercourses, is important to support instream aquatic ecosystems. The following exclusion and buffers have been put in place to protect environmental values associated with riparian habitats and watercourses:

- 50 m buffer applied to stream order 2 drainage lines (minor non-perennial streams)
- 100 m buffer applied to stream order 3 and 4 drainage lines (minor non-perennial streams)
- 250 m buffer applied to stream order 5 + above drainage lines
- Exclusion of areas potentially impacted by flooding (alluvial plains).

These buffers have benefits for maintaining wildlife corridors, as well as for controlling erosion and sediment movement. For example:

- Intercept overland flow
- Encourage natural drainage flows
- Form natural sediment traps
- Continued stabilization of streambanks
- No impact on the natural runoff from area with slopes > 3%
- Facilitate control of sediment and flow accumulation of impacted areas with downslopes of 2-3 %.

3 EROSION HAZARD AND RISK

Inputs and equations used to assess erosion hazard and risk for the project area are detailed in the sections below.

3.1 Erosion hazard

Erosion hazard within individual project sub-catchments is assessed using the Revised Universal Soil Loss Equation – RUSLE (IECA 2008). This is commonly used to predict the long term, average, annual soil loss from sheet and rill erosion under specified management conditions. The RUSLE is represented by the following equation:

A = R * K * L * S * P * C, where:

Factor	Description	Value	Comment
A	estimated soil loss (tonnes/ha/yr)	25 t/ha/yr	Maximum as calculated
R	rainfall erosivity factor	880	Based on 0.5EY AEP for site, which is strongly correlated to the 2-year Average Recurrence Interval (ARI), 6-hour storm event (Landcom 2004) (Section 3.1.1).
K	soil erodibility factor	0.043	Adopted – worst case scenario (Section 3.1.2)
LS	slope length/gradient factor	1.35	Max 5% slope, 100m length (Section 3.1.3)
P	erosion control practice factor	1.3	Compacted & smooth (Section 3.1.4)
C	ground cover and management factor	0.37	25% cover (gravel hardstand surface) (Section 3.1.5)

3.1.1 Rainfall erosivity (R–factor)

The rainfall erosivity factor (R-factor) is a measure of the ability of rainfall to cause erosion. It is a product of two components: total energy (E) and maximum 30-minute intensity for each storm, which is strongly correlated to the 2-year Average Recurrence Interval (ARI), 6-hour storm event (Landcom 2004). The R-factor is an input component in measuring estimated soil loss using the RUSLE calculation. The adopted annual R factor for the site is 880.

3.1.2 Erodibility (K-factor)

The K-factor is a numerical representation of the ability of soils to resist the erosive energy of rain (IECA 2008). Soil texture is the principal component affecting K, but soil structure, organic matter and profile permeability also contribute. In the absence of site specific soils information, a K-factor of 0.043 has been adopted. Based on the landform descriptions within Section 2.2 this represents the highest soil erodibility.

3.1.3 Slope (LS–factor)

The LS-factor describes the combined effect of slope length and slope gradient on soil loss. The project area is characterised by flat to undulating sandplains, with low reticulate dunes becoming more frequent in the

northern region. The highest LS-factor on erodible soils is represented by topography with slope gradient < 5%, and slope length < 100m.

3.1.4 Cover and management factor (C–factor)

The cover and management factor is a measure of the level of soil surface protection provided by various groundcovers. It represents relative proportions of natural soil cover, including vegetation, rock, organic matter (mulch, logs); along with artificial cover such as soil binders, matting, hardstand and associated non-erodible material. Roads are proposed to be formed with compacted surface and drainage consistent with the Santos Civil Standard Drawings for Class D Roads (Appendix A). The construction of roads with a suitable gravel hardstand material (from adjacent borrow pits) is equivalent to a minimum of 25% groundcover (equating to a C-factor or 0.37).

3.1.5 Erosion control practice factor (P–factor)

The P-factor measures the combined effect of all support practices and management variables. It also represents structural methods for controlling erosion (IECA 2008). The nominated P-factor for access road, camp and well pad construction is 1.3, representing a compacted and smooth surface.

3.1.6 Estimated soil loss

Potential soil loss calculation based on the above parameters is 25 t/ha/yr (maximum), representing very low erosion hazard for construction of road access and the associated well pad.

3.2 Erosion risk

Erosion risk refers to the evaluation of the “risk” of soil erosion when consideration is given to both the degree of erosion and the likelihood of the erosion occurring (IECA 2008). In the absence of a site-specific risk assessment procedure, erosion risk rating is determined from the average monthly rainfall for Kulgera. Erosion risk ratings are low in December and February, and very low for all other months.

Table 3-1. Monthly erosion risk rating for Kulgera

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Rainfall depth (mm)	28.9	32.5	29.1	13.3	12.3	15.5	11.4	8.4	14.8	19.7	25.2	32.8
Rating	Very Low	Low	Very Low									Low

4 EROSION AND SEDIMENT CONTROL MEASURES

4.1 Site preparation

4.1.1 Vegetation clearing

Vegetation clearing (where required) is to be undertaken in accordance with applicable approvals. Clearing methodology to be included in the ESCP should cover the following:

- Clearing activities to be implemented consistent with the *NTG Land Clearing Guidelines* (DENR 2019)
- Vegetation clearing shall be kept to the minimum amount necessary to allow access and/or approved activities.
- Areas of protected vegetation and significant areas of vegetation which are to be retained, must be clearly identified prior to the commencement of clearing.
- Approved areas for native vegetation clearing to be clearly identified.
- Previously cleared areas shall be utilised where possible for laydown and turn around points.
- Disturbance to natural watercourses and associated riparian zones must be limited to the minimum practicable.
- Cleared vegetation is to be retained and reused in site rehabilitation wherever possible.

4.1.2 Buffers

Santos will maintain riparian buffer strips around drainage features to enhance and protect riparian habitats and vegetation. Buffer distances are as per the *NT Land Clearing Guidelines* (NTG 2019).

Table 4-1. Riparian buffer widths (NTG 2019)

Riparian class	Steam order	Min buffer width (m)	Measured from
Drainage depression	NA	25	The outer edge of the drainage depression, which is the extent of the associated poorly drained soils and associated vegetation.
Intermittent streams	1st	25	The outer edge of the riparian vegetation or levee (whichever is greater). If braided channels are present, the edge of the outer-most stream channel.
Intermittent streams	2nd	50	As above
Creeks	3rd & 4th	100	As above
Rivers	5th or higher	250	As above

The adoption of the buffer distances, as listed in Table 4-1, will have the following benefits:

- Reduce velocity of runoff entering drainage depressions and watercourses via sheet flow
- Promoting capture of sediment
- Reduce erosion within riparian areas (wind and water)
- Provide network of linked habitats and wildlife corridors
- Provision of shade and amenity

4.2 Drainage control

Drainage controls include measures for the diversion of 'clean' stormwater runoff around and through the site; and the diversion of 'dirty' site stormwater runoff to enable treatment of sediment prior to release offsite, as defined below:

Clean water:

Water that either enters site from an external source and has not been further contaminated by sediment within site; or water that has originated from the site and is of such quality that it does not need to be treated in order to achieve the required water quality standard (IECA 2008). Site clean water constitutes surface runoff from areas of non-erodible cover, including vegetation, hardstand, soil binder, mats or blankets (e.g. geotextile).

Dirty water:

Water not defined as clean, thereby requiring treatment with appropriate controls prior to release from site (IECA 2008).

Temporary drainage controls installed as part of construction will enable management of stormwater within work areas. Drainage controls will perform the following functions:

- Enable diversion of 'clean' up-slope run-on water either around or through the site at non-scouring velocities.
- Enable collection of 'dirty' runoff generated within construction areas and the delivery of this water to an appropriate sediment control measure.
- Minimise the risk of soil erosion caused by site-generated flows within the project, through the use of 'intermediate' flow treatment and release points.
- Control of the flow velocity, volume and location of water passing through the project at drainage line and waterway crossings.

4.3 Erosion control

Prevention of erosion is the primary approach for the prevention of adverse impacts associated with sedimentation. Construction and operation activities are to be undertaken so as to reduce the duration of soil exposure to erosive forces (wind and water), either by holding the soil in place or by shielding it. Measures to be used include a variety of construction practices, structural controls and vegetative measures aimed at managing runoff at a non-erosive velocity, and the protection of disturbed soil surfaces.

The specific measure(s) implemented will be based on seasonal erosion risk and construction considerations. Measures will be documented in the most current Site Specific ESCP (see Appendix B) and based upon IECA guidelines. Proposed controls are listed below:

- Minimise disturbance to existing vegetation as far as practical within the project area. Land clearing will be undertaken in accordance with a Vegetation Clearing Procedure, which includes procedures and methods for minimising levels of soil disturbance and impacts to natural drainage pathways.

- Promptly stabilising exposed areas once construction phase has been completed.
- Protection of soil surface (temporary and permanent) including placement of hardstand surfaces, use of soil binder, vegetation establishment (including mulch), and protection with mats & blankets (e.g. jute, geotextile) where practical.
- Application of dust suppression by wetting of exposed surfaces (water truck), application of soil binder, and/or application of soil cover.

4.4 Sediment control standards

Effective erosion and sediment hazard reduction is best achieved by the implementation and preparedness of controls, where practical, prior to the onset of undertaking initial construction activities (e.g. roads and tracks). Civil contractors on site to ensure there is a sufficient supply of materials for construction of controls during the higher risk periods.

Sediment control standards are described below and are based upon the soil loss calculations relevant to the site.

4.4.1 Type 2 sediment control standard

Specific requirements are to be documented within Site Specific ESCPs (see Appendix B) and engineering plans, taking into account timing (i.e. season) and practicality of control measures.

A Type 2 sediment control is the minimum requirement for the following scenarios:

- Catchment area > 1,000 m^2 and soil loss > 75 t/ha/yr
- Catchment area > 2,500 m^2 and soil loss of 75 – 150 t/ha/yr.

A Type 2 sediment trap will demonstrate the following characteristics:

- Under typical flow conditions (discharge and suspended sediment concentration), is capable of capturing and holding at least 90% of material > 0.14 mm.
- Sufficient sediment retention capacity to capture and hold one month's sediment loss from the catchment.
- Designed to maintain its hydraulic and structural integrity under normal site conditions.

Type 2 controls include:

- Rock Filter Dam (RFD) - RFDs are structures formed by the incorporation of geotextile (e.g. A19 bidum®) and a coarse rock filter (40-75 mm nominal diameter).
- Filter Bag/Tube - Filter tubes are geotextile bags through which site runoff is directed to enable filtering and treatment of sediment.
- Coir logs - Coir logs are biodegradable tubes filled with densely packed coconut fibre wrapped in coir netting. They can be used as flow diversion berms or to provide sediment control by providing temporary ponding and filtering of site runoff.
- Mulch berms - Berms of coarse mulch located along the contour. Often incorporate a rock filter dam discharge point.

4.4.2 Type 3 Sediment Control standard

A Type 3 sediment control is the minimum requirement where calculated soil loss is < 75 t/ha/yr. A Type 3 sediment trap will demonstrate the following characteristics:

- Under typical flow conditions (discharge and suspended sediment concentration), is capable of capturing and holding at least 90% of material > 0.42 mm.
- Sufficient sediment retention capacity to capture and hold one month's sediment loss from the catchment
- Designed to maintain its hydraulic and structural integrity under normal site conditions.

Type 3 controls include:

- Rock berms - clean rock may be placed as a perimeter berm to filter sheet flow runoff from site (typical size 75-150 mm).
- Sediment fence - sediment fence may be used in locations where placement of rock berms is not practical (due to access, materials and equipment constraints).

4.4.3 Supplementary sediment control

Supplementary sediment controls are not considered effective to meet the Type 3 classification in isolation but will form an important component of the erosion and sediment control system when implemented as supplementary controls. The following supplementary controls will be implemented where relevant to the project phase and site conditions:

- Grass filter strips
- Check dams
- Construction exits.

In addition to adopting measures as per IECA Standard Drawings, variations to these may be implemented where it can be demonstrated that they are equally as effective and meet the intent of IECA standards.

4.5 Site stabilisation

Following the completion of construction activities, long-term protection of the site from erosion will be provided by the final constructed infrastructure, as per the applicable engineering plans when developed.

In the context of erosion and sediment control, the following practices will assist in achieving site stabilisation and long-term protection for downstream environments:

- Site preparation and revegetation works are commenced as soon as practicable after completion of each stage of earthworks.
- Topsoil (if required) is managed to ensure preservation of its long-term value (i.e. limits to stockpiling duration, and stockpiling height limits). Compaction of stockpiles to be appropriate to moisture content of soils (i.e. do not over compact stockpiles if moisture content is high to allow for stabilisation of seedstock to settle.
- If seeding, ensure selected plant species for revegetation are appropriate for site conditions and endemic to local vegetation communities. Seeding of stockpiles to occur early to avoid hard panning.
- Erosion and sediment controls are to remain in place until minimum 75% self-sustaining groundcover (or equivalent to adjacent lands) is achieved for disturbed areas, with minimum of 90% for drainage features.

5 SPECIFIC AREAS AND ACTIVITIES

5.1 Drill pad

The drill pad will be constructed by to reflect the construction methodology (i.e. preparation of hardstand and pad area withs with suitable compacted capping) within the scoping document, within the approved boundary. Surface groundcover and soil disturbance will be avoided as far as practical. Upon completion of drilling activities any drill spoil will be removed. Further rehabilitation of the well pad area will be in a staged manner, as the area will no longer be required for activities. Rehabilitation will occur to enable the land to return to its natural condition.

5.2 Site access roads

Most access tracks within the area are existing and/or are public roads. Access tracks that are to be constructed and maintained are minor tracks to and from the well pad and water bores. These new tracks are to be consistent with the following principles (also refer to Santos typical drawings in Appendix A of this supporting document):

Route selection

- minimise disturbance to soil and vegetation
- minimise the number of watercourse and drainage line crossings
- reduce the catchment area above the road or track by locating the road along a ridge or as high as possible on side slopes
- locate roads to avoid:
    - steep cross-slopes
    - high erosion hazard soils
    - areas of riparian vegetation
    - perched water tables, swamps, or areas of poor drainage
    - unstable geology, steep topography or rock outcrops.

Design and construction

- Roads are to be graded to a crown, or with crossfall drainage.
- Watercourse crossings and associated approaches are to be protected from erosion.
- Road runoff to be directed to stable outlets (vegetated or rocky areas).
- Roads are to be monitored for excessive sediment tracking. Where sediment build up occurs on public roads as a result of site activities, a review of the controls is to be undertaken and additional control measures may be required.
- Upon completion of construction, roads no longer required will be rehabilitated to its natural condition.

Cross banks

- Where access road runoff cannot be adequately controlled (eg. observation of rills along road surface, water ponding or potential to block drainage paths), construct cross banks consistent with the following:

- Level outlets, enabling discharge of runoff into undisturbed areas (not directly into watercourses) as per Figure 4-1.
- 300mm consolidated effective height, 2-3m crest width as per Figure 4-2.

- Cross drains (excavated dished drains) may be used for low track grades in place of cross banks.

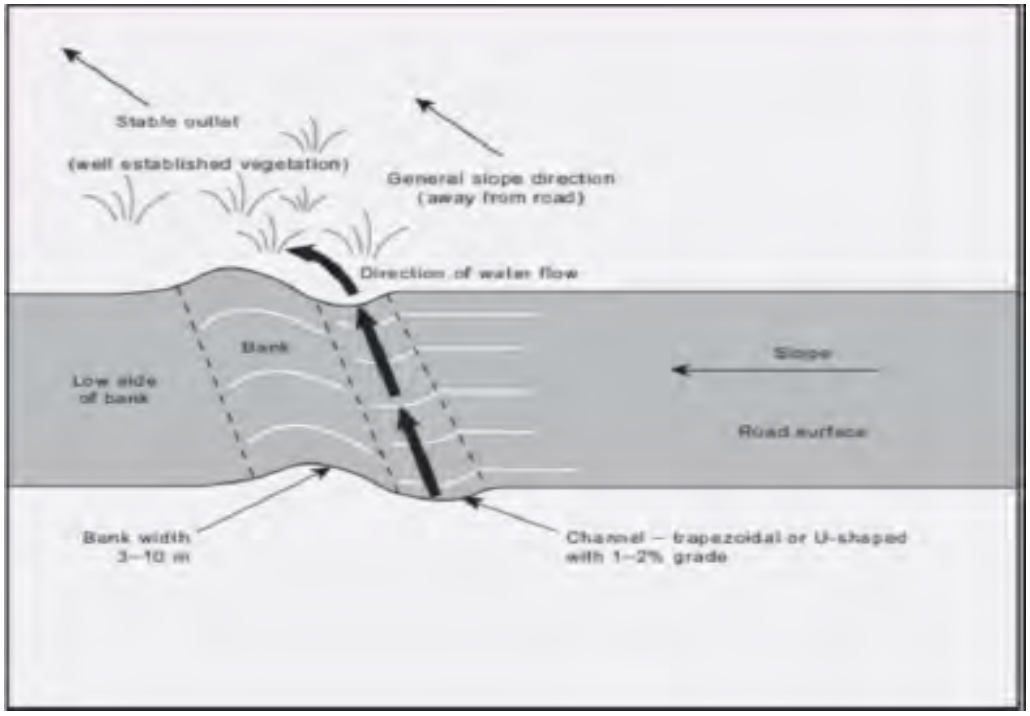


Figure 5-1. Cross bank profile (DECC 2008, modified from Beatty 1995)

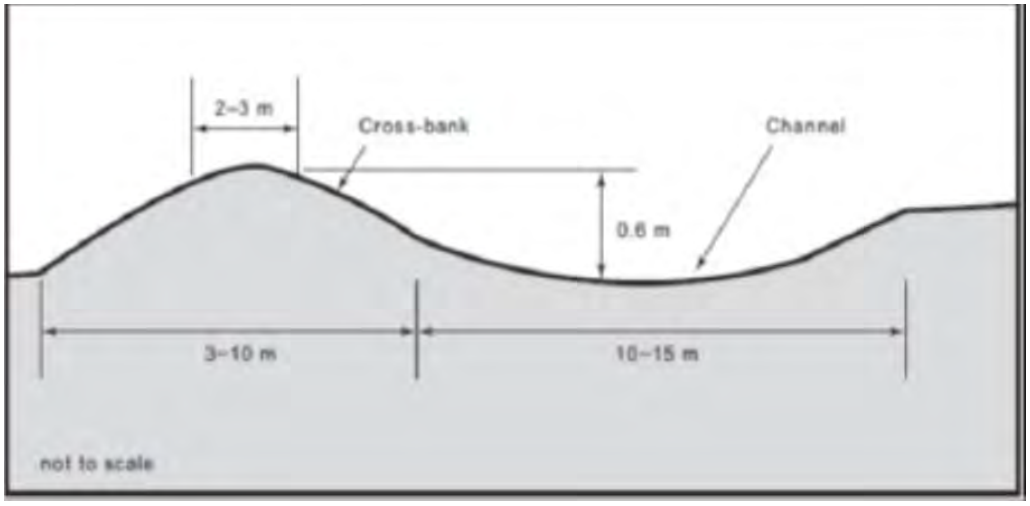


Figure 5-2. Cross bank construction (DECC 2008, modified from Beatty 1995)

Sediment control

Sediment control measures may be required at site runoff discharge points, integrated with drainage control measures (eg. within mitre drains). Suitable sediment controls include:

- Rock Check Dam (RCD) - RCDs are structures formed by a coarse rock filter (> 75 mm nominal diameter). Refer Figure 4-3.
- Filter Bag/Tube - Filter tubes are geotextile bags through which site runoff is directed to enable filtering and treatment of sediment. These may be used as an alternative to RCDs.

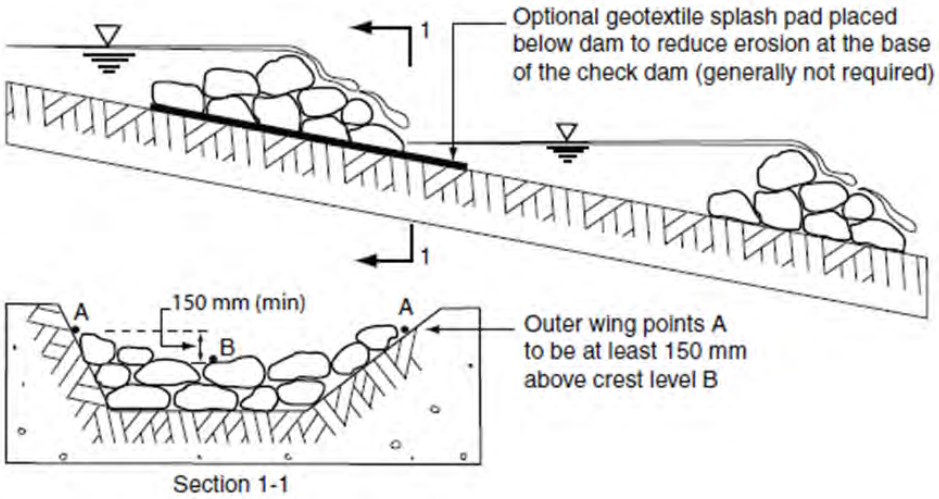


Figure 5-3. Rock check dam design (Catchments & Creeks 2010)

5.3 Borrow pits

Borrow pits associated with the project are existing extraction areas. It is noted that the borrow pit located adjacent to the well pad is the existing pit of preference to be utilised for the program. All borrow pits across the project are to be managed consistent with the following:

Location and design

- Borrow pit locations are to be identified so as minimise disturbance to soil and vegetation.
- Borrow pit access is to be via existing temporary access roads. Access is to avoid drainage depressions/low lying areas. Access road are to be construction in line with Santos Class D Road design.
- Woody vegetation resulting from clearing to be pushed to perimeter of disturbance area. Mulching is recommended if facilities are available.
- Perimeter bunds are to be formed from unsuitable overburden (min 0.5m height). These are to be managed so as to promote the re-establishment of vegetation (eg. incorporate seed bank and organic matter).
- Perimeter bunds are to be located so as to contain internal pit runoff during rainfall events.
- In cases where borrow pits have 1:1 side slopes, pits must require perimeter/diversion bund to deflect water from pit. These bunds are to be regularly maintained and monitored as per Table 4 in Appendix B of this document. Rehabilitation should be undertaken progressively once borrow pit is deemed to have provided the material required for the project.
- Borrow pits are to be designed to contain internal runoff, with pit floors to be maintained at slopes < 2% as far as practical.

Soil management

- Topsoil is to be stripped in slightly damp condition to reduce dust generation and deterioration in topsoil quality as far as practical.
- Topsoil with suitable seed bank should be spread over the exhausted pit areas, to encourage natural regeneration.
- Topsoil is only to be stockpiled when disturbed areas are not available for immediate rehabilitation.
- Material stockpile areas are to be managed so as to keep stockpile area to a minimum.
- Care to be undertaken when compacting stockpiles during wet periods, to allow for natural healthy biota in topsoil to assist with revegetation.

Rehabilitation

- Rehabilitation of borrow pits is to be undertaken progressively as road is constructed.
- Where pits (or sections within pits) are no longer to be used, final rehabilitation is to incorporate:
    - Contouring to ensure drainage of disturbed area is directed to shallow, low-sloped voids (internal).
    - Removal of stockpiled subsoil material.
    - Light contour ripping of reshaped surface.
    - Respreading of topsoil across disturbed surface at 50-100mm depth. Handle topsoil in damp condition and avoid an over-compacted or smooth surface (rough is preferred).
    - Placement of residual organic matter across reshaped landform.
    - Hand seeding/broadcasting of local native grass species is encouraged.
    - Prevention of vehicle traffic entering topsoiled areas.
- For pits which are anticipated to be utilised again in the future, rehabilitation is to incorporate:
    - Contouring to ensure drainage of disturbed area is directed to shallow, low-sloped voids (internal).
    - Consolidation of stockpiled subsoil material (to occupy minimal area).
    - Light contour ripping of reshaped surface.
    - Retention of perimeter bunds (topsoil).

5.4 Ancillary areas

The erosion and sediment control principles and strategies discussed within this document will equally apply to all ancillary areas. These areas include temporary infrastructure required to support the drilling program and include site compounds, turn-around points, lay-down areas, go-lines etc.

6 MANAGEMENT AND IMPLEMENTATION

6.1 Responsibilities, training and awareness

Site supervisors and specific staff will have responsibility for installing and maintaining erosion and sediment controls. Scopes for supervisors and staff will be defined through the ESCP, which is to be followed by requisite personnel. Staff directly involved will be required to have an awareness of their individual responsibilities for environmental management including supervising, installing and maintaining erosion and sediment control measures. A break down of the staff roles and responsibilities is found below in Table 6-1.

Table 6-1. Key personnel roles and responsibilities

Who	What
All staff including contractors	• Complete a site induction prior to commencement of work • Implement and comply with this Erosion and Sediment Control Plan • Report any activity that has resulted in, or has the potential to result in, an environmental incident to their Supervisors • Attend any additional Erosion and Sediment Control training provided
Project Manager	• Ensure implementation of this Erosion and Sediment Control Plan • Lead by example – develop a 'one team-one culture' and 'beyond compliance' culture within the team • Provide necessary resources and technical support for implementation of Erosion and Sediment Control Plan • Ensure non-conformances/corrective actions have been investigated and closed out timely and appropriately
Project Engineer	• Implementation of requirements outlined in this Erosion and Sediment Control Plan • Ensure all staff including sub-contractors are inducted prior to commencement of works • Notify the Project Manager of incidents/non-conformances • Conduct and document weekly site inspections • Advise Site Supervisor immediately of any corrective actions that are required upon completion of site inspections • Report non-conformances to the Project Manager
Site Supervisors	• Implementation of requirements outlined in this Erosion and Sediment Control Plan • Ensure all staff including sub-contractors are inducted prior to commencement of works • Conduct regular visual inspections of erosion and sediment control measures on site during operational periods when there is heavy rainfall. • Notify the Project Engineer and/or Project Manager of incidents/non-conformances
Environmental Manager/ Environmental Representative	• Development of site specific requirements outlined in this Erosion and Sediment Control Plan • Ensure the results of daily and weekly monitoring are forwarded to the Client and Project Manager monthly • Ensure any breaches or NCR's are reported in a timely fashion • Accompany the Superintendent on periodic inspections and audits
Erosion and Sediment Control Independent Verifier	• Review ESCP • Conduct site inspections and audits • Prepare audit reports • Provide advice regarding ESC site improvements

6.2 ESC installation and maintenance

The installation and maintenance of all ESC measures is to be overseen by a suitably qualified person. Installation is to be consistent with theESCP.

All required temporary erosion and sediment control measures must be fully operational and maintained in proper working order until permanent stabilisation is achieved. If ESCs are observed to have reduced capacity, damage or insufficient effectiveness, they are to be repaired, improved or substituted as follows:

- Identified soil erosion areas are to be resolved as soon as possible, with additional control measures implemented to prevent recurrence.
- Sediment removed from areas of deposition is to be incorporated within subsoil stockpile areas and/or buried on-site.

6.3 Updates and variations

ESCPs are dynamic documents, typically requiring updating as construction and operational stages progress and site characteristics alter. The ESCP document should be reviewed and updated annually (minimum requirement).

Any alterations to the implementation of erosion and sediment controls within specific areas will be recorded and outlined in updated ESCPs. This may include the following scenarios:

- Controls require alteration due to change in work practices or new stage of works is commenced.
- Controls require alteration due to change in seasonal conditions (e.g. dry season vs wet season).
- Changes occur in slope gradients and drainage paths, with their exact form unpredictable before works start.
- A change in the project design occurs that potentially impacts on ESC requirements.
- The desired outcome (e.g. protection of receiving environments) is not being achieved.

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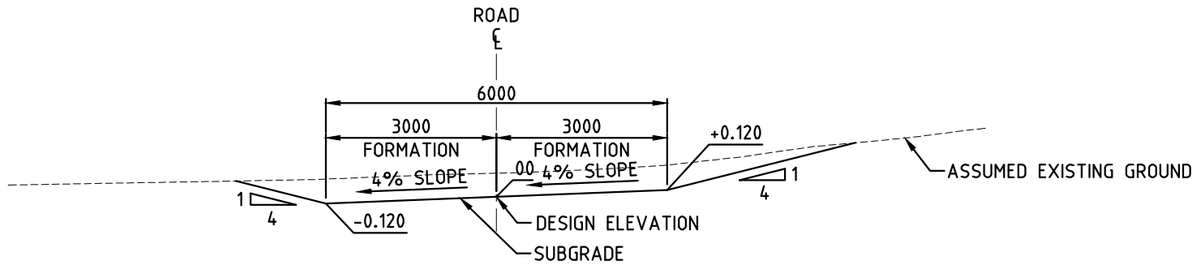
APPENDIX A SANTOS CIVIL STANDARD DRAWINGS – CLASS D ROAD



IN CUT AREAS

TYPICAL SECTION - CLASS D ROADS (B)
(FOR SECTIONS GRADED TO HARD SURFACE)

SCALE 1:50

(B)

1000 0 1000 2000 3000 4000
SCALE 1:50 SCALE IN mm

NOTES:

1. THIS DRAWING TO BE READ IN CONJUNCTION WITH ALL THE COMPLETE CONTRACT DOCUMENTS AND SPECIFICATIONS.
2. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
3. FOR SITE PREPARATION, EXCAVATION AND BACKFILL REFER TO PROJECT SPECIFICATION.
4. FOR ROAD CONSTRUCTION REFER TO ROAD WORKS SPECIFICATION 1515-120-S006.
5. SIDE BATTER SLOPES FOR (B) CLASS D ROADS SHALL BE 4 HORIZONTAL TO 1 VERTICAL IN CUT AND FILL.
6. CLEARING, GRUBBING AND STRIPPING OF FULL DEPTH (MIN. 100mm) OF TOPSOIL WITHIN THE ROAD RIGHT OF WAY SHALL BE UNDERTAKEN FOR THE NEW ROAD ALIGNMENTS.
7. REFER TO PLANS FOR ACTUAL LOCATIONS OF ROADSIDE TABLE DRAINS. TABLE DRAINS SHALL MITRE AT THE FOLLOWING SPACING.

RECOMMENDED MITRE DRAIN SPACING		
SLOPE		SPACING (m) (MAXIMUM)
%	GRADIENT	
0.5	1 : 200	120
1	1 : 100	120
2	1 : 50	100
3	1 : 33	80
4	1 : 25	60
5	1 : 20	60
6	1 : 17	50
8	1 : 12.5	30

8. MINIMUM INVERT OF TABLE DRAIN TO BE BELOW PAVEMENT SUBGRADE LEVEL.
9. FOR CLASS D ROADS, FORMATION ELEVATED TO PROVIDE STABLE RUNNING SURFACE NO PROVISION FOR DRAINAGE.

ROAD CLASSES	D
ROAD WIDTH - METRES	
NORMAL WIDTH	6.0
SAND DUNE CROSSING	8.0
CULVERT/FLOODWAY	8.0

(B)

1000 0 1000 2000 3000 4000
SCALE 1:50 SCALE IN mm

No	DATE	DRN	CHKD	ENG	Q.A.	PROJ	ACC	DESCRIPTION
B		SAN						REVISED FOR REVIEW UNDER MOC-CB-002992
A		KBR		BC				ISSUED FOR CLIENT REVIEW

REVISIONS

DRG No.	SUBJECT

REFERENCE DRAWINGS

DRN: KBR
DATE:
SCALE: AS SHOWN
CHKD:
ENG: BC
Q.A.:
PROJ:
ACC:
A.B.N. 80 007 550 923

CIVIL STANDARD DRAWING
TYPICAL ROAD CROSS SECTION
CLASS C AND CLASS D ROADS
(SECTIONS GRADED TO A HARD SURFACE)

Santos

DRAWING No. 0001-040-DDR-0006

REV B

CADFILE No. - aaaa-40-006-1

TYPICAL ROAD CROSS SECTIONS - CLASS C AND CLASS D ROADS A1SHEET

AUTOCAD

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APPROVED COMPANY AS/NZS 4801 Occupational Health & Safety Management Systems QMS Certification Services

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Waste and Wastewater Management Plan

Appendix 06

Amadeus Basin: Jacko Bore 1DW1 Drill and Test Program

EP125

Santos QNT Pty Ltd

Date	Rev	Description	Initiated	Reviewed	Approved
14/02/2023	1	Approved for Use	KR, TS, VC,	MG, RA, JG	MD
16/06/2023	2	Approved for Use	TS	RA, PS, NF	MD
15/12/2023	3	Approved for Use	TS	PS, NF	RD
03/05/2024	4	Approved for Use	NF	TS	DG
28/06/2024	5	Approved for Use for STO5-5	NF	TS	DG

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Table 3—1 Waste Management 19

1. Introduction

Santos QNT Pty Ltd (the Interest Holder) has created this Waste and Wastewater Management Plan (WWMP) to be used in conjunction with this Environmental Management Plan (**EMP**) and its revisions.

This plan's objective is to outline the waste and wastewater management practices to be undertaken during the regulated Activity (the Activity) under this **EMP**.

1.1 Wastewater Management Framework

The Waste and Wastewater Management Framework seeks to:

- **Describe** the relevant works, environmental risks, and impacts involved in managing waste and wastewater.
- **Define** the methods and approaches used to store, treat, and reuse water and ultimately dispose of it either on-site or off-site.
- **Estimate** the quality and quantities of water and wastewater from the Activity and derived solids that will be removed from the site.
- **Monitor**, manage and report waste and wastewater volumes.

1.2 Waste Management Hierarchy

The following hierarchy of principles outlined in the *National Waste Policy* will be used to achieve optimal environmental outcomes [Australian Government, 2018].

- Avoid, reduce, reuse, recycle, treat, and dispose.

The application of this hierarchy to the waste types generated during the Activity is outlined in **Table 3—1** Waste Management.

The opportunities for the avoidance, reduction, reuse, and recycling of wastewater generated during the Activity are limited and are restricted primarily to the evaporation of fluids and the reuse and recycling of drilling fluids.

1.3 Management

1.3.1 Activity Description

This section describes the Activity that will generate wastewater. Works are included where wastewater is proposed to be handled, stored, or transported away from the location of the Activity.

Works that generate wastewater are summarised in **Table 1—1** and briefly described in the following sections.

Table 1—1 Wastewater Types

Waste Source	Waste Type
Domestic Facilities	• Greywater • Sewage effluent
Drilling and Completions	• Residual drilling and completions fluids
Extended Production Testing	• Produced fluid • Drilling and completions fluids produced back from formations

The environmental impacts and risks associated with the management (treatment, handling, and reuse) of wastewater are deemed to be reduced to As Low As Reasonably Practicable (ALARP) and acceptable based on multiple controls detailed in **Appendix 04** – Risk Assessment; this plan, **Appendix 07** – Spill Management Plan, and the **EMP**. The environmental performance standards (**Section 7.7** of the **EMP**) detail the measurement criteria of critical controls to help demonstrate the risks are being reduced to a level that is ALARP and acceptable.

1.4 Domestic Facilities

Accommodation and messing facilities will be provided from the campsite, and an on-site temporary campsite located on the well pad. All camp wastewater produced from laundry, showers, kitchen, and treated sewage will be treated by a fully self-contained Sewage Treatment Plant and irrigated away from the camp.

The designated irrigation area will be >200m from a water body and have vegetation capable of enabling a high evapotranspiration rate, as per *the Code for Small On-site Sewage and Sullage Treatment Systems and the Disposal or Reuse of Sewage Effluent* [DoH, 2014]. The designated area will be checked to prevent pooling. Solid and macerated sewage will be transported to a licenced facility for disposal.

1.5 Waste Characteristics and Volumes

Table 1—2 presents the anticipated volumes and chemical characteristics of waste generated per well during the Activity.

Table 1—2 Waste Volumes and Characteristics

Waste Type	Volume per Well	Characteristics
Residual Drilling Fluids, Cuttings, and Cement	~800 m^3	A saline, alkaline saturated solid mixture of cuttings, cement and groundwater that is potentially hazardous based on the utilized drilling fluid chemical additives* Waste characterisation by sampling prior to drilling pit re-instatement or off-site management conducted as per Section 6.1
Drilling Fluids	~2.5 ML	A saline, alkaline mixture of >90% groundwater and water-based drilling additives that are potentially hazardous based on the utilized fluid chemical additives* Waste characterisation prior to drilling pit re-instatement or or off-site management conducted as per Section 6.1
Completion Fluids	~0.080 ML	A saline, alkaline mixture of >90% groundwater and water-based additives that are potentially hazardous based on the utilized drilling fluid chemical additives* Waste characterisation prior to drilling pit re-instatement or off-site management conducted as per **Section 6.**
Produced Fluids	~ 80 kL – 1ML	Formation water that is potential saline not expected to be hazardous. Waste characterisation prior to off-site disposal (if required) as per receiving facility requirements.
Greywater	~150 m^3	Wastewater from bath, basin, kitchen laundry or shower that is non-hazardous.
Sewage Effluent	< 200 m^3	Semi-solid effluent with chemical additives possible, e.g., to treat sewage. Treated sewage effluent non-hazardous.

*The chemical fluid additives used in drilling and completions fluids (and their potential to be hazardous) are classified based on function as per assessment of Safety Data Sheets (SDS):

- Treating bacteria (hazardous)

- Adjusting pH (hazardous)
- Controlling viscosity (non-hazardous)
- Adding weight (potentially hazardous)
- Prevent loss of circulation (non-hazardous)
- Corrosion inhibition (hazardous)

Additives are selected and managed in accordance with the manufacturer's recommendations and the SDS. The name, type and quantity of each chemical used on the well will be recorded as per the Well Operations Management Plan. Additives will not contain benzene, toluene, ethylbenzene, or xylene (BTEX) above the levels prescribe in *Section B.5* of *the Code*.

2. 1 in 1,000 Average Rainfall Interval, and Freeboard Management

It is important to note the Project Area, as described in **Section 5** of the **EMP**, is in the Northern Territory arid region, and therefore there is no 'wet season'. However, *the Code* defines the wet season as the months of October to April inclusively. For calculation purposes, the local wet season has been determined to occur between December and February, the three months with the largest average rainfall.

2.1 Evaporation

The Interest Holder has used SILO's Morton's Shallow Lake evaporation data to calculate evaporation in the Project Area [SILO, 2021, 2022]. Monthly evaporation depth totals have been listed in **Table 2—1** for the 10th, 50th and 90th percentiles (P10, P50 and P90). Summation of the P10 values for the three wettest months (Dec, Jan, Feb) gives a value of 563 mm. By assuming the three-monthly (Dec, Jan, Feb) evaporation total as 450 mm instead, our freeboard calculations will be overestimates.

Table 2—1 Kulgera Average Monthly Evaporation

Evapo-ration	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
P10 (mm)	200.5	165.3	152.3	109.8	73.3	56.7	67.6	94.7	124.9	162.0	183.0	197.4	1587.5
P50 (mm)	225.9	190.3	176.1	124.4	87.7	65.8	76.5	106.8	143.1	186.9	199.1	218.8	1801.4
P90 (mm)	242.7	206.5	186.2	133.0	94.6	71.2	84.0	115.1	153.5	196.3	211.7	237.1	1931.8

2.2 Wet Season

2.2.1 1 in 1,000 Average Rainfall Interval

Consistent with industry-accepted methodology associated with practices such as dam risk assessments (which calculate the wet season based on geographical location), three months was determined to be an applicable period to model a 1:1,000 ARI (1 in 1,000-year average recurrence interval) rainfall event.

The highest three-month rainfall periods were used, and a Log Pearson III distribution was fitted to the data. This analysis allowed us to extrapolate the 1,000-year, three-month duration wet season.

The median highest predicted 1 in 1,000-year total rainfall in three months, within the wet season, is 525 mm (**Figure 2—1**). However, applying 10% uncertainty confidence bounds show that rainfall could be up to 577mm. These calculations do not allow for any evaporation.

Figure 2—2 shows the Log Pearson III distribution plots for 1 in 1,000-year events, with 10% uncertainty bounds.

2.2.2 Wet Season Freeboard

Based on an enlarged 90-day extreme rain event of 577 mm during the wet season and a conservative P10 evaporation value of 450 mm, the theoretical minimum amount of reserved space required to handle a 1 in 1,000-year rainfall event would be 127 mm during the wet season. Although 127 mm is the minimum required reserved space to handle a 1 in 1,000-year rainfall event, the Interest Holder is setting a minimum freeboard level at 300mm for open drilling pits and open-topped treatment tanks with a target level of 400 mm to further minimise the risk of overtopping. This is further explained in **Section 2.4**.

Compared with 127 mm reserved space, the adopted 300 mm minimum freeboard figure provides a factor of safety of over 2, and the target freeboard of 400 mm provides a factor of safety of over 3.

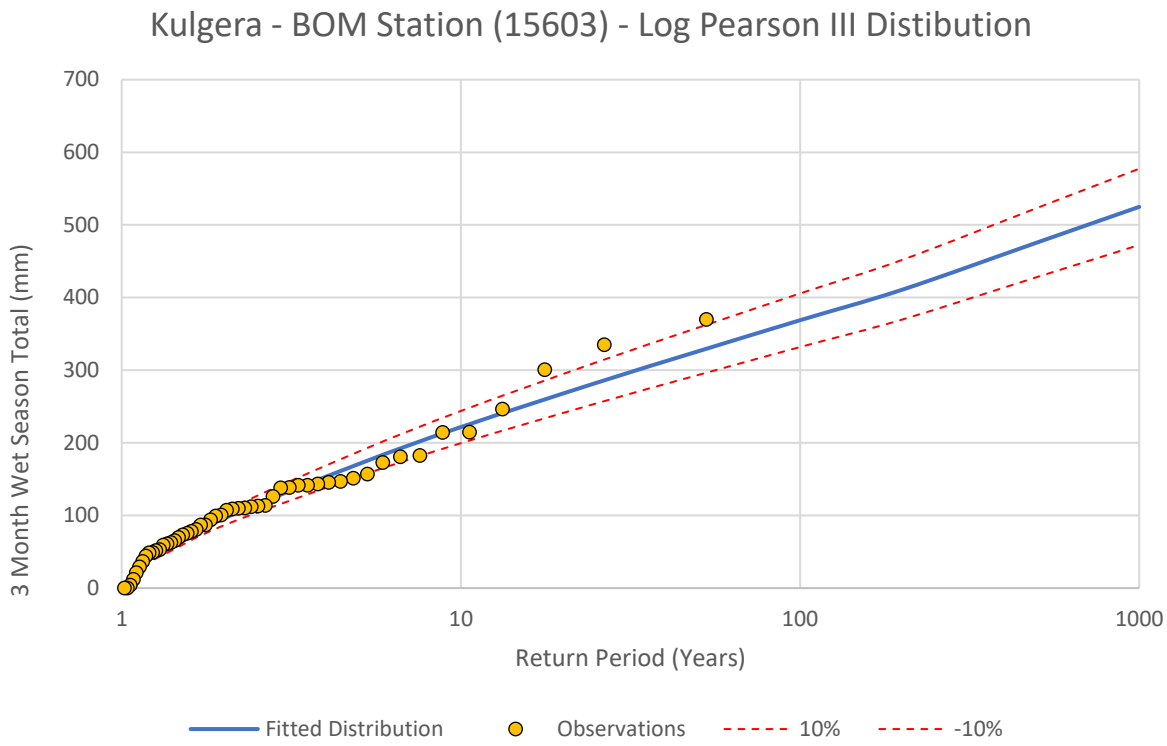

Figure 2—1 1:1,000-year Rainfall Events (Wet Season)

2.3 Dry Season

2.3.1 1 in 1,000 Average Rainfall Interval

Kulgera weather station has recorded rainfall data since 1968 (52 years). The highest cumulative rainfall over a three-month period (during the dry season) was determined to be an appropriate period to model a 1 in 1,000 dry season rainfall event.

The median highest total rainfall level predicted in a 1 in 1,000-year event in three months, within the dry season is 370mm, as show in **Figure 2—2**. 10% confidence bounds indicate that this could be up to 407mm, noting that calculations do not allow for any evaporation.

2.3.2 Dry Season Freeboard

Based on an enlarged 90-day extreme rain event of 407 mm during the dry season and a conservative P10 evaporation value of 450 mm, no amount of reserved space would be required to handle a 1 in 1,000-year rainfall event during the dry season, as the evaporation rate is greater than the 1:1,000 ARI rain event. Although no reserved space is required for the dry season, as noted above we are setting a target freeboard of 400 mm for all open pits and open-top treatment tanks to further minimise the risk of overtopping.

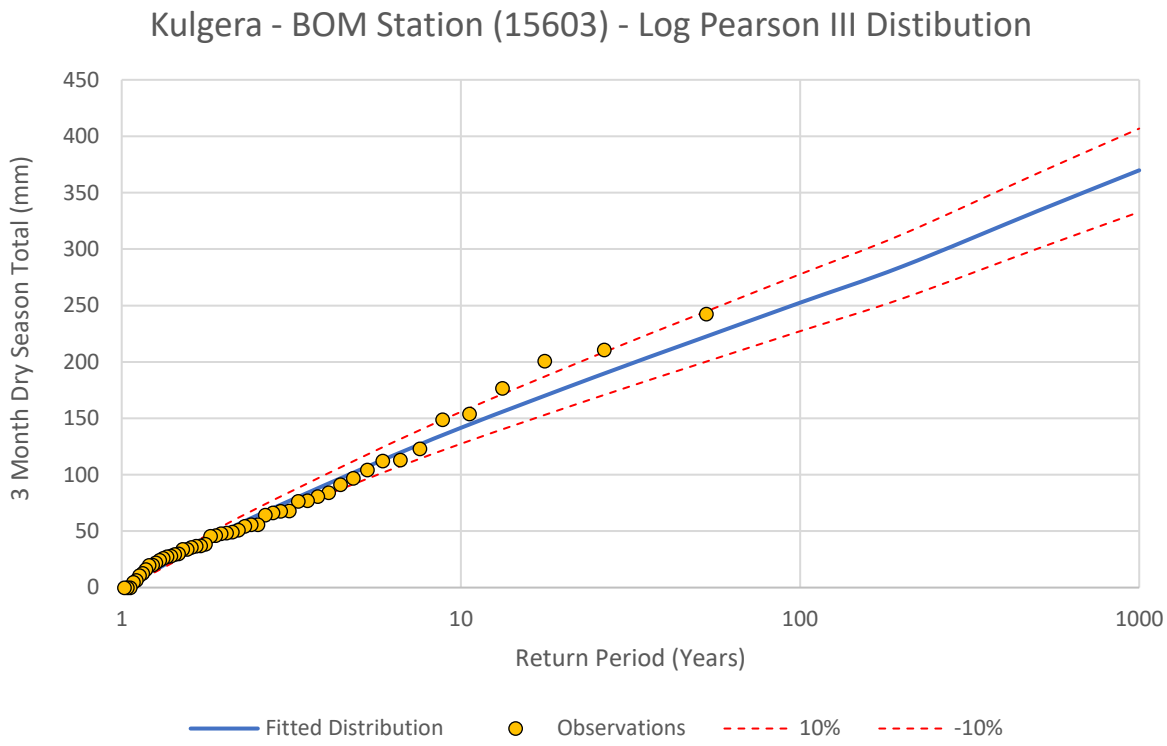

Figure 2—2 1:1000-year Rainfall Events (Dry Season)

2.4 Freeboard Management Wet and Dry Season

Drilling pits and open-topped treatment tanks (if needed) will be operated with sufficient freeboard to accommodate the total rainfall anticipated based on a 1:1,000 ARI rainfall event.

To reduce risk of overtopping to as low as reasonably practicable, a target of 400 mm freeboard has been adopted, and this figure has been applied to all open pits and treatment tanks to minimise the risk of overtopping. The minimum operational freeboard is set at 300 mm. When compared with a worst-case 1:1,000 ARI rainfall event these criteria provide a design factor of safety of over 2 and an operational factor of safety of over 3 (refer to **Section 2.2.2**).

If the water level exceeds the target freeboard level of 400 mm an assessment will be undertaken to determine the potential risk of overtopping from rainfall, wind or overfilling and if removal of fluid is required, or if tank/s need to be covered. This assessment will include consideration of the current and forecasted Activity and weather on the available freeboard to ensure the minimum freeboard levels are maintained.

Freeboard for drilling pits will be set and managed according to the season, as shown in **Table 2—2** below.

Table 2—2 Wastewater Storage Freeboard

Storage	Minimum Operational Freeboard Required	Target Freeboard Level
Drilling by-product pit(s) and open topped treatment tank	300 mm*	400 mm*

*Both levels to be marked on open topped treatment tanks and open pits.

2.5 Wastewater Risk Assessment

The Code of Practice: Onshore Petroleum Activities in the Northern Territory (*the Code*) [DENR et al., 2019] details the controls required to prevent environmental harm, including:

- Implementing a Well Operations Management Plan (WOMP) to ensure the risk of the well to surrounding aquifers is mitigated, including the requirement for multiple verified well barriers containing steel and cement.
- Using an above-ground tank.
- Requiring secondary containment for all pumps and high-risk spill locations.
- Prohibiting wastewater discharges and reinjection.
- Developing a Spill Management Plan (**Appendix 07**).
- Implementing freeboard requirements to accommodate a 1:1,000 ARI total wet season.

The environmental impacts and risks associated with the management (treatment, handling, and reuse) of wastewater in this Project are deemed to be reduced to As Low As Reasonably Practicable (ALARP) and acceptable based on the identification and implementation of multiple controls detailed in **Appendix 04** (Risk Assessment) this plan, **Appendix 07** (Spill Management Plan), and the **EMP**. The environmental performance standards (**Section 7.7** of the **EMP**) outline the measurement criteria of critical controls to ensure that risks are being reduced to a level that is ALARP and acceptable during and post operations.

2.6 Groundwater Investigation

The Project Area is located within the Neoproteric – Palaeozoic Amadeus basin, which has a 7-8km sedimentary thickness in some areas. The Groundwater of the Northern Territory map generated by the Department of Environment, Parks and Water Security natural resource maps database indicates that groundwater beneath the Project Area is likely to be sedimentary rock with intergranular porosity [DENR, 2022; DEPWS, 2022]. The area has a moderate to high level of groundwater salinity. Three principal aquifers have been identified within the Amadeus basin, including:

- The Pacoota Sandstone aquifer, which contains predominantly saline groundwater. Groundwater in this aquifer generally flows west to east.
- The Mereenie Sandstone aquifer, which overlies the Pacoota Sandstone aquifer. Groundwater in this aquifer also flows generally from west to east.
- The Hermannsburg Sandstone aquifer, which is used for stock and potable water.

The area has a moderate to high level of groundwater salinity [G. A. YOUNG et al., 1987], which coincides with the presence of the Karinga Creek Paleodrainage System, a series of more than 100 saline lakes spanning from Horseshoe Bend and Curtin Springs pastoral stations [L. HARRISON et al., 2009]. **Figure 2—3** shows the major aquifer systems of the region.

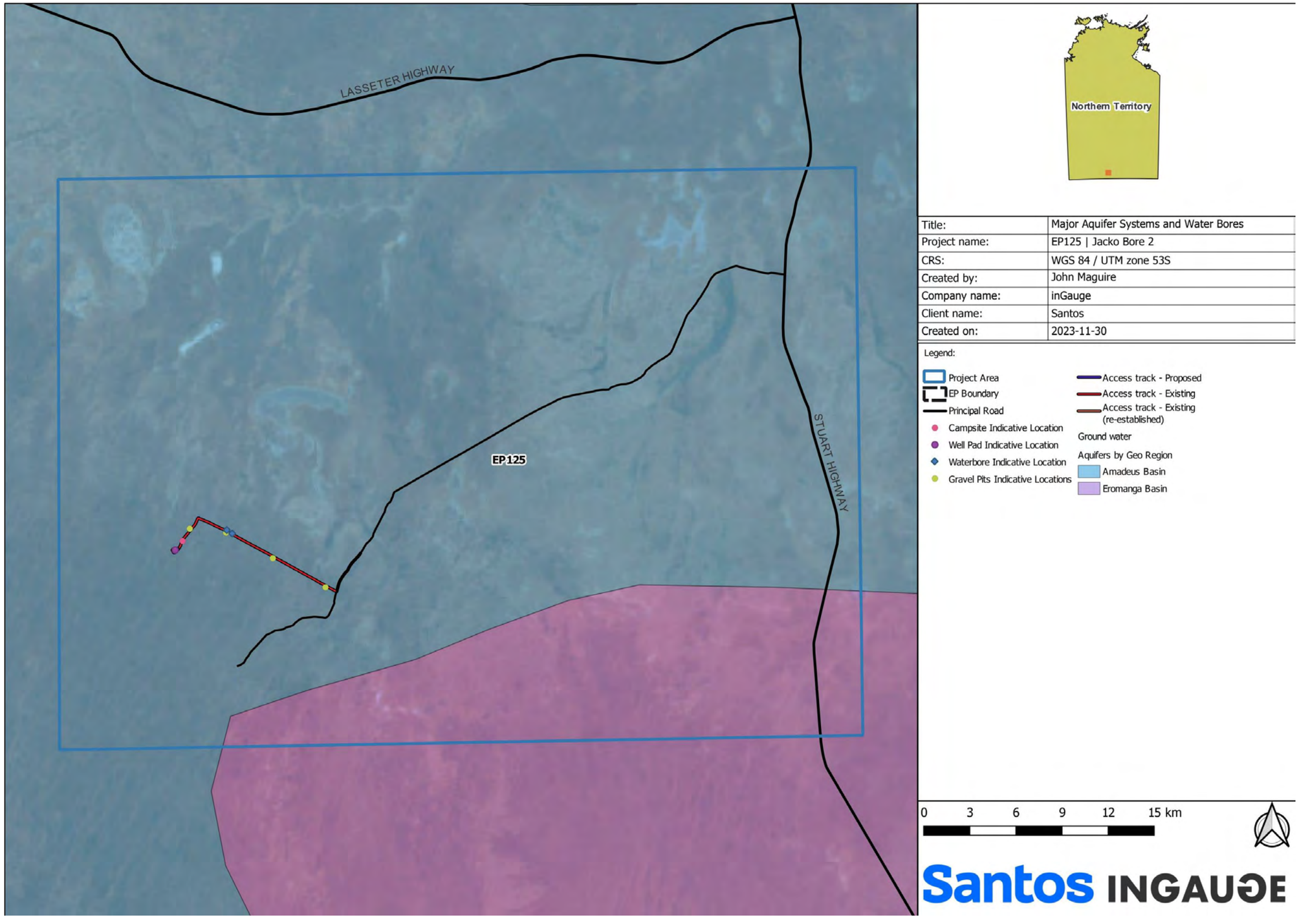

Figure 2—3 Major Aquifer Systems of the Region

2.7 Location

EP 125 is not within a water allocation plan area [DEPWS, 2021B]. Any guidelines published by the Northern Territory Government relating to groundwater monitoring parameters, methodologies, frequencies, reporting and data submission for petroleum operations will be followed.

2.8 Data Management and Reporting

The Interest Holder will provide required data and reports to DEPWS.

2.9 Water Extraction

All water extraction for the EMP and its revisions will be conducted according to the approved Groundwater Extraction License, in accordance with the *Northern Territory Government's Water Act* of 1992 [DEPWS, 1992].

Groundwater will be stored for use in a dedicated fresh/groundwater pit/turkey's nest on-site.

Controls to maintain the quantity and quality of water include:

- Minimising water use to only cover what is needed to perform the Activity.
- Not using surface water during the Activity.
- Reuse/recycling drilling fluids by use of a centrifuge (where practicable).
- Adhering to the groundwater extraction licence.

3. Waste and Wastewater Management

Wastewater containment structures will be installed to minimise, or avoid, the risk of wastewater interaction with soil, surface, and groundwater.

- Drilling/completion fluids, cuttings, and cement returns will be stored in pits on-site:
    - Constructed with a perimeter bund where needed around drilling by-product storage pits to prevent overland flow from entering pit/s.
    - Lined with an impermeable membrane (Aquacon 345, HDPE or equivalent), which meets the criteria for any residual drilling fluids and cuttings with the following specifications:
        - An impermeable membrane with a coefficient of permeability of less than 10-9m/s tested following AS 1289.6.7.2 and with resistance to tearing of >0.5kN (ASTM D4073); static puncture > 0.5kN (ASTM D4073) and tensile strength > 20kN/m (ASTM D 7275) in *Section C.4.1.2 (b)* of *the Code*.
    - Marked with the appropriate target and minimum operational freeboard level to ensure capacity is available.
    - Fitted with fauna ladders (*Section C.4.1.2 (g)* of *the Code*).

Produced fluid will be stored in above-ground tanks. The anticipated plan for produced fluid storage is described in **EMP Section 3.11.1.** In summary, the Interest Holder will initially have two above-ground mobile tanks available on-site but may mobilise more mobile tanks or alternatively install a panel tank depending on the amount of produced fluid anticipated to be received when flow has stabilised (~12 hours). The specifics of the above-ground storage solutions, whether mobile or panel tanks, are outlined below:

- Designed and constructed following the relevant Australian Standards (including AS1554.1 and AS3990).
- Installed as per the manufacturer's installation procedures.
- Installed on compacted pads constructed per vendor requirements to ensure stability. The tank pad will be designed with an overland flow diversion bund.
- Designed to withstand bushfires and have a <10 m fire access trail/break.
- Designed to meet local wind loading conditions.
- Designed with outer walls/framework with no clear access points for fauna.
- Will have a leak detection system to detect leaks.
- Fitted with level monitoring equipment that includes a high-level alarm calibrated to manage freeboard.
- Designed and operated to prevent overtopping.

- Resistant to physical, chemical, and other failure during handling, installation, and use.
- Always maintained in good order.
- Target and minimum operational freeboard marked.
- May have a removable lid to allow above-ground tanks to be open-topped treatment tanks. This will allow for evaporation to reduce wastewater for disposal.
- If above-ground tanks are being used for open topped treatment it will be ensured that:
    - There is a lid available on-site to be deployed in the event of a Significant Rainfall Event (Refer to **Section 3.1**)
    - The removable lid prevents the build-up of explosive gases (e.g., the lid has vents).
    - The lid is prevented from sinking. For example, by use of vented floats and buoyant covers that account for rainwater accumulation.
    - Vents are designed to be above the water level.
    - If rainwater accumulates on the lid, it will be removed by pump under supervision. The pump suction will be placed in a ballast/low point on the lid to limit the potential for damage.
    - Any rainwater that collects on the lid will be tested for pH and EC and pumped from the top of the lid to the nearest well pad ESC drain in a controlled manner, under supervision, if the pH is between 6.5-8.5 and the EC <2000 us/cm.
    - Maintained with the minimum operational freeboard under the lid.
- Unless the above-ground tank is double-lined or double-walled, and/or have secondary containment that meets all of the following (as per Section A.3.8 of *the Code*):
    - Sufficient capacity to hold 100% of the volume of the largest container stored in the area plus10%, unless the container is equipped with individual secondary containment.
    - Permeability able to contain materials or waste until it can be removed or treated. A impervious geomembrane or a suitably constructed clay liner will be used as per B.4.16.2.h.ii of the Code.
    - Provide for separation of clean and dirty water.
    - Be compatible with the material or waste stored or used within the containment.
    - Be resistant to physical, chemical and other failures during handling, installation and use.
    - Be maintained in good order at all times.

Details of condensate storage tanks, if condensate is encountered:

- Designed and constructed following the relevant Australian Standards (AS 1940) [ME/17 FLAMMABLE AND COMBUSTIBLE LIQUIDS, 2004].
- Installed on pads constructed per vendor requirements to ensure stability.

Wastewater fluids generated from the Activity will be assessed and either be removed from the Project Area (**Section 3.3**) for disposal or reduced by evaporation, re-used.

The primary avenue to re-use waste fluid is during drilling works. However, given the limited volume of make-up water required to drill and complete a well the volume of water estimated to be reused is <25% of what is required to drill a well. To enable re-use centrifuges may be used on the drill rig to remove solids and/or the solids will be settled out in the drill pits and re-used where possible.

The primary avenue to reduce drilling and completions fluids generated during the Activity is evaporation. The estimated volume of fluids that will be evaporated prior pit closure is ~95%.

The primary avenue to reduce produced fluid, if encountered, is evaporation. The estimated volume of fluids that will be evaporated prior to residuals being transported for disposal is ~95% if using an above ground open topped treatment tank.

3.1 Significant Rainfall Event Response

A significant rainfall event (SRE) is an event that can cause a substantial impact on the freeboard and may necessitate pre-emptive measures to manage fluid levels. Such events are typically caused by significant meteorological events like remnants of a tropical cyclone, low-pressure systems, or monsoonal trough. Therefore, the SRE adopted for the Activity is an event that has the potential to cause prolonged and intense rainfall, which could substantially impact freeboard and would warrant action.

Therefore, an SRE has been calculated over a four-day period based on an Annual Exceedance Probability of approximately 5% (1 in 20-year Average Recurrence Interval). An SRE of this magnitude is therefore defined as 150 mm of rain over 4 days. This definition is calculated from 50 years of rainfall data from the nearest weather station, Kulgera (station #015603) (**Section 5.2.2** of the EMP). The frequency of these events compared with the Alice Springs Airport weather station (station #015590) rainfall data is shown in **Figure 3—1**.

A significant rain event is only anticipated in the ‘wet season’. During the wet season, weather will be monitored, and if a significant rainfall event is forecast, any produced fluid in an above-ground tank will be enclosed with a floating lid available on-site installed to enclose the treatment tank (as required by *the Code*). Operations would be temporarily suspended to avoid adding further fluid into open-air storage infrastructure. In addition, no chemicals or wastewater will be transported on unsealed roads during a forecast SRE event.

Environmental performance standards and measurement criteria to achieve the desired environmental outcome are listed in **Section 7.7** of the **EMP** main body.

Further explanation of the responses to rainfall can be found in **Section 2** of this Plan.

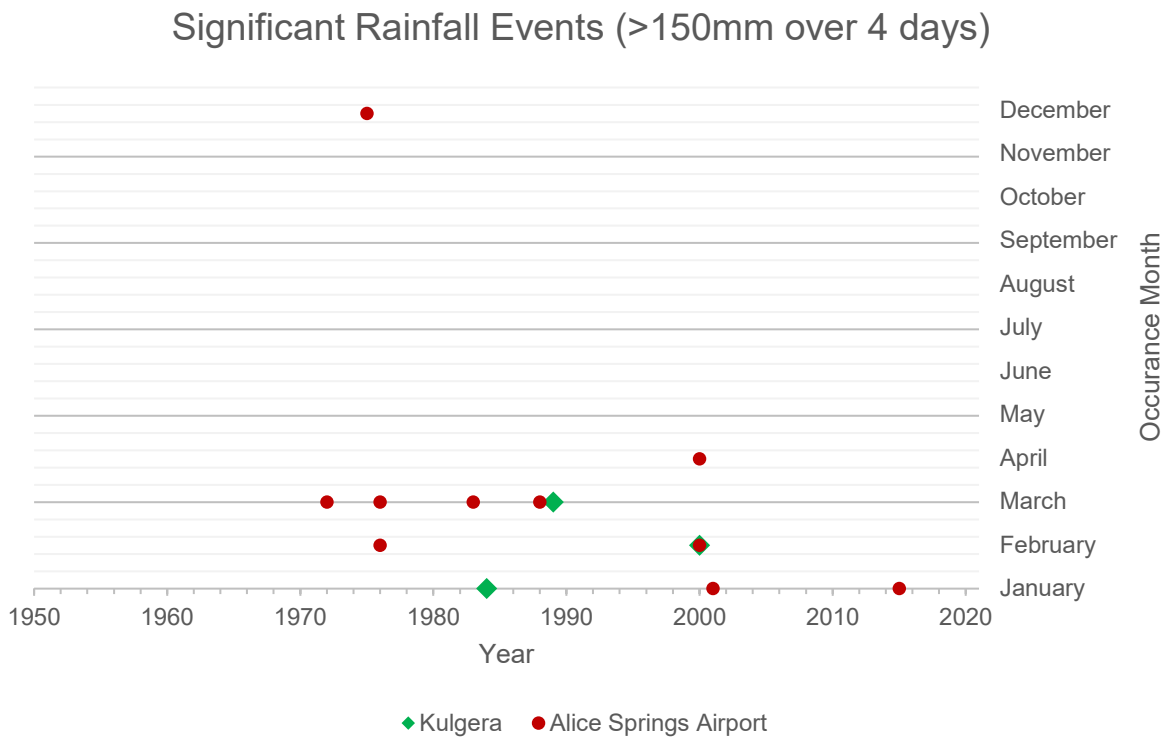

Figure 3—1 Significant Rainfall Frequency

3.2 Waste Management

Waste will be avoided, reduced, reused, recycled, treated, and disposed of in line with **Table 3—1**.

Table 3—1 Waste Management

Waste Stream	Avoid	Reduce	Reuse	Recycle	Treat	Dispose
Greywater and Sewage Effluent	• Cannot avoid.	• No practical method of reducing.	• Not proposed.	• Not proposed.	• Treated on-site and irrigated.	• Greywater and treated sewage effluent irrigated. • Sewage/solids will be transferred to a licensed disposal facility.
Residual Drilling Fluid	• Only water-based drilling fluid is planned for use. • Oil or synthetic-based drilling fluids will not be used.	• Evaporation from pits.	• Store used fluids in drilling pit/s. Allow solids to settle and re-use fluids in place of groundwater for makeup fluid.	• Not proposed.	• Not proposed.	• Drilling fluids will be re-used as much as possible. • The remaining fluid will be transported and disposed of at a licensed facility or mix bury and covered with drill cutting pending sampling results.
Drill Cuttings	• Cannot avoid.	• Mud weights are designed specifically for the gauge wellbore, therefore minimising excess cuttings.	• Not proposed.	• Not proposed.	• Not proposed.	• Cuttings buried on-site pending sampling results and certification from an independent EPA-accredited auditor. Disposal will comply with Clause C.4.1.2 of *the Code*. • Cuttings disposed off-site if on-site disposal is not available. Off-site disposal will comply with Clause C.5.2 of *the Code*.
Cement Returns	• Cannot avoid.	• Not proposed.	• Not proposed.	• Not proposed.	• Not proposed.	• Cement returns added to drill pit and managed with residual drilling fluid and cuttings.
Completion Fluids	• Cannot avoid.	• Evaporation from pits.	• Not proposed.	• Not proposed.	• Not proposed.	• Fluids remaining to be transported off-site by licensed contractors to a licensed disposal facility or added to the drilling pit and managed with the residual drill fluids.
Produced Fluids	• Cannot avoid (note: not anticipated in large volumes).	• Disposal off-site • Volume reduced if above-ground open topped treatment tank used.	• Not proposed.	• Not proposed.	• Evaporation	• Fluid remaining after evaporation to be transported off-site by licenced contractors to a licensed disposal facility.

Waste Stream	Avoid	Reduce	Reuse	Recycle	Treat	Dispose
Chemical Additives	• Cannot avoid the use of some chemical additives.	• Reusing drilling fluids can reduce the consumption of chemicals and, therefore, the production of waste.	• Excess chemicals are to be returned to the supplier or used for other operations.	• Not proposed.	• No treatment of chemicals is proposed under this EMP.	• Unused chemicals unable to be returned or reused are to be transferred to a licensed disposal facility.
Produced Condensate	• Cannot avoid.	• Not applicable.	• Not applicable.	• Not applicable.	• Not applicable.	• Transported off-site by a licensed contractor to an appropriate facility.
Contaminated Water (water collected in an unclean secondary containment measure)	• Inspect secondary containment, when in use, weekly during the dry season, and daily during the wet season for damage, spills, or water for management. • As appropriate, cover equipment or storage area.	• Not proposed	• Not proposed.	• Not proposed.	• Not proposed.	• Water that has come in contact with chemicals or wastewater, in secondary containment, to be disposed in accordance with the requirements of that chemical or wastewater.
Other Waste (Including Listed Waste) • General and Food • Empty IBCs • Metals and Plastics • Batteries and Trues • Used Fuel Drums	• Cannot avoid.	• Reduce the quantity of single use plastics in campsite where practicable.	• Not proposed.	• Recyclable materials will be identified, and an appropriately licensed facility will be engaged. • Storage will be an appropriate facility prior to transportation.	• Not proposed.	• Transported off-site to a licensed disposal/recycling facility. • Collected in designated area for disposal, following the *Waste Management and Pollution Control Act* [DEPWS, 1998]. • Listed waste transported by a licensed company will carry out transportation and disposal following the regulation.

3.3 Transport

For off-site transport, the Interest Holder will:

- Meet the requirements of *the Code* in regard to waste transport.
- Use appropriately licenced waste management facilities in the Northern Territory or interstate.
- Use appropriately licensed waste transport providers in the Northern Territory, and if required interstate.
    - If wastewater is required to be transported interstate, a consignment authority as per the *National Environmental Protection (Movement of Controlled Waste Between States and Territories) Measure 1998 (NEPM)* will be implemented [SEWPAC, 1998].
- Activate the Contingency Plan / Emergency Response Plan (**Appendix 13**) if a vehicle becomes bogged so that extraction works are conducted safely and prevent loss of contents.
- Residual drilling fluid cuttings will be tested before off-site disposal and transport by an SQP as per Section C.5.2 (C) of *the Code*.

3.3.1 Waste Tracking

The movement of all wastewater will be documented and available upon request. Tracking will be carried out as per the following guiding documents:

- The *NT Waste Management and Pollution Control Act* 1998.
- The *National Environment Protection (Movement of Controlled Waste Between States and Territories) Measure 1998 (NEPM)* [SEWPAC, 1998].
- *Movement Of Controlled (Listed) Waste: Guide to using the NT Online Waste Tracking System* 2021 [DEPWS, 2021A]
- The *Radiation Protection Act 2004* [DoH, 2004].
- The **EMP**.

Tracking of water and wastewater will include:

- Volumes of produced fluid from each well.
- Volumes of water transferred into each tank.
- Estimates for evaporation rates from each tank.
- Volumes of water planned to be and re-used in drilling works.
- Volumes of water and wastewater used for other purposes (not anticipated).
- Volumes of water and wastewater removed from site and its destination (inc. details of the licence number of licensed waste transporters).

All wastewater tracking documents in a chain of custody system.

Annual wastewater tracking documentation will be reported annual to the Minister as per the **EMP Monitoring Program**.

4. Wildlife, Stock, and Human Interaction

Management and control methods will be implemented to minimise the risk of wildlife, stock, and human receptors interacting with stored waste. Control measures will comprise fencing of the well pad, installation of signage at the main well pad access gate and covered kitchen waste containment bins, as necessary. **Figure 7—2** is a well pad layout showing the indicative locations of drilling pits, and chemical and wastewater storage locations:

- Bunded Area:
    - Indicative location for above-ground tank/s and/or chemical storage illustrated in **Figure 7—1**.
- Pit(s):
    - Lined earth bund structures used to store groundwater and drilling by-products to specifications like those illustrated in **Figure 7—1**.

Open topped treatment tanks, pit(s), and the surrounding well pad area will be monitored during operations to detect any fauna interaction with wastewater. The risk of interaction is considered low based on the implementation of numerous initiatives, including:

- Open topped treatment tanks have outer walls/frameworks with no clear fauna access points.
- Fenced well pad.

Control measures to prevent large wildlife, stock, and human receptors from interacting with wastewater include, but are not limited to:

- Fenced and sign posted well pad.
- Open topped treatment tanks have outer walls/frameworks with no clear fauna access points.
- Installation of fauna ladders in open pits.

Pit and tank locations are inspected for fauna until their removal and/or pit closure as per **Table 7–2** (Monitoring Program) of the **EMP**.

5. Measurement Criteria

To meet the wastewater management Environmental Performance Standards as outlined in the **EMP Section 7.7**, the following measures are to be followed:

- Drilling works will be completed using water-based drilling fluid chemical additives and will not contain BTEX above limits prescribed in the Code of Practice.
- Drilling works completed using water-based drilling fluid additives that are selected in accordance with the designed function, the manufacturer's recommendations, and SDS.
- The name type and quantity of drilling fluids additives are recorded in daily well reports.
- Hazardous materials register to be maintained during site operations.
- A perimeter bund will be constructed where needed around drilling by-product storage pits to prevent overland flow from entering pit/s.
- Drilling pits will be lined with an impermeable liner.
- Minimum operational freeboard will be maintained in drilling by-product storage pit/s.
- Liquid drilling, completions and cementing additives will be stored in/on temporary bunding with a volume greater than 110% of the largest container in accordance with the requirements of the SDS.
- Treated sewage effluent and greywater irrigation will occur with dispersion hoses and/or sprinklers, >200m from a water body, within a fenced vegetated area with a slope of <5%.
- Wastewater volumes will be reduced through evaporation from tanks and drilling pits.
- Drilling by-product storage pit(s) will be sampled for off-site transport, or mix bury and cover approximately 12 months post-drilling activity.

6. Monitoring

6.1 Monitoring Plan

Waste monitoring will be implemented as per **Table 7—2 Monitoring Program** of the **EMP** and includes, but is not limited to:

- Waste and wastewater volume, quality, and destination recorded at the time of transport by on-site personnel.
- At the time of well suspension an assessment of the potential accumulation of NORM in well equipment assessed and measures put in place to reduce risks.
- Drilling by-product pit and produced fluid tanks levels monitored daily by online telemetry, or photography until closure.
- Where a lid is in place on an above-ground tank the daily inspection will include an integrity check. This check will cover the lid's condition e.g. vent obstruction, ballast points, and pump readiness.
- Annual review of the effectiveness of mitigation measures to avoid stock, wildlife, and human interaction (e.g., interrogation of incident reports).
- Post drilling activity prior to pit re-instatement or off-site management.
    - NORMS as per *C.5.2* of *the Code*.
    - Leachability testing as per *C.4.1.2* of *the Code*.
    - Analytes as per *Table 9* of *the Code*.

6.2 Monitoring Methodology

Records regarding waste transfer to licensed facilities will be maintained per requirements under the *NT Waste Management and Pollution Control Act 1998* [DEPWS, 1998].

Samples will be collected as per the following methodology (as verified by an SQP):

Pit characterisation:

- AS4482.1- 2005: Guide to the Investigation and Sampling of Sites with Potentially Contaminated Soil [EV/9 Sampling and Analysis of Soils and Biota, 2005].
- National Environment Protection (Assessment of Site Contamination) Measure [ASC NEPM, 1999].

Fluid monitoring:

- Australian and New Zealand Guidelines for Fresh and Marine Water Quality [ANZECC et al., 2000].

- AS/NZ5667.1:1998: Water Quality Sampling Part 1: Guidance on the design of sampling programs, sampling techniques and the preservation and handling of samples [EV/8 Methods For Examination Of Waters, 1999].

Sampling procedures will include the following components:

- All field measurements and sampling will be undertaken by an SQP using equipment that is properly maintained, laboratory checked and calibrated in line with OEM's specifications.
- Each sample will have a unique identification number that can be cross-referenced with the monitoring location and sampling time.
- Sample preservation measures will be documented and, where feasible, comply with analytical laboratory requirements and relevant standards (e.g., AS/NZS 5667.1:1998).
- Chain of Custody (CoC) procedures will be followed following section 3.7 of the Monitoring and Sampling Manual 2009 — *Environmental Protection (Water) Policy* [DES, 2009].
- Sample analysis will be undertaken by a National Association of Testing Authorities (NATA) laboratory approved for that analysis.
- QA/QC protocols (such as trip blanks) and samples will be sent to duplicate laboratories where a NATA-accredited analysis is unavailable.

7. Indicative Well Pad Layout and Pit Profiles

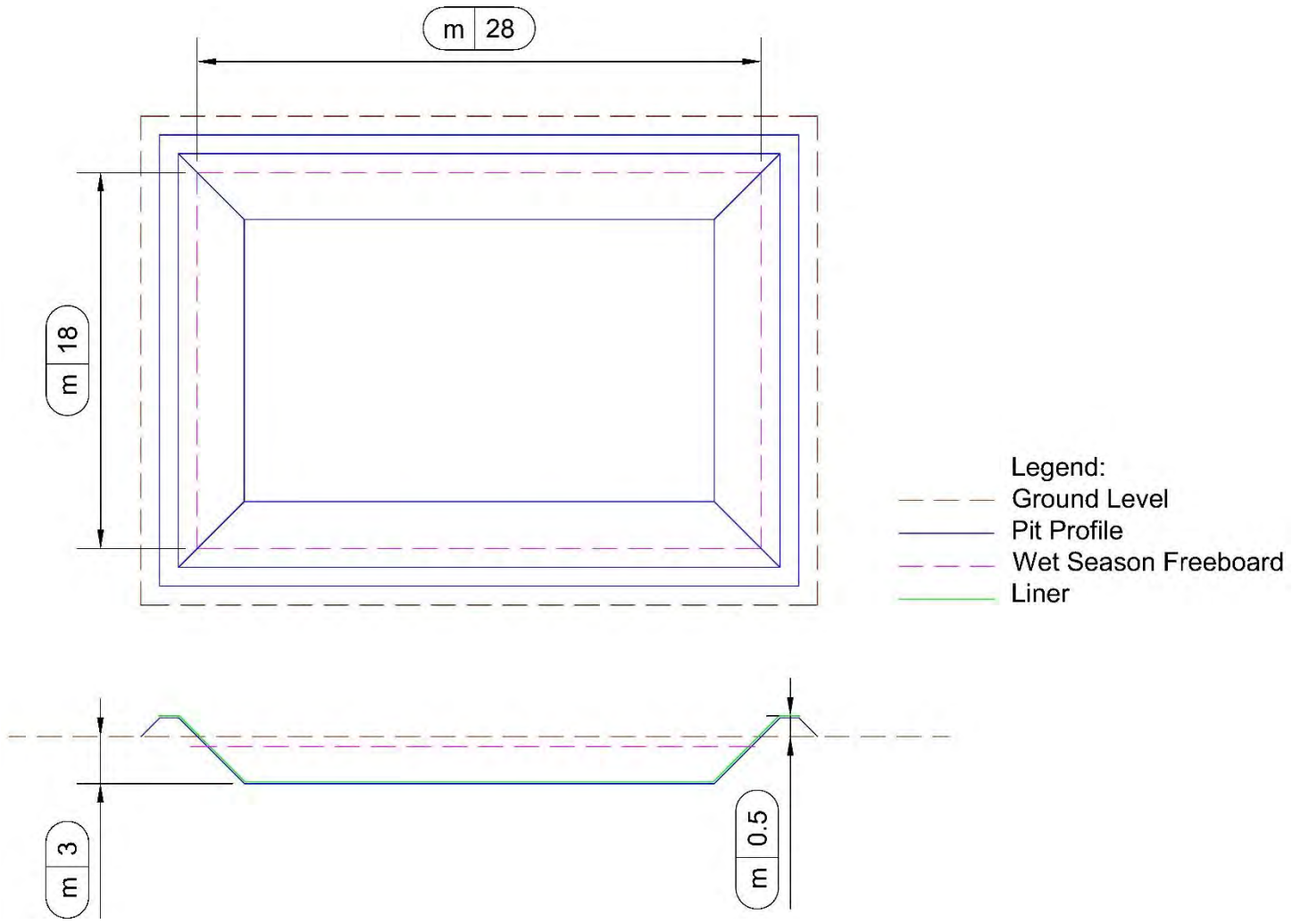

Figure 7—1 Indicative Pit Profile

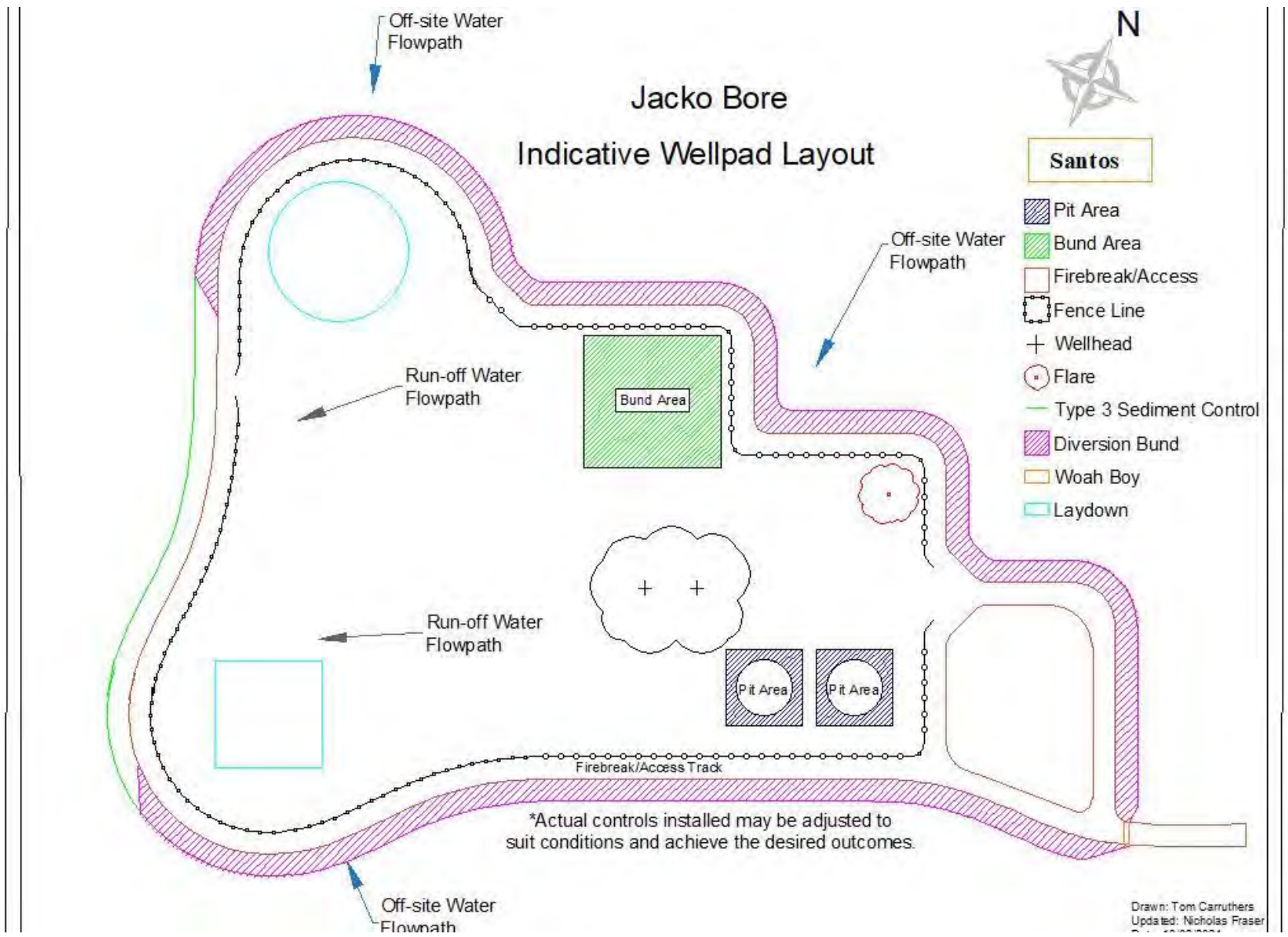

Figure 7—2 Indicative Well Pad Layout

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Spill Management Plan

Appendix 07

Amadeus Basin: Jacko Bore 1DW1 Drill and Test Program

EP125

Santos QNT Pty Ltd

Date	Rev	Description	Initiated	Reviewed	Approved
14/02/2023	1	Approved for Use	KR, TS, NF	JG, LD	MD
16/06/2023	2	Approved for Use	TS	LD, PS, RA, NF, SR	MD
15/12/2023	3	Approved for Use	TS	PS, NF	RD
03/05/2024	4	Approved for Use	NF	TS	DG
28/06/2024	5	Approved for Use for STO5-5	NF	TS	DG

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1. Purpose

This Spill Management Plan has been developed to support the Activity covered in Santos QNT Pty Ltd (the Interest Holder)'s Environmental Management Plan (**EMP**) (EP 125).

This plan has been developed following the *Code of Practice: Onshore Petroleum Activities in the Northern Territory,* herein referred to as *the Code* [DENR, 2019].

2. Key Legislation

Key legislation and documents that have been consulted in developing this plan are provided below:

- ***Petroleum (Environment) Regulations 2016***: requires the Interest Holder to assess the environmental impacts and risks of the regulated Activity regarding any action proposed, including the prevention of a spill of the chemical or other substance [[NT GOVERNMENT, 2016].
- ***Code of Practice: Onshore Petroleum Activities in the Northern Territory:*** covers the management of chemicals and wastewater on-site, including the use of secondary containment and the Interest Holder's spill management plan [DENR, 2019].
- ***The Code of Practice of On-site Wastewater Management*** **[DoH,2014]**: provides standards and guidance to ensure the management of on-site wastewater.
- ***Transport of Dangerous Goods by Road and Rail (National Uniform Legislation) Act 2010:*** covers the transportation of goods by road in the NT and licence requirements for vehicles and drivers carrying dangerous goods [DEPARTMENT OF THE ATTORNEY-GENERAL AND JUSTICE, 2010].
- ***Workplace Health and Safety (National Uniform Legislation) Act 2011:*** covers the storage and handling of chemicals on-site [DEPARTMENT OF THE ATTORNEY-GENERAL AND JUSTICE, 2011].
- ***Waste Management and Pollution Control Act 1998:*** covers the requirements for the transportation and disposal of waste within the Northern Territory, including the requirements for contractors, vehicles and facilities managing listed wastes to be licenced [DEPWS, 1998].

3. Potential Spill Materials

Table 3—1 below provides information about how fluids, chemicals and wastewater will be stored, transported, and transferred during the Activity.

Table 3—1 Estimated Volumes of Chemicals and Wastewater Associated with the Activity per Well Pad

Item	Est. Volumes on Site	Storage Location	Containment	Management
Diesel Fuel	50,000 L	Fuel storage tanks.	Secondary containment. (Double-skinned tanks).	• Bulk fuel will be stored within tanks equipped with safety features such as double skins or temporary bunding. • Spill, leak, and drip trays will be used to address the immediate risk associated with refuelling operations. • Any unused fuel at the end of the program will be transported from the site.
General Equipment Maintenance Chemicals: • Hydraulic oil • Lubricants • Degreasers, etc.	2,000 L	Storage tanks and drums.	Secondary containment. (Double-skinned tanks or bunded containment area or bunded pallet storage).	• General equipment maintenance chemicals, including lubricants and liquid chemicals, will be transported, and stored within their original containers or in tankers equipped with safety features such as double skins (or temporary bunding). • Spill, leak, and drip trays will be used to address the risk of minor drips and spills associated with filling operations. • Any unrequired general equipment maintenance chemicals will be removed from the site at the end of the program.
Drilling, Completions, and Cementing Additives	25,000 L	Storage tanks, drums, and bags.	Secondary containment for liquid additives (Bunded storage).	• Drilling and completions additives will be transported in their original containers. • Liquid drilling and completions additives will be stored in/on temporary bunding, with a volume greater than 110% of the largest container. • Drilling fluids shall not contain benzene, toluene, ethylbenzene, or xylene (BTEX) above the levels prescribed in section B.5 of the Code. • Any unrequired additives will be transported from the site at the end of the program in suitable containers.
Drilling By-products: • Drilling fluids • Completions fluids • Cuttings • Cement	3,300 m^3	Mud Tank System.	Engineered tanks.	• Drilling and completions rigs have open-topped tank systems designed to mix and circulate fluids. Tank volumes are monitored by rig crews during operations and emptied into pits on-site at the completion of the Activity. • Drilling and completions fluid will be made up of groundwater and drilling additives, and the residual drilling fluids (fluids no longer required for drilling purposes) will be stored in engineered, lined pits. • Drill cuttings are brought to the surface during drilling works and will be stored in lined pits along with the residual drilling and completions fluids. • Residual drilling by-products will be tested for on-site disposal or be transported by HV for off-site disposal.
		Pit/s.	Engineered lined pits.	
Produced Fluid	80 kL (1 ML contingency)	Above-ground tank.	Secondary containment (Double-lined/walled tanks or bunded containment area as per the *Code*)	• Produced Fluid generated during Extended Production Test (EPT) will be stored in tanks. • If produced fluid is recovered, above-ground tanks will be available for storage. • Volume of produced fluid in above ground open topped treatment tanks will be reduced by 95% by evaporation, when suitable conditions prevail, see Appendix 06 (Wastewater Management Plan). • If an above ground open-topped treatment tank is utilised a lid will be available to enclose the tank 8 hours prior to a forecast significant rainfall event. • Produced fluids will be evaporated on-site or transported off-site for disposal.
Condensate and Oil	50,000 L	Condensate storage tanks.	Secondary containment. (Double-skinned tanks).	• Appropriately transported and disposed of at the end of the program.
Greywater and Sewage	25,000 L	Treatment system.	Secondary containment (e.g., Double-skinned tanks).	• Irrigation of on-site within a designated wastewater irrigation area as per the Code of Practice for On-site Wastewater Management [DoH, 2014], or transported off site.

3.1 Transport

Transport of chemicals or wastewater on unsealed roads during the wet season is only approved by the Site Supervisor when the chance of a spill occurring is risk assessed as low, and no significant rainfall events are forecast.

The contingency Plan (Emergency Response Plan **Appendix 13**) will be available for an immediate coordinated response to spill scenarios.

3.2 Fuels

Bulk fuel will be stored within tanks equipped with safety features such as double skins or temporary bunding. Spill, leak, and drip trays will be used to address the immediate risk associated with refuelling operations.

Any unused fuel at the end of the program will be transported from the site.

3.3 General Equipment Maintenance Chemicals

General equipment maintenance chemicals, including lubricants and liquid chemicals, will be transported, and stored within their original containers or in tankers equipped with safety features such as double skins (or temporary bunding).

Spill, leak, and drip trays will be used to address the risk of minor drips and spills associated with filling operations.

Any unrequired general equipment maintenance chemicals will be transported from the site at the end of the program.

General equipment and maintenance chemicals are not anticipated to be hazardous, but all must be stored and handled in accordance with the SDS to limit the potential for environmental harm.

3.4 Drilling, Completions and Additives

Drilling and completions additives are used during the Activity, and their use generates waste. Additives are selected and managed in accordance with the manufacturer's recommendations and SDS. The name, type and quantity of each chemical used on the well will be recorded as per the Well Operations Management Plan (WOMP). Waste generated from their use is covered in **Appendix 06** (Waste and Wastewater Management Plan).

Some chemical fluid additives/materials used in drilling and completions prior to use in the well can be considered hazardous and may cause environmental harm if not handled as per their SDS. No drilling and completions additives to be used in the process will contain benzene, toluene, ethylbenzene, or xylene above the levels prescribed in section B.5 of *the Code*.

Drilling and completions chemical additives to be used on the Jacko Bore 1DW1 well are classified based on function group. These functional groups (indicative list below) have been assessed for their potential to contain hazardous chemicals as per representative chemical additive Safety Data Sheets (SDS), for example:

- Treating bacteria (hazardous).
- Adjusting pH (hazardous).
- Controlling viscosity (non-hazardous).
- Adding weight (potentially hazardous).
- Prevent loss of circulation (non-hazardous).
- Corrosion inhibition (hazardous).

To prevent environmental harm from the storage, handling, and transport of hazardous chemicals, they will be managed in accordance with their SDS, which will be made available with the chemicals during transport at storage and handling locations, and there will be a hazardous chemical register on-site. There will be spill kits available at handling and storage locations.

3.5 Residual Drilling and Completions Fluids, Cuttings and Cement Returns

Drilling and completions fluid will be made up of groundwater and drilling and completions additives, and the residual fluids (fluids no longer required) will be transferred by the rig equipment for storage and management in engineered, lined pits or tanks under the supervision of the Site Supervisor.

Residual drilling and completions fluids, cuttings and cement returns are described in the EMP as drilling by-products. Drilling by-products can cause environmental harm if released to the ground or water. Additives used in drilling and completions fluids can be considered hazardous, but as the resulting waste is primarily water and cuttings, the resulting waste is not considered to be hazardous.

Reduction, reuse, recycling and treatment options for the fluids and solids components of the by-products are described in **Appendix 06** (Wastewater Management Plan).

3.6 Produced Fluid

Produced fluid generated during Extended Production Testing (EPT) (expected to be less than 80KL) will be managed as described in **Appendix 06** (Wastewater Management Plan).

Fluids transferred to tanks will be completed during EPT operations by use of EPT equipment and will be under the supervision of the EPT supervisor.

Produced fluid (formation water) can be considered hazardous and may cause environmental harm if a large quantity is spilled on the site.

3.7 Greywater and Treated Sewage

Accommodation and messing facilities will be provided from a temporary on-site camp located on a designated pre-cleared campsite. The campsite will be equipped with a fully self-contained sewage treatment plant and furnished with an irrigation sprinkler system.

All treated wastewater produced from laundry, showers, kitchen, and treated sewage will be irrigated in an appropriately sized, designated area near the camp. The designated irrigation area will be >200 m from a water body have vegetation capable of enabling a high evapotranspiration rate, as per *the Code For Small On-site Sewage and Sullage Treatment Systems and the Disposal or Reuse of Sewage Effluent* [DOH, 2014]. The designated area will be checked to prevent pooling. Solid and macerated sewage will be transported to a licenced facility for disposal.

4. Potential Spill Scenarios

Table 4—1 presents the potential spill scenarios associated with the proposed Activity and key controls to reduce the risk of spills to As Low As Reasonably Practicable.

These scenarios include:

- Spills of chemicals and wastewater during transportation by heavy vehicle or transfer to tanks/pits (on and off-site).
- Tank, drilling pit and/or containment structure overflows and/or structural failures.
- Spills of additives, chemicals or wastewater during handling and storage works on-site.

The Well Operations Management Plan (WOMP) covers containment loss due to well barrier failure.

Table 4—1 Quality and Quantity of Spill Scenarios

Potential Spill Scenario	Mechanisms	Location	Estimated Quantity	Worst Case Quantity	Maximum Time to Locate Spill	Quality of Spill	Key Controls
Diesel Refuelling	• Coupling/hose failure. • Overfill fuel tank. • Storage tank failure.	Well pad	<1,000 L	1,000 L	Immediate	Combustible C1	• Drip trays. • Spill kits. • Secondary containment.
Diesel Storage Tank	• Tank failure.	Well pad	<50,000 L	50,000 L	2 hr	Combustible C1	• Secondary containment • Routine inspections. • Removed from site at end of Activity
Transport of Diesel	• Loss of load. • Traffic accident. • Container failure.	Access tracks	<25,000 L	25,000 L	Immediate	Combustible C1	• Transport companies licenced. • Spills cleaned up ASAP. • Vehicles maintained to the Original Equipment Manufacturer (OEM)'s specifications. • Transport on unsealed roads during wet weather must be risk assessed and approved by the Site Supervisor.
Handling of Chemicals	• Coupling/hose/valve failure. • Overfill working tank.	Well pad	<1,000 L	1,000 L	Immediate	Potentially hazardous chemicals	• Secondary containment. • Routine inspections. • Spill kits.
Storage of Chemicals	• Container failure.	Well pad	<1,000 L	1,000 L	2 hr	Potentially hazardous chemicals	• Secondary containment. • Routine inspections. • Spill kits. • Removed from site at end of Activity
Transport of Chemical	• Loss of load. • Traffic accident. • Container failure.	Access tracks	<25,000 L	25,000 L	Immediate	Potentially hazardous chemicals	• All transport companies licensed. • Spills cleaned up ASAP. • Transport vehicles maintained to the Original Equipment Manufacturer (OEM)'s specifications. • Transport on unsealed roads during wet weather must be risk assessed and approved by the Site Supervisor.
Handling Drilling By-Products	• Spills during fluids transfers from the rig to the drilling pits.	Well pad	<5,000 L	<5,000 L	Immediate	Potentially hazardous chemicals	• Transfers completed under supervision. • Clean up equipment on-site.
Handling Produced Fluid	• Coupling, hoses, or valve failure. • Overfill container. • Tank Failure.	Well pad	<5,000 L	80,000 L – 1 ML	Immediate	Potentially hazardous chemicals	• Secondary containment. • Daily inspections during ongoing activities • Compacted tank pads. • Leak detection monitoring.
Transporting Drilling By-Products, Produced Fluid, Wastewater	• Loss of load. • Traffic accident. • Container failure.	Well pad	<25,000 L	25,000 L	Immediate	Potentially hazardous chemicals	• All transport companies licensed. • Spills cleaned up ASAP. • Transport vehicles maintained to the Original Equipment Manufacturer (OEM)'s specifications.

Potential Spill Scenario	Mechanisms	Location	Estimated Quantity	Worst Case Quantity	Maximum Time to Locate Spill	Quality of Spill	Key Controls
							• Transport on unsealed roads during wet weather must be risk assessed and approved by the Site Supervisor.
Drilling Pit Overflow or Failure	• Overfilling of a pit. • Structural failure of the embankment.	Well pad	<5,000 L	~2.5 ML	~12 h	Potentially hazardous chemicals	• Daily inspections during activities (via telemetry or in person) • Freeboard based on a 1–1,000-year rainfall event. Maintained at or below 127mm post-drilling to prevent overflow.
Fugitive Gas	• Well integrity failure.	Well pad	3 MMscf	3 MMscf	Immediate	Flammable gas	• Monitoring of well integrity. • Leak Detection Surveys
Hydraulic Fluid	• Failure of storage container and/or hydraulic systems. • Spill.	Well pad	<1,000 L	3,800 L	2 hr	Not hazardous and not a Dangerous Good.	• Secondary containment. • Removed from site at end of the Activity.

4.1 Environmental Fate Analysis

Table 4—2 Environmental Fate Analysis

Potential Spill Scenario	Worst Case Quantity	Fate Unmitigated	Extent Mitigated
Diesel Refuelling	1,000 L	<1m deep surface soil.	Contained in bunded area.
Diesel Storage tank	50,000 L	<1m deep surface soil.	Contained in bunded area.
Transport of Diesel	25,000 L	<1m deep surface soil.	Quick response limits impact to soil and drainage system.
Handling of Chemicals	1,000 L	<1m deep surface soil.	Contained in bunded area.
Storage of Chemicals	1,000 L	<1m deep surface soil.	Contained in bunded area.
Transport of Chemical	25,000 L	<1m deep surface soil.	Quick response limits impact to soil and drainage system.
Handling Drilling By-Products	5000 L	<1m deep surface soil.	Quick response limits impact to soil and drainage system.
Handling Produced Fluid	80,000 L – 1 ML	<1m deep surface soil.	Quick response limits impact to soil and drainage system. An amount contained on compacted tank pad overland flow bunded area. If containment bunding implemented, contained within this area.
Transporting Drilling By-Products, Produced Fluid, Wastewater	25,000 L	<1m deep surface soil.	Quick response limits impact to soil and drainage system.
Drilling Pit Overflow or Failure	~2.5 ML	<1m deep surface soil, or >3m deep below pit.	Quick response limits impact to soil and drainage system.
Fugitive Gas	3 MMscf	Escape to atmosphere.	Negligible if well integrity maintained.
Hydraulic Fluid	3,800 L	<1m deep surface soil.	Contained in bunded area.

5. Potential Receptors

Appendix 01 and **02** describes the environment at the Project Area, including environmental and cultural sensitivities, which have the potential to be impacted by a spill.

Maps are provided throughout the document illustrating the separation distance between project infrastructure and sensitive receptors: heritage sites, communities, protected areas, watercourses, etc.

5.1 Groundwater

Chemicals and fuels used during the civils, drilling, completions, and Extended Production Testing works may result in accidental releases to the surface and infiltrate the ground, migrating to shallow groundwater, and affecting groundwater quality.

These potential releases, whilst unexpected, are considered to have a low probability of occurrence and are constrained by the **EMP** requirements managing risk, existing legislative requirements, and the ongoing mitigation of potential impacts.

5.2 Surface Water

Spills to the surface have the potential to migrate to surface waters such as ephemeral watercourses and thus have the potential to affect surface water quality and the ecological values of that habitat. Bunding of chemicals to prevent spill to ground a key control to prevent this risk.

5.3 Soil

For smaller spills and leaks (<1,000 L), migration is likely to be contained within the surface soils and would be readily removed, contained, or remediated.

6. Risk Assessment

The risk of spills associated with the proposed Activity is covered in the Interest Holder's Risk Assessment (**Appendix 04**) and controls are listed in **Section 7**.

7. Control Measures

The key control measures to manage spills associated with the Activity in the **EMP** are summarised in the list below. The key management controls include but are not limited to:

- All contaminated materials / waste stored on the well pad or at the campsite in appropriate containers or bunds to prevent off-site release.
- All drilling and completion fluids, liquid chemicals additives, hazardous chemicals, oil, and fuel will be stored on the well pad and have secondary containment as per *the Code*.
- Secondary containment will have sufficient capacity to hold 100% of the volume of the largest container stored in the area (plus 10%) unless the container is equipped with individual secondary containment (*Section A.3.8 (g)(i)* of *the Code*).
    - Above-ground tanks, whether above-ground mobile tank or pond, will have secondary containment.
- Drilling pits will be lined with Aquacon345, HDPE, or equivalent, which meets the Code requirements for an impermeable membrane.
- Drilling pits, and above-ground tanks will be constructed and/or operated with enough freeboard to manage a 1:1,000 ARI event during the wet season. A target freeboard will be set at 400mm to enable compliance with a minimum freeboard of 300mm.
- Drilling pits will have a raised bund of 500mm to prevent overland flow from adding any additional water to the pits and as an additional contingency for freeboard.
- Pressure transducers (or similar) will be installed in the tanks/sumps to measure freeboard and will be calibrated against manual dips to ensure accuracy.
- Tank pad/s will be constructed to minimise the impact of a potential spill of produced fluid; this includes compacting the tank pad surface to above-ground tank vendor specifications to ensure stability.
- Above-ground tank/s will be placed on the compacted tank pad with an overland flow diversion bund.
- Monitoring to detect spills will be in accordance with Table 7—2 Monitoring Program of the EMP. And includes:
    - Secondary containment, when in use, is to be visually inspected weekly during the dry season and daily during the wet season for damage, spills, or water for management. As per *A.3.8.i* of *the Code*. Note: if secondary containment is found to be damaged, it must be repaired as soon as practicable.
    - Above-ground tanks will have telemetry that can be accessed remotely to detect leaks. All handling and fluids transfer works will be completed during operations under Site Supervisor.

- No storage, set down, or transfer of chemicals (including re-fuelling) will occur within the Karinga Creek Paleo Drainage Site of Conservation Significance located within the Project Area.
- Spill kits will be readily available at each worksite while operational and on all mobile service trucks or vehicles where hydrocarbons and chemicals are stored or used.
- Inspection reports and maintenance records of secondary containment shall be kept and available for review upon request.
- Transport on unsealed roads speed limited to 60 km/hr.
- Spill-specific contingency/emergency response drills to be conducted in line with the **Emergency Response Plan** (**Appendix 13**).
- Materials that escape from primary containment or are otherwise spilled onto secondary containment will be removed as soon as possible.

7.1 Assessment of Spillage Risk During Transport

The Code requires that during the wet season (1st October to 30th April), the transport of chemicals and wastewater on unsealed roads must not be undertaken unless the risk of spills is demonstrated to be ALARP and acceptable.

The risk of a chemical spill during the wet season may occur if a vehicle becomes bogged, tips over, or is damaged during extraction from a bogged position.

To demonstrate that the risks of a chemical or wastewater spill are reduced to ALARP and acceptable in these circumstances, the following key controls are to be put in place (as reflected in the **Appendix 04**):

- During the wet season chemicals or wastewater is not to be transported during a significant rain event (>150mm over 4 days forecast).
- Transport of chemicals and wastewater will not occur if water crossings have >30cm of flowing water at the time of proposed transport.
- During the wet season, if chemicals or wastewater is to be transported, a Santos Road Status Report will be completed for unsealed roads within the Project Area. This report details which roads are open, closed, and the hazards and controls based on site-specific conditions as assessed by the site supervisor.
- In the event of a chemical or wastewater transport vehicle becoming bogged, the contingency plan for bogged vehicles (**Section 7.2**) is to be followed so extraction works are conducted safely and prevent loss of contents and the **Emergency Response Plan** (Section 8 – Emergency Communication) in case of a release of chemicals.

With these controls in place, the transport of chemicals is deemed to be reduced to ALARP and acceptable in the wet season.

7.2 Contingency Plan for Bogged Vehicles Transporting Chemicals and wastewater

If a vehicle becomes bogged extraction activities must be conducted safely and in a manner that prevents loss of contents.

Vehicle extraction must be conducted as follows:

- If anyone requires medical attention or the incident cannot be rectified using existing resources, contact Emergency Services 000.
- Notify the line manager of incident and ask for assistance. Never attempt extraction without assistance.
- Ensure rescue vehicles can safely reach the incident location. Stop traffic or divert away from the incident if required.
- Complete Job Hazard Analysis before attempting extraction. Take action to mitigate hazards identified.
- If safe, removal of chemicals from the bogged vehicle may be necessary before extraction.
- Chemicals and wastewater may have escaped from containment on the bogged vehicle.
    - If safe, use vehicle placarding and HAZCHEM code to identify chemical spill.
    - Refer to SDS for safety and environmental risks that must be managed.
    - Ensure all personnel are safe from fumes, smoke, and other chemical hazards.
    - Use safety equipment, if required, to extract personnel from bogged vehicle.
    - Be aware of potential for fires. Keep ignition sources and personnel away if there is a risk of fire from flammable or combustible chemical spills.
    - If safe, activate chemical containment action:
        - Wear appropriate PPE, consult the SDS.
        - If safe and possible, stop spill at source. Shut off valves.
        - If spill pooling, try to contain with spill kit, soil, or other bunds to prevent it escaping to drainage and waterways.
    - Clean up:
        - Retrieve as much as possible at source with absorbents.
        - Remove contaminated soil. Seal in labelled containers and transport by licensed contractor to licensed facility for disposal.

8. Spill Response and Management

The following section provides an overview of the response to spills during the Activity under the **EMP**. Where the spill results from an emergency, **Appendix 13**, the Contingency/Emergency Response Plan (ERP), will take precedence over this plan.

8.1 Initial Spill Assessment

When a spill occurs, the Site Supervisor will conduct the initial assessment of the spill to identify the potential hazards, type, location, and required assistance. The assessment will:

- Determine the type of spill and safety hazard by use of the SDS to response personnel and identify if additional resources (e.g., emergency services, specialised equipment, or advice) are required to manage the spill safely.
- Determine the spill movement, including factors affecting the movement.
- Determine the spill response priorities as per **Table 8—1**.
- Evaluate the material's hazardousness and the associated control measures, including any potential risks associated with chemical mixing, such as oxidising and reducing agents, as outlined in the Safety Data Sheet.
- Determine the appropriate spill category and type of response required as per Table 7—3 in the EMP.
- Determine the physical (volume and state) and location of the spill.

Table 8—1 Spill Response Priorities

Spill Priority	Response
People and Communities	• Muster and evacuate (if deemed necessary). • Account for all people and determine missing persons. • Stop unauthorised access. • Provide a technical resource to the Emergency Services (if required). • Protect the community (e.g., prevent incident escalation, community awareness).
Environment and Sacred Sites	• For emergencies that are safe to manage, on-site personnel will respond with available resources to limit the extent of the impact on the environment or a protected site. • For larger incidents or where it is unsafe for on-site personnel to respond, trained people will be mobilised to control and contain the emergency to minimise the impact on the environment or protected site.
Regulators	• Notify Regulators as per incident reporting requirements (refer to: Table 7—3 Incident and Reporting Requirements of the EMP).
Assets	• Monitor automatic shutdown of the equipment or part thereof or initiate manual shutdowns where it is safe to do so. • Mobilise Emergency Services to intervene.
Reputation	• Notify neighbours (if required).

8.2 Spill Response Actions

Construction, drilling, completions and EPT contractors working under this **EMP** will follow their company procedures that supplement the requirements of this plan. The listed actions below are to guide spill containment and response:

For **small spills** – utilise available spill kits and dispose of material in segregated waste bins.

For **larger spills** – reference the Contingency Plan/Emergency Response Plan (**Appendix 13**), and:

- Move all people out of harm's way.
- Prevent people, livestock, and wildlife access to hazardous materials through fencing or other barriers.
- Alert others nearby.
- Assess the situation:
    - Determine what substances are involved. The substance must be known before taking any action (refer to Material Safety Data Sheet).
    - Assess the potential receptors (people and the environment) and identify if additional support is required.
- Where applicable, remove any possible risk-escalating factors (e.g., ignition hazards for inflammable/combustible spills).
- Approach the spill from up-wind to reduce fume risks and isolate the spill source (close containment valve or similar).
- Ensure appropriate control requirements are met (e.g., Personal Protective Equipment, first aid support) before conducting spill clean-up.
- If it is safe and possible to do so, stop the source of the leak and contain the spill using on-site equipment to prevent the spill from exiting the site boundary or entering a waterway or sensitive feature.
- Recover any free liquid and contaminated material as soon as practicable to mitigate infiltration.
- Store contaminated material in a manner to minimise the risk of additional contamination.
- For level 2 spills (see **Table 7—3 of the EMP**) and higher, the Site Supervisor shall be notified as soon as it is safe to do so, but within 2 hours of the spill.
- The Interest Holder is to ensure that appropriate external (DEPWS/DITT) incident reporting requirements are actioned per Section 13 (Incident Reporting) of this document.
- For level 2 spills and higher, the Interest Holder will seek expertise on whether additional testing and remediation are required upon completion of the initial

containment and clean-up. This consideration will be undertaken following the National Environment Protection Assessment of Site Contamination Measure [ASC NEPM, 1999]. Spill levels are defined in **Table 7—3 of the EMP**.

- Upon rectifying a reportable spill, an incident investigation shall be completed as per the Petroleum (Environment) Regulations; this shall include:
    - An investigation into the incident.
    - Actions taken to mitigate the impact.
    - Ongoing monitoring and maintenance to ensure the site is stable and non-polluting.
    - Actions taken to prevent future similar incidents from occurring again.

8.3 Contaminated Material Disposal

Contaminated material disposal will consider the following principles while being completed:

The storage of contaminated material must be undertaken in a manner that minimises additional contamination.

Off-site disposal must be undertaken following the *NT Waste Management and Pollution Control Act 1998* [DEPWS, 1998].

All listed waste transportation shall be undertaken by licenced contractors and be tracked and disposed of at approved waste management facilities.

9. Monitoring and Inspection

Monitoring measures used to manage risk during the proposed Activity are presented in the Monitoring Program of the **EMP Section 7.5.4**.

Monitoring includes:

- Monthly visual inspections in person or remotely with telemetry of primary and secondary containment of chemicals, fluids, fuel, or additives storage locations, when stored on site.
- Weekly visual inspections in person or remotely with telemetry of secondary containment, when in use, during the dry season.
- Daily visual inspections of secondary containment in person or remotely with telemetry, when in use, during the wet season.

Note: if secondary containment is found damaged, it must be repaired as soon as practicable.

The minimum volume of a leak that would likely be identified:

- Chemicals and additives (visual: ~10 Litres).
- Fluids/fuel (visual: ~10 Litres).
- Drilling fluids stored in sumps (visual: ~1,000's Litres; remote: ~8,000L*).
- Produced fluids stored in above-ground double-lined tanks (visual: ~1,000's Litres; remote ~10-100 Litres**).
- Produced fluids stored in above-ground single-lined pond (visual: ~1,000's Litres; remote: ~8000L*).
- Produced fluids stored in above-ground single-lined mobile tank (visual: ~1,000's Litres; remote: ~600L*).

*Minimum volume is based on post-evaporation water level change exceeding respective month P90 evaporation rate. To be calibrated based on actual storage vessel dimensions.

**Moisture detection sensors can detect small volumes of fluid (suitable for double-lined tanks only)

10. Roles and Responsibilities

The roles and responsibilities set out below are specific for the people responsible for managing and leading spill responses.

Site Supervisor

- Initial spill response.
- Liaise with contractors in charge of the work program to initiate spill assessment.
- Engage emergency services (if required).
- Coordinate immediate spill clean-up operations.
- Notify the Project Manager.

Project Manager/Lead

- Implementation of the Spill Management Plan.
- Coordinate remediation and rehabilitation requirements.
- Assess the reportability of spills.
- Interface with government and regulatory bodies for communication and consents.

Emergency Team

- Provide Emergency Response support for spill management works.

Other (including contractors)

- All personnel, including contractors engaged to perform project works, must comply with the Spill Management Plan and the Code.

11. Implementation

All personnel, including contractors engaged to perform project works, must comply with this Spill Management Plan and *the Code*.

12. Spill Reporting

Refer to **Table 7—3** Incident and Reporting Requirements in the **EMP**.

13. Incident Reporting

Incidents may require reporting under the *Petroleum (Environment) Regulations* and the *Waste Management and Pollution Control Act* [DEPWS, 1998; NT GOVERNMENT, 2016]. Refer to **Table 7—3** Incident and Reporting Requirements in the **EMP**.

13.1 Petroleum (Environment) Act Incident Reporting

13.1.1 Reportable Environmental Incident Reporting

The Petroleum (Environment) Regulations define a reportable incident as an incident arising from a regulated Activity that has caused or has the potential to cause material environmental harm or serious environmental harm as defined under the Petroleum Act.

An interest holder must notify (this may be verbally or in writing) DEPWS of a reportable incident as soon as practicable but no later than two hours after the first occurrence of the incident or after the time the interest holder becomes aware of the incident.

A written initial report must be completed within three days, and a final report no later than 30 days after the clean up or rehabilitation is complete.

13.1.2 Recordable Incidents

The *Petroleum (Environment) Regulations* define a recordable incident as an incident arising from the regulated Activity that:

- Has resulted in an environmental impact or environmental risk not specified in the current plan for the Activity.
- Has resulted in a contravention of an environmental performance standard specified in the current plan for the Activity.
- Is inconsistent with an environmental outcome specified in the current plan for the Activity, and
- Is not a reportable incident.

The Interest Holder must notify (this may be orally or in writing) DITT of a recordable incident as soon as practicable but no later than 15 days after the reporting period (agreed period or every 90 days after the day on which the **EMP** is approved).

13.1.3 Waste Management and Pollution Control Act Incident Reporting (WMPC Act)

Following the WMPC Act, where contaminants or waste is not confined within the land on which the Activity is undertaken (i.e., the approved disturbance areas where the Activity is occurring), the Interest Holder will notify the EPA of any incident causing or threatening to cause pollution as soon as practicable, but no less than 24 hours after becoming aware of the incident.

13.1.4 Notifiable Incidents

Under the WMPC Act, a notifiable incident is defined as an incident that causes, threatens, or may threaten to cause pollution resulting in material environmental harm or serious environmental harm. The notification must include the following details:

- The incident causing or threatening to cause pollution.
- The place where the incident occurred.
- The date and time of the incident.
- How the pollution has occurred, is occurring or may occur.
- The attempts made to prevent, reduce, control, rectify or clean up the pollution or resultant environmental harm caused or threatening to be caused by the incident.
- The identity of the person notifying.
- The notification shall be made to the NT EPA Pollution Hotline 1800 064 567 as soon as practicable, but no later than 24 hours after the first occurrence of the incident or after the time the interest holder becomes aware of the incident.

13.2 Communication

Spill prevention and monitoring strategies will be communicated to personnel via:

- Site inductions.
- Safety meetings.
- Toolbox talks.
- Daily meetings.

14. Chemical and Additive Tables

Drilling and Completions fluids are selected and used in accordance with their designed function, the manufacturer's recommendations, and relevant safety data sheets (SDS). Drilling fluid requirements are covered in the WOMP. The WOMP will be compiled by Santos and reviewed and approved by DITT before the regulated activities under this **EMP** are carried out.

Table 14—1 and **Table 14—2** provide a list of additives that may be used on the wells being drilled under this EMP to enable an assessment of what chemicals may be hazardous or have the potential to cause environmental harm. The hazardous chemical analysis was conducted by reviewing representative SDS for chemical additives within a primary function/description category. If a functional group contains additives that were deemed hazardous to the environmental, considerations were added along with the recommended handling and storage considerations to enable safe use on-site.

It is to be noted that **Table 14—1** and **Table 14—2** comprise the best available information as at the time of submission of the EMP, but aspects may change depending on available supply and sub-contractor preferences.

As per the Code, additives will be selected and managed to ensure they are used in accordance with the Manufacturer's recommendations and relevant safety data sheets (SDS)and the names and volumes will be recorded.

Drilling and Completions additive names, to achieve the described function, may change based on the sub-contractor or supplier of the additives, and availability.

Any change to the list of chemicals or and their hazardousness will need to be formalised through a modification or revision to the EMP in accordance with the PER, before the change is enacted.

Table 14—1 List of Indicative Drilling and Completions Additives and Their Potential to be Hazardous

Additives Name	Description / Primary Function (Group)	Environmental Hazardous (Y/N)	Ecological Toxicity (Y/N)	Typical Environmental/ Disposal Considerations (if hazardous)	Recommended Handling and Storage Considerations (if hazardous)
BaraBlend®-665	Lost Circulation Material	No	No	N/A	N/A
BaraBlend®-657	Lost Circulation Material	No	No	N/A	N/A
BARABLOK™	Fluid Loss Additive	No	No	N/A	N/A
BaraCor® 95	Ph Control	No	Yes	• In case of accidental release, Use appropriate protective equipment. Avoid contact with skin, eyes, and clothing. Avoid breathing vapors. Ensure adequate ventilation. Evacuate all persons from the area. • In case of accidental release, isolate spill and stop leak where safe. Contain spill with sand or other inert materials. Scoop up and remove. • Prevent from entering sewers, waterways, or low areas. Consult local authorities. • Disposal should be made in accordance with federal, state, and local regulations. • Follow all applicable national or local regulations.	• Use appropriate protective equipment. Avoid contact with eyes, skin, or clothing. Avoid breathing vapors. Ensure adequate ventilation. Wash hands after use. Launder contaminated clothing before reuse. • Handle in accordance with good industrial hygiene and safety practice. • Store in a cool well-ventilated area. Keep container closed when not in use. • Product has a shelf life of 36 months. • Use in a well-ventilated area. Local exhaust ventilation should be used in areas without good cross ventilation. • Not expected to be reactive but is incompatible with strong acids and strong oxidizers.
BaraScav™ W-480	Hydrogen Sulfide Scavenger	No	Yes	• In case of accidental release, use appropriate protective equipment. Avoid breathing vapors. Avoid contact with skin, eyes, and clothing. Ensure adequate ventilation. • In case of accidental release, isolate spill and stop leak where safe. Contain spill with sand or other inert materials. Scoop up and remove. • Prevent from entering sewers, waterways, or low areas. • Follow all applicable community, national or regional regulations regarding waste management methods. • Follow all applicable national or local regulations.	• Avoid contact with eyes, skin, or clothing. Avoid breathing vapors. Ensure adequate ventilation. Wash hands after use. Launder contaminated clothing before reuse. Use appropriate protective equipment. • Handle in accordance with good industrial hygiene and safety practice. • Store away from direct sunlight. Keep container closed when not in use. • Use approved industrial ventilation and local exhaust as required to maintain exposures below applicable exposure limits. Ensure adequate ventilation, especially in confined areas. • Not expected to be reactive but is incompatible with strong oxidizers. Reducing agents, strong acids.
BaraScav™-1061	Hydrogen Sulfide Scavenger	No	Yes	• In case of accidental release, ensure adequate ventilation. Use appropriate protective equipment. Do not breathe dust/fume/gas/mist/vapors/spray. Avoid contact with skin, eyes and clothing. • In case of accidental release, dike far ahead of liquid spill for later disposal. Soak up with inert absorbent material. Pick up and transfer to properly labeled containers. • Prevent from entering sewers, waterways, or low areas. • Disposal should be made in accordance with federal, state, and local regulations. • Dispose of container according to national or local regulations.	• Do not breathe dust/fume/gas/mist/vapors/spray. Ensure adequate ventilation. Use appropriate protective equipment. Avoid contact with eyes, skin, or clothing. • Handle in accordance with good industrial hygiene and safety practice. • Store in a well-ventilated area. • Ensure adequate ventilation, especially in confined areas. • Not expected to be reactive but is incompatible with strong oxidizers.
BaraFLC® Nano-1	Fluid Loss Additive	No	Yes	• In case of accidental release, use appropriate protective equipment. Avoid contact with skin, eyes, and clothing. Avoid breathing vapors. • In case of accidental release, dike far ahead of liquid spill for later disposal. Soak up with inert absorbent material. Pick up and transfer to properly labeled containers.	• Handle in accordance with good industrial hygiene and safety practice. • Keep container closed when not in use. • Not expected to be reactive but is incompatible with strong oxidizers.

Additives Name	Description / Primary Function (Group)	Environmental Hazardous (Y/N)	Ecological Toxicity (Y/N)	Typical Environmental/ Disposal Considerations (if hazardous)	Recommended Handling and Storage Considerations (if hazardous)
				• Prevent from entering sewers, waterways, or low areas. • Dispose in accordance with local regulations. • Follow all applicable national or local regulations.	
BaraShield®-632	Lost Circulation Material	No	No	N/A	N/A
BaraShield®-981	Lost Circulation Material	No	No	N/A	N/A
BaraShield®-982	Lost Circulation Material	No	No	N/A	N/A
BaraSure™ W-988	Shale Stabilizer	No	No	N/A	N/A
BDF™-637	Fluid Loss Additive Viscosifier	No	No	N/A	N/A
BDF™-678	Additive	No	No	N/A	N/A
DEXTRID® E	Fluid Loss Additive	No	No	N/A	N/A
PAC	Fluid Loss Additive	No	No	N/A	N/A
SOURSCAV®	Hydrogen Sulfide Scavenger	No	No	N/A	N/A
THERMA-THIN®	Fluid Loss Additive	No	No	N/A	N/A

14.1 Indicative Cement Additives

Table 14—2 Indicative Cement Additives and Their Potential to be Hazardous

Additive Name	Recommended Use	Environmental Hazardous (Y/N)	Ecological Toxicity (Y/N)	Typical Environmental/ Disposal Considerations (if hazardous)	Recommended Handling and Storage Considerations (if hazardous)
Class G Cement	Cement	No	No	N/A	N/A
HTB Cement	Cement	No	No	N/A	N/A
CFR-3	Fluid Loss Additive	No	No	N/A	N/A
Halad 344	Fluid Loss Additive	No	No	N/A	N/A
D-Air 300L	Defoamer	No	No	N/A	N/A
Pol-E-Flake	Lost Circulation Material	No	No	N/A	N/A
Flocele	Lost Circulation Material	No	No	N/A	N/A

Additive Name	Recommended Use	Environmental Hazardous (Y/N)	Ecological Toxicity (Y/N)	Typical Environmental/ Disposal Considerations (if hazardous)	Recommended Handling and Storage Considerations (if hazardous)
Liquid Econolite	Light Weight Cement Additive	No	Yes	• In case of accidental release, use appropriate protective equipment. Handle in accordance with good industrial hygiene and safety practice. • In case of accidental release, Isolate spill and stop leak where safe. Contain spill with sand or other inert materials. Neutralize to Ph of 6-8. Scoop up and remove. Do NOT spread spilled product with water. • Prevent from entering sewers, waterways, or low areas. • Disposal should be made in accordance with federal, state, and local regulations. • Follow all applicable national or local regulations.	• Avoid contact with eyes, skin, or clothing. Wash hands after use. Launder contaminated clothing before reuse. Avoid breathing vapours. Avoid breathing mist. Ensure adequate ventilation. Use appropriate protective equipment. • Handle in accordance with good industrial hygiene and safety practice. • Store away from acids. Store in a cool well-ventilated area. Keep container closed when not in use. • Use in a well-ventilated area. Local exhaust ventilation should be used in areas without good cross ventilation. • Not expected to be reactive but is incompatible to strong acids. Amphoteric metals such as aluminium, magnesium, lead, tin, or zinc.
SA-1015	Suspending Agent	No	No	N/A	N/A
WellLife 1094	Cement Additive	No	No	N/A	N/A
BridgeMaker II	Lost Circulation Material	No	No	N/A	N/A
Latex 4000	Additive	No	No	N/A	N/A
GasCon 469	Cement Additive	No	No	N/A	N/A
HALAD-413	Fluid Loss Additive	No	No	N/A	N/A
SCR-100	Retarder	No	No	N/A	N/A
Microbond HT	Cement Additive	No	No	N/A	N/A
Stabilizer 434D	Anionic Surfactant	No	Yes	• In case of accidental release, use appropriate protective equipment. • In case of accidental release, dike far ahead of liquid spill for later disposal. Soak up with inert absorbent material. Pick up and transfer to properly labelled containers. • Prevent from entering sewers, waterways, or low areas. • Disposal should be made in accordance with federal, state, and local regulations. Incineration recommended in approved incinerator according to federal, state, and local regulations. • Follow all applicable national or local regulations. Contaminated packaging may be disposed of by: o Rendering packaging incapable of containing any substance, or treating packaging to remove residual contents, or treating packaging to make sure the residual contents are no longer hazardous, or by disposing of packaging into commercial waste collection.	• Only open container in preparation for use. Avoid contact with eyes, skin, or clothing. Material is slippery underfoot. • Handle in accordance with good industrial hygiene and safety practice. • Store in a cool well-ventilated area. Keep container closed when not in use. Store at temperatures between 70 and 120 F (21 and 49C) • Product has a shelf life of 24 months. • Use in a well-ventilated area. • Not expected to be reactive but is incompatible to strong oxidizers and strong acids.
Tuned Spacer III	Cement; Spacer	No	No	N/A	N/A
Bentonite	Weight Additive	No	No	N/A	N/A
Calcium Chloride	Additive	No	No	N/A	N/A

Additive Name	Recommended Use	Environmental Hazardous (Y/N)	Ecological Toxicity (Y/N)	Typical Environmental/ Disposal Considerations (if hazardous)	Recommended Handling and Storage Considerations (if hazardous)
Tuned Defense	Cement Additive	No	No	N/A	N/A
D-Air 3500L	Defoamer	No	Yes	• In case of accidental release, Ensure adequate ventilation. Use appropriate protective equipment. Do not breathe dust/ fume/ gas/ mist/ vapours/ spray. • In case of accidental release, dike far ahead of liquid spill for later disposal. Soak up with inert absorbent material. Pick up and transfer to properly labelled containers. • Prevent from entering sewers, waterways, or low areas. • Disposal should be made in accordance with federal, state, and local regulations. • Follow all applicable national or local regulations.	• Do not breathe dust/fume/gas/mist/vapours/spray. Ensure adequate ventilation. Use appropriate protective equipment. • Handle in accordance with good industrial hygiene and safety practice. • Store in a well-ventilated area. • Not expected to be reactive but is incompatible with strong oxidizers, strong acids, and strong alkalis. • Ensure adequate ventilation, especially in confined areas.
D-Air 5000	Defoamer	No	Yes	• In case of accidental release, use appropriate protective equipment. Avoid creating and breathing dust. • In case of accidental release, Collect using dustless method and hold for appropriate disposal. Consider possible toxic or fire hazards associated with • contaminating substances and use appropriate methods for collection, storage, and disposal. • Prevent from entering sewers, waterways, or low areas. • Bury in a licensed landfill according to federal, state, and local regulations. • Follow all applicable national or local regulations. Contaminated packaging may be disposed of by: Rendering packaging incapable of containing any substance, or treating packaging to remove residual contents, or treating packaging to make sure the residual contents are no longer hazardous, or by disposing of packaging into commercial waste collection.	• This product contains quartz, cristobalite, and/or tridymite which may become airborne without a visible cloud. Avoid breathing dust. Avoid creating dusty conditions. Use only with adequate ventilation to keep exposure below recommended exposure limits. Wear a NIOSH certified, European Standard En 149, or equivalent respirator when using this product. Material is slippery when wet. Avoid contact with eyes, skin, or clothing. • Handle in accordance with good industrial hygiene and safety practice. • Use good housekeeping in storage and work areas to prevent accumulation of dust. Close container when not in use. Do not reuse empty container. Store in a cool, dry location. • Use approved industrial ventilation and local exhaust as required to maintain exposures below applicable exposure limits. • Not expected to be reactive but is incompatible to hydrofluoric acid.
D Air 3000	Defoamer	No	No	N/A	N/A
HR-5	Cement Retarder	No	No	N/A	N/A
HR-25	Cement Retarder	No	Yes	• In case of accidental release, use appropriate protective equipment. Avoid creating and breathing dust. Avoid contact with skin, eyes, and clothing. Ensure adequate ventilation. • In case of accidental release, scoop up and remove. • Prevent from entering sewers, waterways, or low areas. Consult local authorities. • Follow all applicable community, national or regional regulations regarding waste management methods. • Follow all applicable national or local regulations.	• Avoid contact with eyes, skin, or clothing. Avoid creating or inhaling dust. Ensure adequate ventilation. Wash hands after use. Launder contaminated clothing before reuse. Use appropriate protective equipment. • Handle in accordance with good industrial hygiene and safety practice. • Store away from oxidizers. Store in a cool, dry location. Keep container closed when not in use. • Product has a shelf life of 60 months. • Use approved industrial ventilation and local exhaust as required to maintain exposures below applicable exposure limits. • Not expected to be reactive but is incompatible to strong alkalis.

Additive Name	Recommended Use	Environmental Hazardous (Y/N)	Ecological Toxicity (Y/N)	Typical Environmental/ Disposal Considerations (if hazardous)	Recommended Handling and Storage Considerations (if hazardous)
Tuned Spacer V	Polymer	No	No	N/A	N/A
Silica Fume	Cement Additive	No	No	N/A	N/A
WellLife 1260 / FDP-C1260-16	Elastomeric Additive	No	No	N/A	N/A
Latex 3000	Fluid Lost Additive	No	No	N/A	N/A
SilicaLite Liquid	Light Weight Cement Additive	No	No	N/A	N/A
SA-541	Additive	No	No	N/A	N/A
Tuned Light Blend (HGS Beads)	Cement	No	No	N/A	N/A
Spherelite	Cement Additive	No	No	N/A	N/A

Note: Specific product names are listed here, but they may change based on choice of supplier which may have proprietary names for similar projects. Any change to the list of chemicals and their hazardousness will need to be formalised through a modification or revision to the EMP in accordance with the PER, before the change is enacted.

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Fire Management Plan

Appendix 08

Amadeus Basin: Jacko Bore 1DW1 Drill and Test Program

EP125

Santos QNT Pty Ltd

Date	Rev	Description	Initiated	Reviewed	Approved
14/02/2023	1	Approved for Use	KR, NF, TS, VC	JG	MD
16/06/2023	2	Approved for Use	TS, VF, PS	RA	MD
15/12/2023	3	Approved for Use	TS	PS, NF	RD
03/05/2024	4	Approved for Use	NF	TS	DG
28/06/2024	5	Approved for Use for STO5-5	NF	TS	DG

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1. Introduction

This Fire Management Plan outlines the fire risk and management strategies for the Activity associated with Santos QNT Pty Ltd (the Interest Holder)'s EP 125 (EP), located within the Alice Springs Fire Management Zone. Bushfire management within the zone is set out in the *Alice Springs Regional Bushfire Management Plan* (Department of Environment, Parks and Water Security [DEPWS] 2022.

1.1 Objectives

The key objectives of the development and implementation of this Fire Management Plan are as follows:

- Identify fire hazards related to the Activity.
- Manage the Activity to reduce the risk of fire impacting the following:
    - Human health and communities.
    - Flora communities.
    - Native fauna.
- Be prepared for fire events.
- Limit the impact of any fire events.

1.2 Impact of the Activity on Existing Bushfire Management Regime

Arrangements for the mitigation, management and suppression of bushfires in the region are to be based on risk management principles from the *Alice Springs Regional Bushfire Management Plan* and the *Bushfire Management Planning Guide: Onshore Petroleum Project* (2020) that will guide the direction and evaluation of these activities [DENR, 2020, 2023].

Based on the controls reflected in this Plan there is no anticipated impact on the existing bushfire management regime from the Activity.

2. Analysis of Baseline Information

2.1 Baseline Data Source

Baseline fire information has been sourced from The North Australia and Rangelands Fire Information (NAFI) website and assessed [NAFI, 2021]. NAFI is independently funded by the Commonwealth of Australia through the Department of Industry, Science, Energy and Resources. It is managed through the Darwin Centre for Bushfire Research as a branch of the Charles Darwin University's Research Institute for the Environment and Livelihoods.

The NAFI is the most reliable source of Northern Territory (NT) bushfire data. Data obtained through the NAFI website has been reviewed and analysed, and the results are presented below.

2.2 Fire Frequency and Last Burn

The number of fires and last burns to occur on the EP in within the last 10 years to occur within the EP are shown in **Figure 3—1** and **Figure 3—2**, respectively.

These figures show that the recorded burns are confined to a small area in the north-west of the Project Area. The closest part of this area is about 13km from the proposed Jacko Bore 1DW1 well pad site.

3. Coordination with the Landholder and Other Land Users

Through the land use agreements and ongoing engagement, the Interest Holder will work with the landholder to ensure the Activities do not affect the landholder's fire management regime and are consistent with the landholder's fire management objectives and strategies.

3.1 Seasonal Conditions and Fuel Load Assessments

During annual weed surveys the well pad, fire access trails and breaks will be assessed to ensure new growth/weeds are controlled to manage fuel load and not increase the risk of a fire on the landholder's property from the Activity. To be completed post-wet season/prior to October which is typically the start of the high bushfire risk period in southern NT.

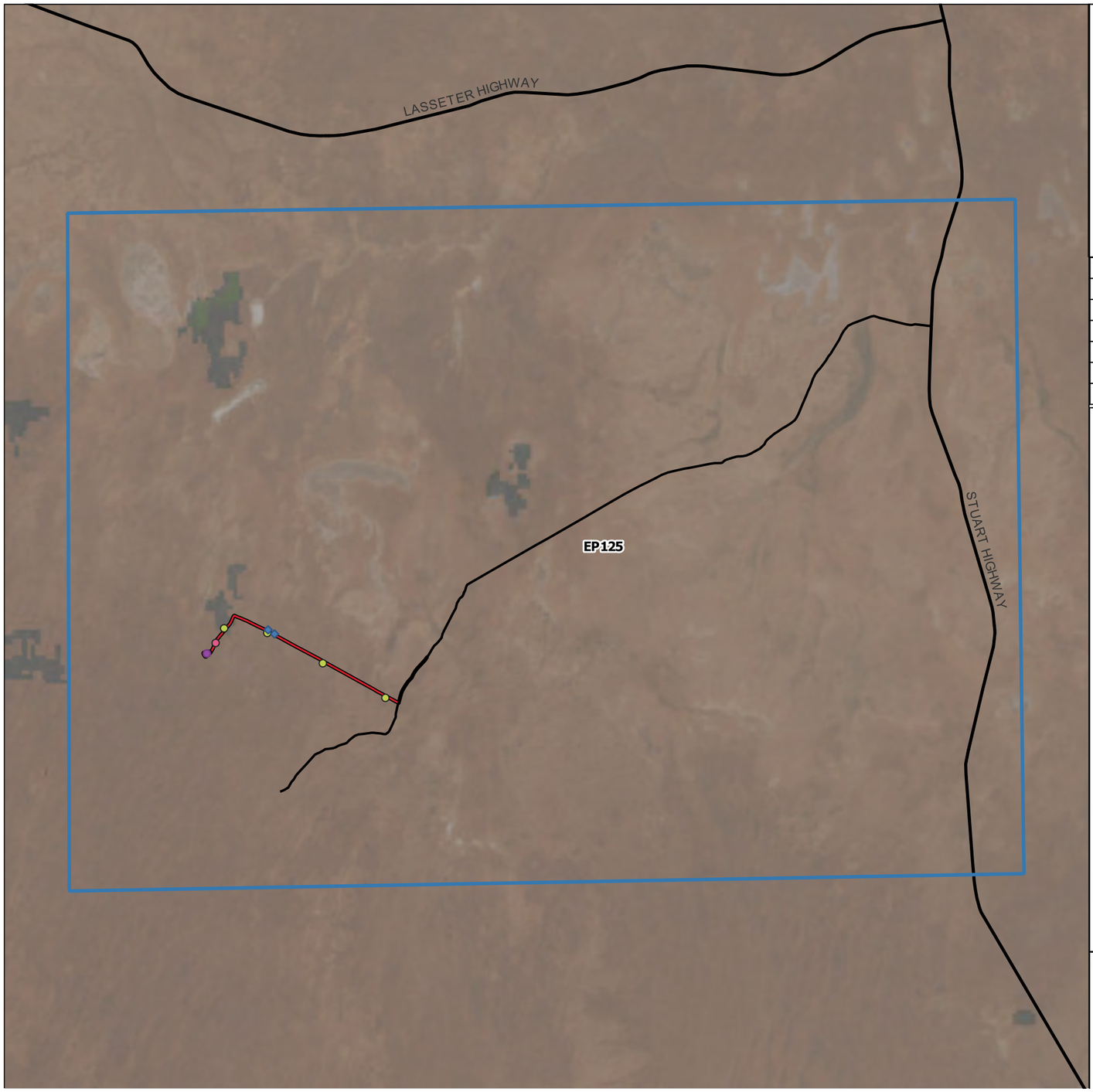
3.2 Fire Access Trails and Fire Breaks

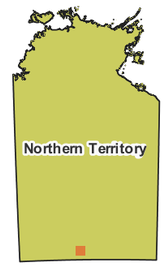
Fire access trails and fire breaks of ~10m will be cleared around the well pad and campsite.

A fire access trail is a vegetation-free access track bordering the well pad and/or campsite. A fire break is a vegetation-free area bordering the well pad and/or campsite that isn't typically used for access.

3.3 Controlled Burns

Controlled burns are not planned to be carried out by the Interest Holder. Management of bushfire risk material in areas required for the Activity will be monitored yearly along with scheduled weed surveys to ensure fire break/access trails remain vegetation free until rehabilitation commences.





Title:	Fire Management - Fire Frequency
Project name:	Jacko Bore 1DW1
CRS:	WGS 84 / UTM zone 53S
Created by:	John Maguire
Company name:	inGauge
Client name:	Santos
Created on:	2023-12-01

Legend:

- Project Area
- EP Boundary
- Principal Road
- Campsite Indicative Location
- Well Pad Indicative Location
- Waterbore Indicative Location
- Gravel Pits Indicative Locations
- Access track - Proposed
- Access track - Existing
- Access track - Existing (re-established)

Fire Frequency (2013-2022)

- 0
- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10
- >10

0 3 6 9 12 15 km

Santos INGAUGE

Figure 3—1 Fire Frequency 2012-2021

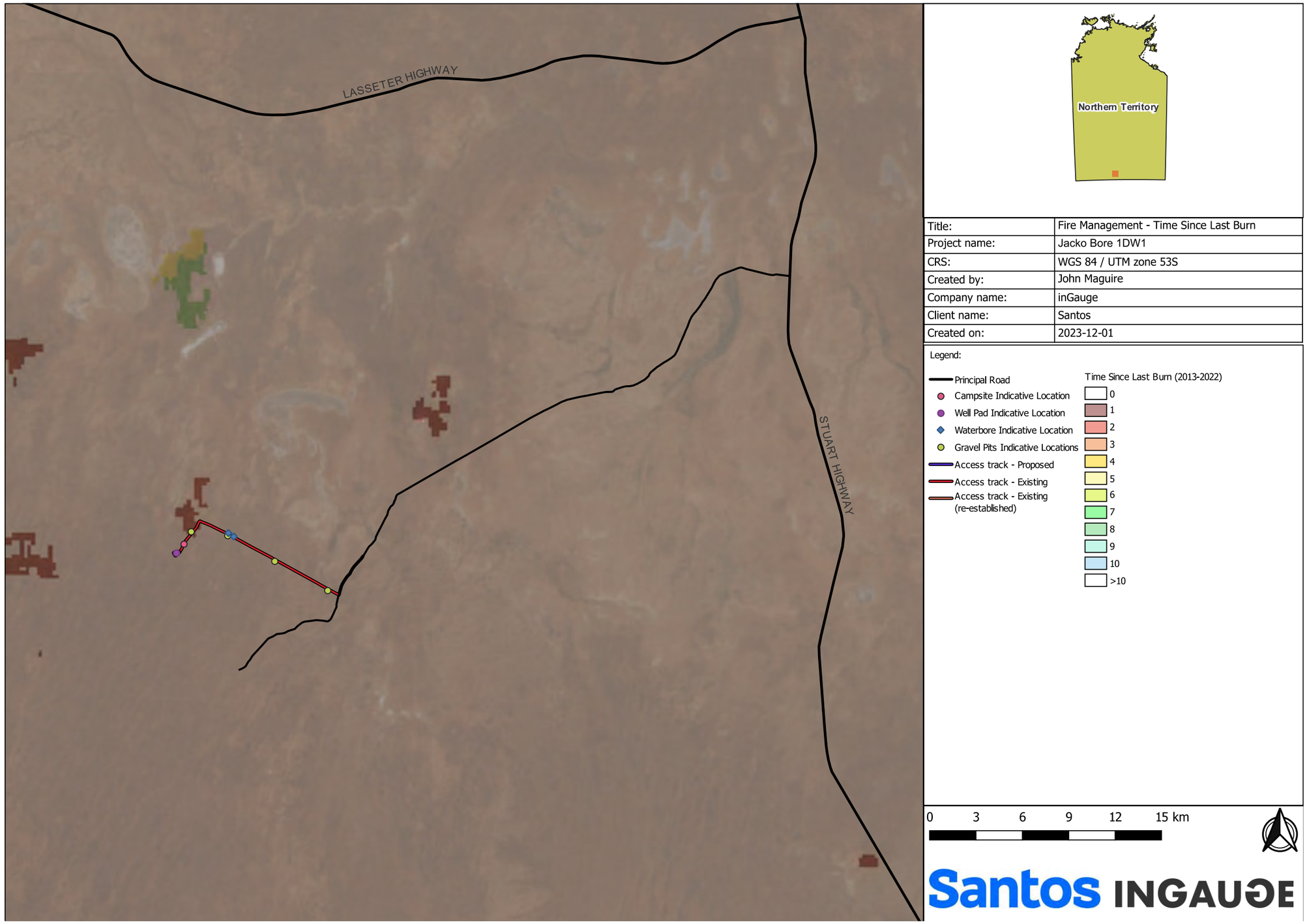


Figure 3—2 Time Since Last Burn

3.4 Monitoring of Bushfire Alerts

As per the Monitoring Program of the **EMP (Table 7—2)**, weather conditions and Fire Weather Warnings will be checked daily during operations via the Bureau of Meteorology.

The NT government has created a three-tier bushfire alert system. The three alerts are:

- **Advice** – Areas which have either a small fire which is controllable, planned fuel reduction burning or an area likely to be affected by smoke.
- **Watch and act** – An area that has a bushfire approaching a community, that is changing with conditions or will threaten property or life if not controlled.
- **Emergency warning** – An area that is in immediate danger from the bushfire and you must act now to protect your life.

Other sources of information are the Northern Territory Government Secure NT website: https://securent.nt.gov.au/alerts, Facebook (Bushfires NT), or Twitter (@BushfiresNT).

3.5 Fire Control Measures

As reflected in **Appendix 04** (Risk Assessment) fire mitigation measures include:

- Availability of fire response equipment on-site during the Activity, including fire extinguishers and operational radios fitted to vehicles and equipment.
- Cleared fire breaks or access trails of ~10m around the campsite and well pad which will be monitored yearly and kept clear of bushfire risk material.
- Prohibiting waste from being burned on site.
- Training and inductions that cover designated smoking areas and emergency response.
- Parking of machinery and vehicles in low fire risk areas.
- The availability of water during high fire risk periods.
- A ~25m minimum vegetation exclusion zone radius for the flare.

3.6 Annual Fire Mapping

Annual fire mapping to be completed during annual survey of cleared areas to monitor changes to fire frequency in the Project Area will be conducted as per *Clause A.3.7.(a)(iii)*. In addition, if a fire occurs in the area immediately surrounding the Project Area during operations, the Interest Holder – in consultation with land managers – will map the extent of the fire's effects within the immediate area and provide DEPWS with the information.

4. Infrastructure Design, Construction, and Operation

The campsite and well pad expansion infrastructure will be designed/constructed with a cleared ~10m ring-fire access trail/fire break. Fire access trails and breaks will be inspected in conjunction with weed surveys post-wet season (prior to October, which is typically the start of the high bushfire risk period) for integrity and clearing maintenance carried out if necessary.

Flaring works associated with Extended Production Testing (EPT) will occur within a vegetation-free safety zone. The flare will have a minimum vegetation exclusion zone radius of ~25m.

Gas produced during EPT will be sent to a vertical flare system to allow a controlled release and gas burning. It will be equipped with an autoignition system that provides electrical impulses to generate a spark to ensure that the flare is always operational.

5. Emergency Contacts

Table 5—1 Emergency Contact Details

Entity	Contact Details
Bushfire Northern Territory Head Office	(08) 8922 0840 – (08) 8922 0844 Bushfires.nt@nt.gov.au
Bushfire Northern Territory Alice Springs	(08) 8952 3066
National Response Centre	1800 076 251
Emergency	**000** or **112** (mobile)
NAFI Central	http://www.firenorth.org.au/nafi3/
Secure NT (Fire Bans)	https://securent.nt.gov.au/alerts
Fire Incident Map	https://pfes.nt.gov.au/incidentmap/

6. Fire Management Plan

The Interest Holder has drafted one-page, tailored Fire Management Plans for the well pad and the campsite. These will be posted at prominent locations at the well pad and campsite and included in site inductions. They will be used / referenced in conjunction with the Emergency Response/Contingency Plan (**Appendix 13**).

These tailored one-page plans are presented below.

6.1 Fire Management Plan 1-Pager – Jacko Bore 1 DW1 Well Pad

Santos

BUSHFIRE MANAGEMENT PLAN 2023
EP 125
JACKO BORE 1D1W

STAKEHOLDER	CONTACT DETAILS	NAME
Santos Supervisor		
Site Supervisor		
Alice Springs Fire Station	(08) 8951 6688	
EMERGENCY	000 or 112	
Bushfires NT Alice Springs	08 8952 3066 or 0400 761 255 **or** 0440 770 899	
Wildlife Information North Australian Fire Information Secure (NAFI) NT (Fire Bans)	www.firenorth.org.au/ https://securent.gov.au/alerts	
DEPWS	(08) 8999 5511	
Land Managers		
Bushfire NT Head Office	(08) 8922 0844	
National Response Centre	1300 560 647	

FIRE MANAGEMENT OBJECTIVES

Property Land Uses

→ Gas exploration, cattle.

Property Aim

→ Undertake the Activity and its ancillary works with minimal impact on primary user/s.

Fire Management Objectives

→ Protect the campsite and associated infrastructure.
→ Coordinate fire management actions with pastoralists.
→ Prevent human-induced bushfire ignitions that cause loss of life, property, or environmental harm.

Manage fuel loads to reduce the rate of spread and intensity of bushfires while minimising pastoral or environmental/ecological impacts.

PREPAREDNESS PLANNING

Based on the Australian Fire Danger Rating System (AFDRS).

<u>Moderate</u>: Plan and prepare.

→ Stay up to date and be ready to act if there is a fire.

<u>High</u>: Be ready to act.

→ Be alert for fires in your area.
→ Decide what you will do if a fire starts.
→ If a fire starts, your life and property may be at risk.
→ Avoid bushfire risk areas.

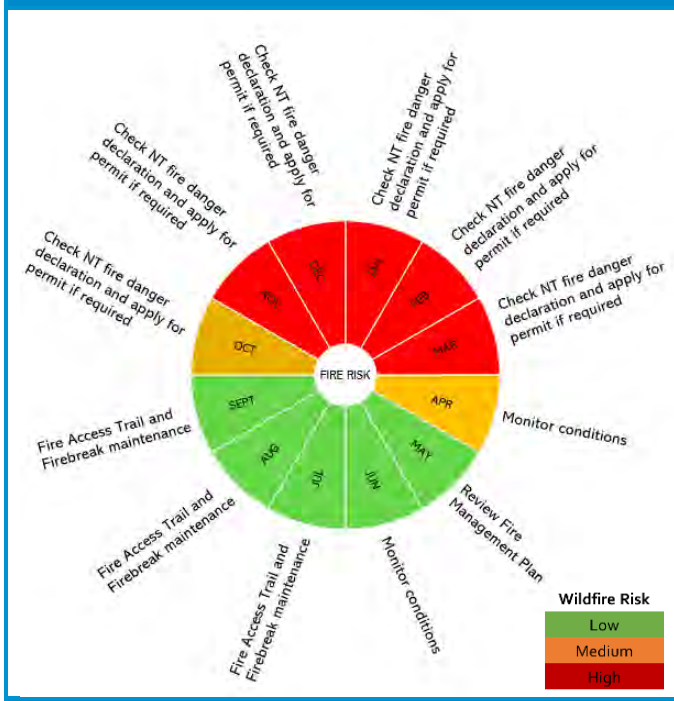
<u>Extreme</u>: Act now to protect your life and property.

→ These are dangerous fire conditions.
→ Check your bush fire plan and that your property is ready fire ready.
→ If a fire starts, take immediate action. If you and your property are not prepared to the highest level, go to a safer location well before the fire impacts.
→ Reconsider travel through bushfire risk areas.

<u>Catastrophic</u>: For your survival, leave bushfire risk areas.

→ These are the most dangerous conditions for a fire.
→ Your life may depend on the decisions you make, even before there is a fire.
→ Stay safe by going to a safer location early in the morning or the night before.
Homes cannot withstand fires in these conditions. You may not be able to leave, and help may not be available.

INDICATIVE ANNUAL WORKS CALENDAR



FIRE FIRST RESPONDER ACTIONS

→ Remove yourself and others from potentially dangerous situations.
→ **Raise the alarm** with the Interest Holder's Site Supervisor.
→ **Identify** the following**:**
a. Location
b. Immediate threats
c. Fire characteristics (what is burning, direction and travel speed)
d. Weather – wind strength and direction.

If possible, wait in a **safe** location for directions from the Site Supervisor or the Pastoralist and communicate this fact.

The Interest Holder's Site Supervisor will escalate the emergency as per the Site Emergency Response Plan (**Appendix 13**).

FIRE MANAGEMENT ACTIONS AND MITIGATION MEASURES

Infrastructure Protection Buffer	→ Protect infrastructure by maintaining a ~10-metre bare earth buffer around the campsite.
Infrastructure Fire Exclusion	→ Ensure all vehicles are fitted with fire extinguishers and that all firefighting equipment and water supplies are checked regularly. → Ensure all machinery and vehicles will be parked in areas of low fire risk and be free of any combustible material. → Ensure all staff/contractors are trained in the operation of firefighting equipment and are aware of this plan. → Site Supervisor is to monitor NAFI regularly and liaise with the pastoralist if a fire threatens infrastructure. → Smoking will only be permitted in areas clear of vegetation and there will be no disposal of butts. → An evacuation area/emergency muster point is established and clearly labelled in the event of an emergency.
Fire Access Trails	→ Co-locate fire access tracks with facility access tracks. → Monitor the main access track and contingency track for weeds, and spray, grade, or slash where appropriate.

Wildfire/Bushfire Response

EP125 FIRE MANAGEMENT ZONES AND FIRE FREQUENCY

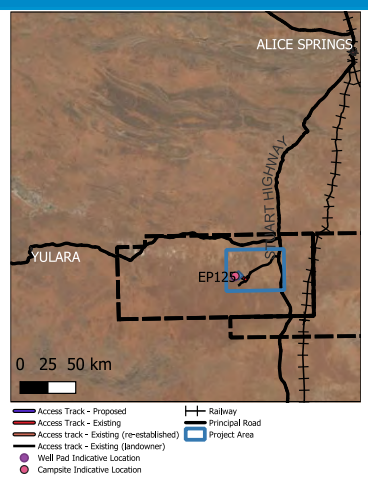


Figure 6—1 Location of Project Area

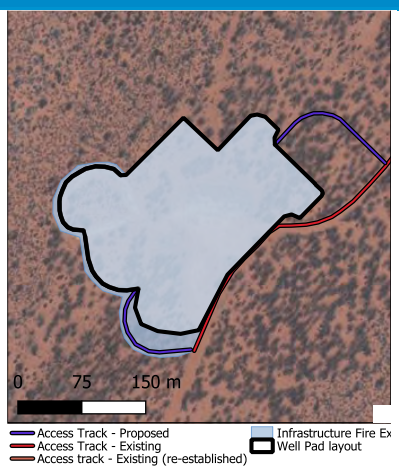


Figure 6—2 Fire Management Zone

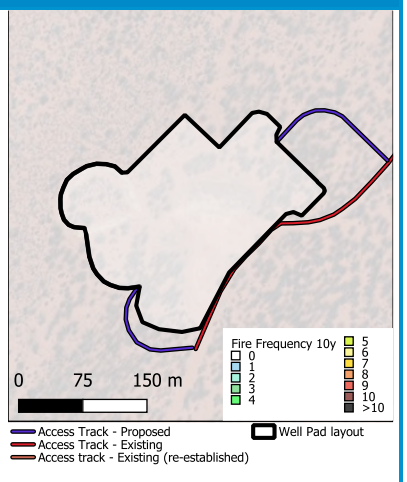


Figure 6—3 Fire Frequency

6.2 Fire Management Plan 1-Pager – Jacko Bore 1D1W Campsite

Santos

BUSHFIRE MANAGEMENT PLAN 2023
EP 125
JACKO BORE 1DW1
Campsite

STAKEHOLDER	CONTACT DETAILS	NAME
Santos Supervisor		
Site Supervisor		
Alice Springs Fire Station	(08) 8951 6688	
EMERGENCY	000 or 112	
Bushfires NT Alice Springs	08 8952 3066 or 0400 761 255 **or** 0440 770 899	
Wildlife Information North Australian Fire Information Secure (NAFI) NT (Fire Bans)	www.firenorth.org.au/ https://securent.gov.au/alerts	
DEPWS	(08) 8999 5511	
Land Managers		
Bushfire NT Head Office	(08) 8922 0844	
National Response Centre	1300 560 647	

FIRE MANAGEMENT OBJECTIVES

Property Land Uses

→ Gas exploration, cattle.

Property Aim

→ Undertake the Activity and its ancillary works with minimal impact on primary user/s.

Fire Management Objectives

→ Protect the campsite and associated infrastructure.
→ Coordinate fire management actions with pastoralists.
→ Prevent human-induced bushfire ignitions that cause loss of life, property, or environmental harm.

Manage fuel loads to reduce the rate of spread and intensity of bushfires while minimising pastoral or environmental/ecological impacts.

PREPAREDNESS PLANNING

Based on the Australian Fire Danger Rating System (AFDRS).

<u>Moderate</u>: Plan and prepare.

→ Stay up to date and be ready to act if there is a fire.

<u>High</u>: Be ready to act.

→ Be alert for fires in your area.
→ Decide what you will do if a fire starts.
→ If a fire starts, your life and property may be at risk.
→ Avoid bushfire risk areas.

<u>Extreme</u>: Act now to protect your life and property.

→ These are dangerous fire conditions.
→ Check your bush fire plan and that your property is ready fire ready.
→ If a fire starts, take immediate action. If you and your property are not prepared to the highest level, go to a safer location well before the fire impacts.
→ Reconsider travel through bushfire risk areas.

<u>Catastrophic</u>: For your survival, leave bushfire risk areas.

→ These are the most dangerous conditions for a fire.
→ Your life may depend on the decisions you make, even before there is a fire.
→ Stay safe by going to a safer location early in the morning or the night before.
Homes cannot withstand fires in these conditions. You may not be able to leave, and help may not be available.

INDICATIVE ANNUAL WORKS CALENDAR

FIRE FIRST RESPONDER ACTIONS

→ Remove yourself and others from potentially dangerous situations.
→ **Raise the alarm** with the Interest Holder's Site Supervisor.
→ **Identify** the following**:**
a. Location
b. Immediate threats
c. Fire characteristics (what is burning, direction and travel speed)
d. Weather – wind strength and direction.

If possible, wait in a **safe** location for directions from the Site Supervisor or the Pastoralist and communicate this fact.

The Interest Holder's Site Supervisor will escalate the emergency as per the Site Emergency Response Plan (**Appendix 13**).

FIRE MANAGEMENT ACTIONS AND MITIGATION MEASURES

Infrastructure Protection Buffer	→ Protect infrastructure by maintaining a ~10-metre bare earth buffer around the campsite.
Infrastructure Fire Exclusion	→ Ensure all vehicles are fitted with fire extinguishers and that all firefighting equipment and water supplies are checked regularly. → Ensure all machinery and vehicles will be parked in areas of low fire risk and be free of any combustible material. → Ensure all staff/contractors are trained in the operation of firefighting equipment and are aware of this plan. → Site Supervisor is to monitor NAFI regularly and liaise with the pastoralist if a fire threatens infrastructure. → Smoking will only be permitted in areas clear of vegetation and there will be no disposal of butts. → An evacuation area/emergency muster point is established and clearly labelled in the event of an emergency.
Fire Access Trails	→ Co-locate fire access tracks with facility access tracks. → Monitor the main access track and contingency track for weeds, and spray, grade, or slash where appropriate.

Wildfire/Bushfire Response

EP125 CAMPSPITE FIRE MANAGEMENT ZONES AND FIRE FREQUENCY

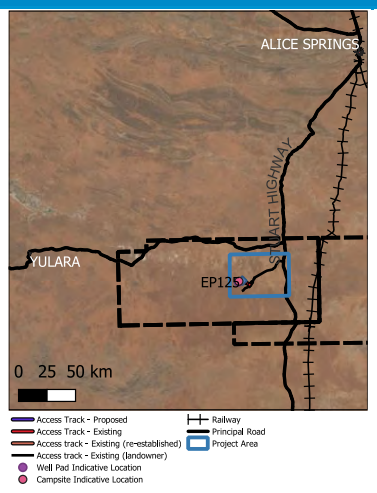


Figure 6—4 Location of Project Area

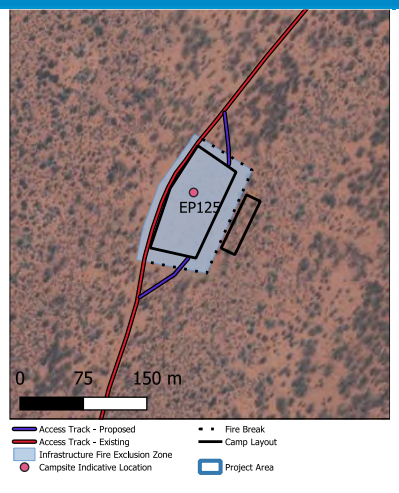


Figure 6—5 Camp Fire Management Zone

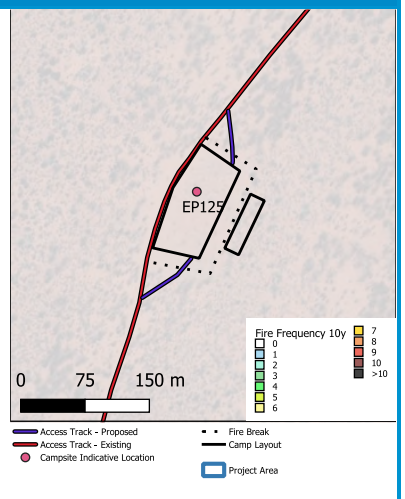


Figure 6—6 Campsite Fire Frequency

7. References

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Weed Management Plan

Appendix 09

Amadeus Basin: Jacko Bore 1DW1 Drill and Test Program

EP125

Santos QNT Pty Ltd

DOCUMENT CONTROL RECORD

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Appendices

Appendix A Weed hygiene declaration
Appendix B Weed control recording template

1 INTRODUCTION

Santos operates Exploration Permit 125 (EP125), which is located approximately 200km south-west of Alice Springs, Northern Territory. Santos proposes to expand the existing Jack Bore (formerly called Mt Kitty) well pad in EP 125 to support the drilling of a helium appraisal well (Jacko Bore 1DW1). The location of the proposed regulated activities are provided in Figure 1-1.

These works will be regulated through an Environmental Management Plan (EMP) approved by the Department of Environment, Parks and Water Security (DEPWS).

This document presents the Weed Management Plan (Weed MP) for the Project.

1.1 Scope and objectives

The scope of this Weed MP is to outline the weed management measures that will be implemented to prevent the introduction and spread of weeds during the works associated with the project.

The objectives of this weed management plan are to:

- Comply with all applicable legislation, regulations, conditions and regional weed management plans.
- Address the specific weed management requirements of station owners.
- Provide controls for all project activities to avoid introducing new weed species into the project area.
- Avoid or control the spread of existing weed species into new areas within the project area.
- Detail the monitoring, reporting and incident response procedures appropriate for the management measures.

The weed management plan is applicable to all activities associated with drilling activities on EP125 and will be used by all personnel (including contractors) involved in project activities.

1.2 Dedicated Weed Officer

The *Scientific Inquiry into Hydraulic Fracturing* recommends a dedicated weed officer for each gas field. To ensure necessary weed management outcomes, the weed officer must have relevant skills and experience and availability to successfully manage weed related issues for the project. Contact details for dedicated Weed Officer for the Project are:

Name, company and position:	Mitch Bird, Santos, Environment Manager
Mobile:	0435 312 291
Email:	mitch.bird@santos.com

1.3 Safety Management System

Santos's Safety Management System is the central system that contains the policies and procedures that they will utilise, in conjunction with this plan, to manage and minimise the impact of its activities and maintain compliance with all relevant environmental, health and safety regulations, legislation and guidelines.

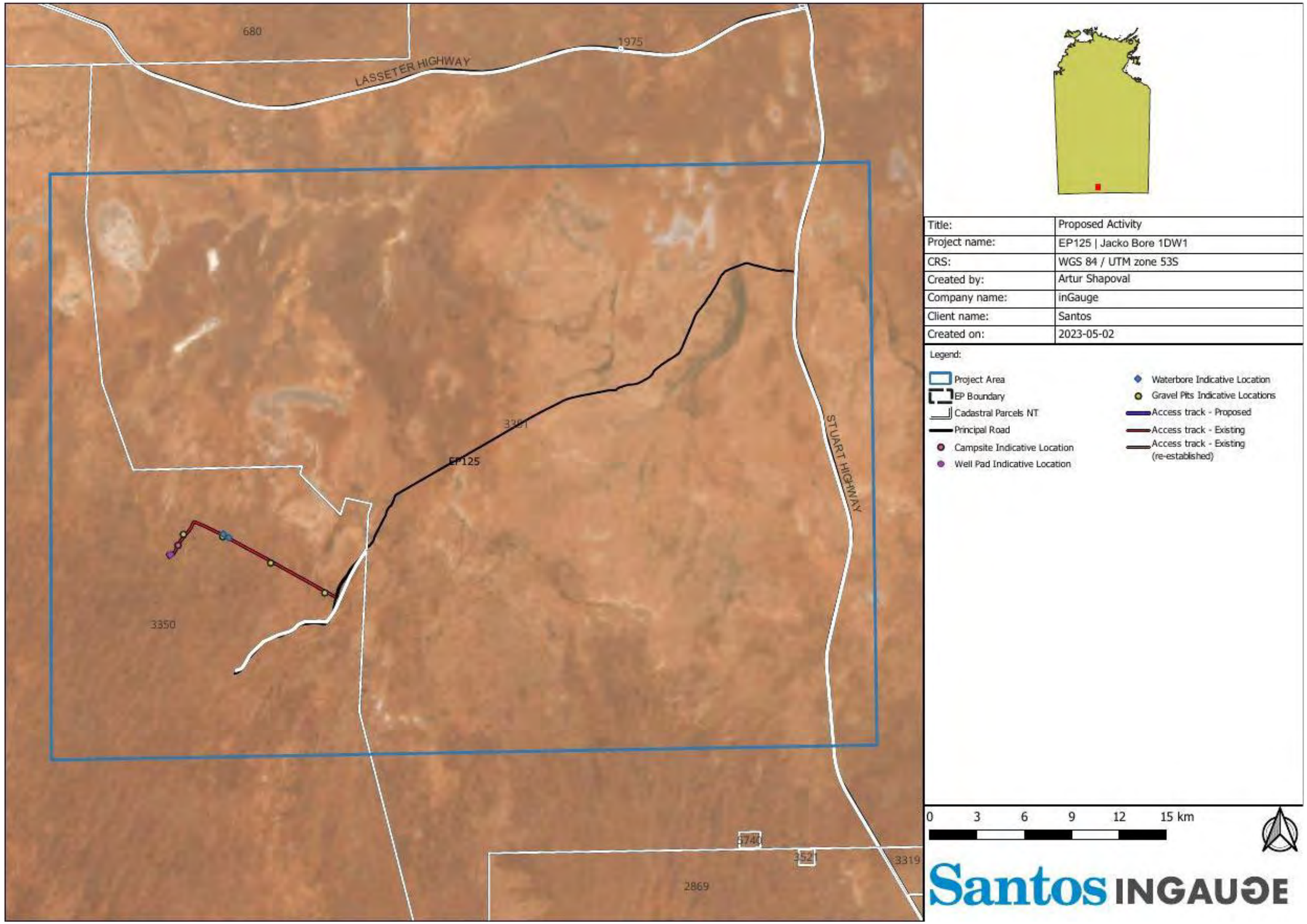


Figure 1-1. Map of Proposed Regulated Activities

2 PROJECT AREA

2.1 Well pad

Santos proposes to drill an appraisal helium well (Jacko Bore 1DW1) on the existing Jack Bore (formerly called Mt Kitty) well pad that requires the well pad to be expanded. The well pad expansion requires the clearing of approximately 5.3 hectares (see

Figure 2-1). The well pad expansion will include:

- Vegetation clearing.
- Grading, excavation, stockpiling, compaction of soil material.
- Upon completion, removal of all surface infrastructure and site rehabilitation
- Re-spreading of any removed vegetation on the well pad following completion of the program, to promote regeneration.

2.2 Camp site

The campsite proposed for use is a pre-existing site next to the well pad (see Figure 2-1) and will not require additional clearing.

2.3 Borrow pits

Santos proposes to obtain gravel/fill for the well pad expansion that will be primarily sourced from the gravel pit at coordinates: latitude -25.4946754, longitude 132.8052621 (see Figure 2-2). The total volume estimated for use is 5000m3.

2.4 Access tracks

The main access track to the well pad is existing. The creation of some small access tracks will be required within the construction buffer (see Figure 2-2) to allow for ease in access to the well pad, campsite and water bores.

General maintenance of tracks and erosion and sediment controls will be completed during the activities.

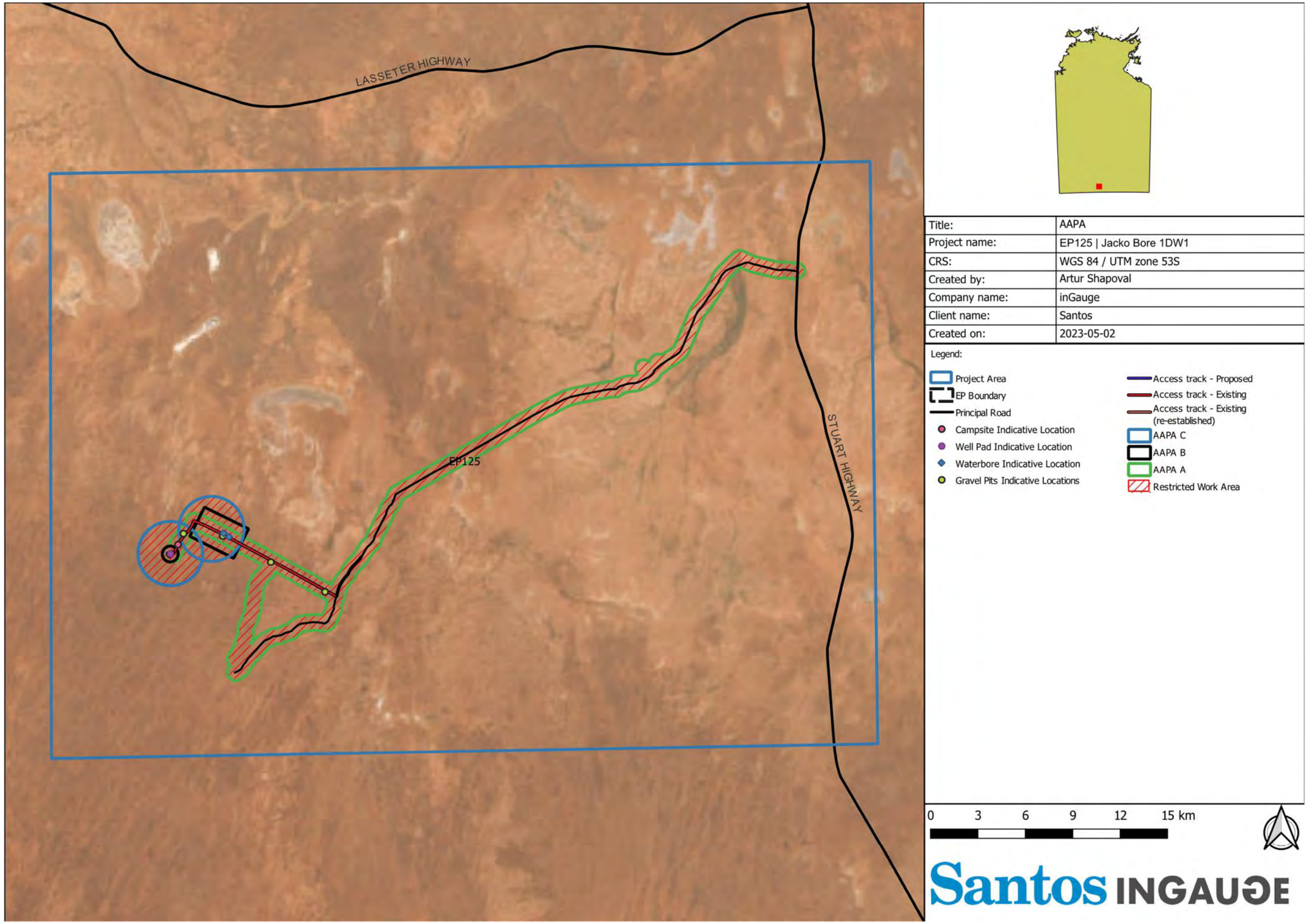


Figure 2-1. Map of Proposed Well Pad and Camp

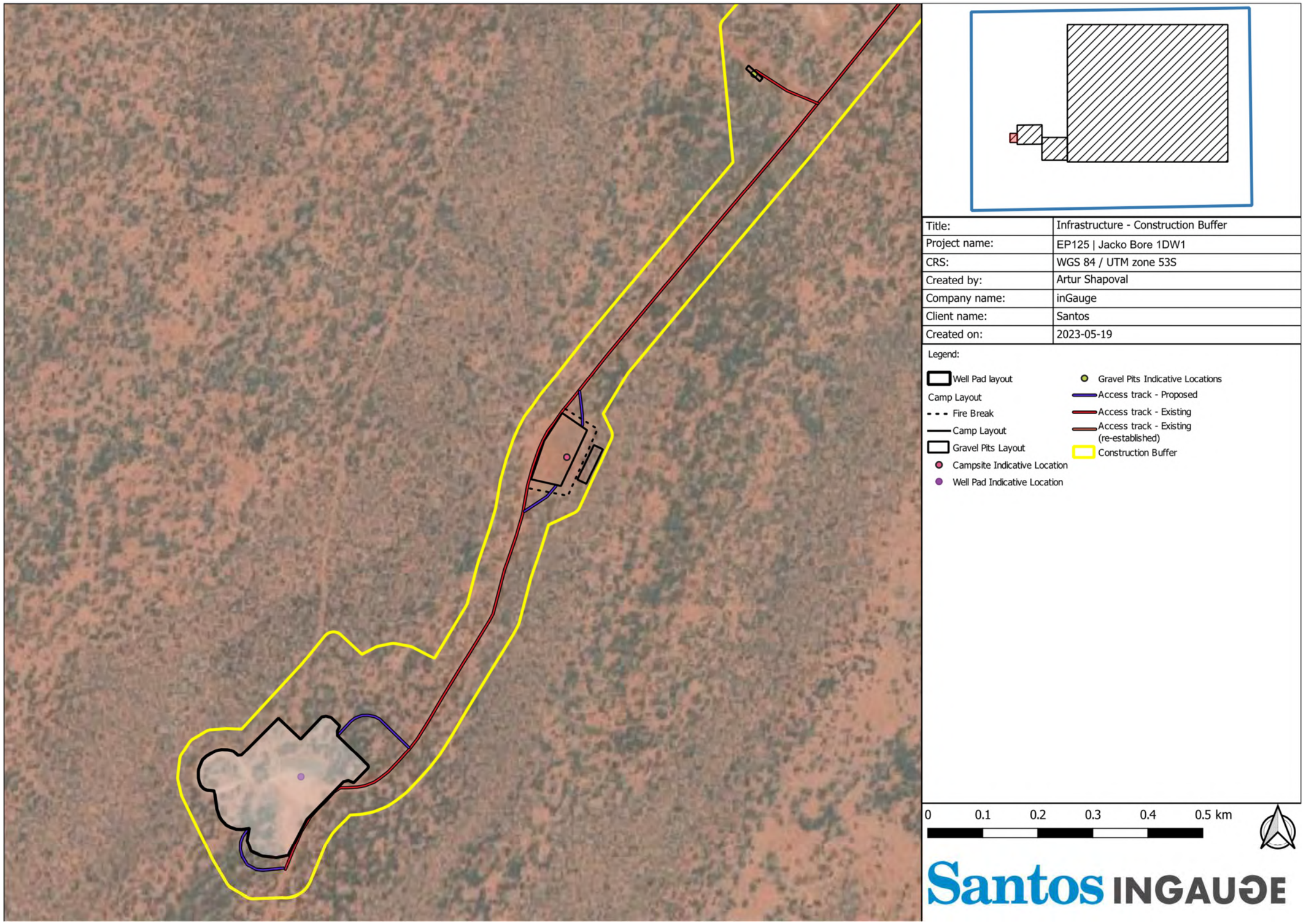


Figure 2-2. Map of Construction Buffer

3 LEGISLATION

The following legislation, statutory obligations and guidelines were considered during the preparation of this weed management plan.

3.1 Petroleum (Environment) Regulations

The Petroleum (Environment) Regulations, (the regulations), require submission of an EMP prior to any petroleum exploration or production activity. This Weed MP represents a component of the Jacko Bore 1DW1 EMP.

3.2 Weed Management Act

Some species of introduced flora are declared to be weeds under the NT *Weeds Management Act* because of the environmental and/or economic harm they can cause. This NT Act aims to:

> *Protect the Territory's economy, community, industry and environment from the adverse impact of weeds*

It declares undesirable species of plants as weeds, and requires these species to be controlled, eradicated or prevented from entering the Northern Territory (NT) depending on their classification. Under the Act, weeds are classified into one of three classes:

- Class A declared plant – to be eradicated
- Class B declared plant – growth and spread to be controlled
- Class C declared plant – not to be introduced into the NT (all Class A and B weeds are also Class C)

The remaining introduced flora species are referred to as *environmental weeds*.

The Act specifies how weeds in each of the classes must be treated.

Weed management plans for specific weeds are endorsed under this Act.

3.3 Weed of National Significance

The Commonwealth government has categorised some species as Weeds of National Significance (WoNS). This is a list of the most problematic plant species in Australia as determined by the federal government.

3.4 Management Plans and guidelines

3.4.1 Statutory Weed Management Plans

These plans are legal documents containing specific information about management requirements for certain high priority weeds. Section 4.1 lists weeds that are present or have the potential for introduction within the Project area and notes those with an associated statutory weed management plan.

3.4.2 Guidelines and standards

The following guidelines associated with the management of weeds in the NT have also been considered during the preparation of this WMP:

- *Northern Territory Weed Management Handbook* (Weed Management Branch, 2015a)
- *Northern Territory Weed Data Collection Manual* (Weed Management Branch, 2015b)

3.4.3 Regional weed strategies

The Northern Territory Government (NTG) has developed four regional weed strategies to cover weed management across the Northern Territory – Darwin region, Katherine region, Tennant Creek region and the Alice Springs region. The strategies set out a strategic approach for the NTG and key stakeholders to reduce the adverse impact of weeds. They have been developed in line with the DEPWS *Strategic Plan 2021-24* and the Australian Weed Strategy 2017-27.

The Project area lies within the *Alice Springs Regional Weeds Strategy 2021-2026* (DEPWS 2021). This strategy focusses on weeds that are most important to the region, categorising them as either:

- *Category 1 – Priority weeds* (present in the region, widely considered feasible to eradicate from the Region, typically evaluated as very high risk and have isolated and restricted distributions)
- *Category 2 – Priority weeds or strategic control – including the eradication of outliers* (species warranting strategic control across the landscape due to the high impact they have on land managers and on broader economic and environmental values)
- *Category 3 – Weeds of concern* (assessed by the weed risk management system as a medium to high risk, or have not been assessed, but have been identified by stakeholders as posing a threat to the values of the Region)
- *Category 4 – Hygiene and biosecurity* weeds (it is important for landholders to implement weed hygiene and other biosecurity measures to prevent the spread of weeds into clean areas, and to control these species where the opportunity arises)
- *Category 5 – Alert weeds* (have the potential to have a high level of impact to the region should it become established, the likelihood of the species naturalising and spreading in the region is perceived to be high).

4 WEED DATA

4.1 Desktop review

A review of the NT Weed Branch dataset (last updated 4 November 2021) indicates that there are weed records within a 100 km radius of the Project. However, there are no weed records within the Project footprint and very few records proximate to the footprint. Species recorded within, or in close proximity to the Project footprint include – *Phoenix dactylifera, Malvastrum americanum, Brassica tournefortii, Eragrostis barrelieri, Tribulus terrestris* and *Acetosa vesicaria*.

- *Tribulus terrestris* (Caltrop) is a Class B species under the *Weeds Management Act 2001* (growth and spread to be prevented) and is listed as a hygiene and biosecurity weed (category 4) in the *Alice Springs Regional Weeds Strategy 2021-2026* (DEPWS 2021). It is now uncertain if this species is native or introduced to the NT. It is currently considered as a weed to be controlled around tracks, parks and other infrastructure because of the spiny fruit (DEPWS 2021).
- *Acetosa vesicaria* (Ruby Dock) and *Eragrostis barrelieri* (African Lovegrass) are listed as weeds of concern (category 3) in the *Alice Springs Regional Weeds Strategy 2021-2026* (DEPWS 2021).

The majority of records in the region of the footprint are associated with drainage systems, alluvial plains and disturbance areas (such as bores/water points, fence lines, tracks).

Declared weeds (as per *Weed Management Act*) and priority weeds (as identified in the *Alice Springs Regional Weeds Strategy 2021-2026*) within the region of the project are listed in Table 4-1.

Distribution maps of priority weeds for eradication in the Alice Springs region are provided in Figure 4-2 (sourced from the *Alice Springs Regional Weeds Strategy 2021-2026*, DEPWS 2021)

The Project footprint occurs within the Bellyache Bush, Brazilian Pepper, Gamba grass and Mimosa Management Zones. These weeds are not known to occur in the region of the Project footprint (and are not part of the regional weed strategy) – and as such are not considered in this Management Plan.

The Project footprint falls within the Class A management zone for Athel Pine (to be eradicated), and occurs to the west of the intensive management area associated with infestations along the Finke River (*Weed Management Plan for Athel Pine 2017-2027* – https://nt.gov.au/__data/assets/pdf_file/0004/407632/athel-pine-management-plan.PDF).

Athel Pine is a large tree species that has established within major rivers and creeks in the Finke River Catchment Area – it is also known to occur on the edges of borrow bits and dams. It has deep, woody root systems and can lower water tables, drain waterholes, deprive native species of water and habitat, change river flow patterns and cause overland flooding and bank erosion (*Weed Management Plan for Athel Pine 2017-2027*). Identification details and photographs of the species are provided in Figure 4-1 (sourced from https://denr.nt.gov.au/__data/assets/pdf_file/0003/407415/Athel-pine-weed-note-2017.pdf).

There are no known records of Athel Pine within or in close vicinity to the project footprint (see Figure 4-2). The majority of Athel Pine records in the area are along Karinga Creek to the north of the Project area, outside of proposed activities.

Table 4-1. Weed records and species relevant to the Project area

Common name	Botanical name	Class	WoNS	Status in management plan
Rope Cactus	*Cylindropuntia spp.* including *C. imbricata, C. fulgida*	A		Category 1, very high
Prickly Pears	*Opuntia spp. including Opuntia stricta*	A		Category 1, very high
Athel Pine	*Tamarix aphylla*	A/B	Yes	Category 2, very high
Parkinsonia	*Parkinsonia aculeata*	B	Yes	Category 2, very high
Buffel Grass	*Cenchrus ciliaris*	Not declared		Category 2, very high
African Lovegrass* (several species)	*Eragrostis spp.* including *E. cilianensis, E. barrelieri, E. cylindriflora, E. minor*	Not declared	No	Class 3, *medium
Mexican Poppy	*Argemone ochroleuca*	B	No	Class 3, medium
Kapok	*Aerva javanica*	Not declared	No	Class 3, N/A
Ruby Dock	*Acetosa vesicaria*	Not declared	No	Class 3, low
Saffron Thistle	*Carthamus lanatus*	B	No	Class 3, medium
Mossman River Grass	*Cenchrus echinatus*	B	No	Category 4, medium
#Caltrop	#*Tribulus terrestris*	B		Category 4, low

*Only *Eragrostis cylindriflora* has been assessed for weed risk.
#It is uncertain whether caltrop (*Tribulus terrestris*) is considered native or introduced to the Northern Territory. It is a weed to be controlled around tracks, parks and other infrastructure because their spiny fruit can cause nuisance.

Sourced from https://denr.nt.gov.au/__data/assets/pdf_file/0003/407415/Athel-pine-weed-note-2017.pdf

Figure 4-1. Athel Pine identification factsheet

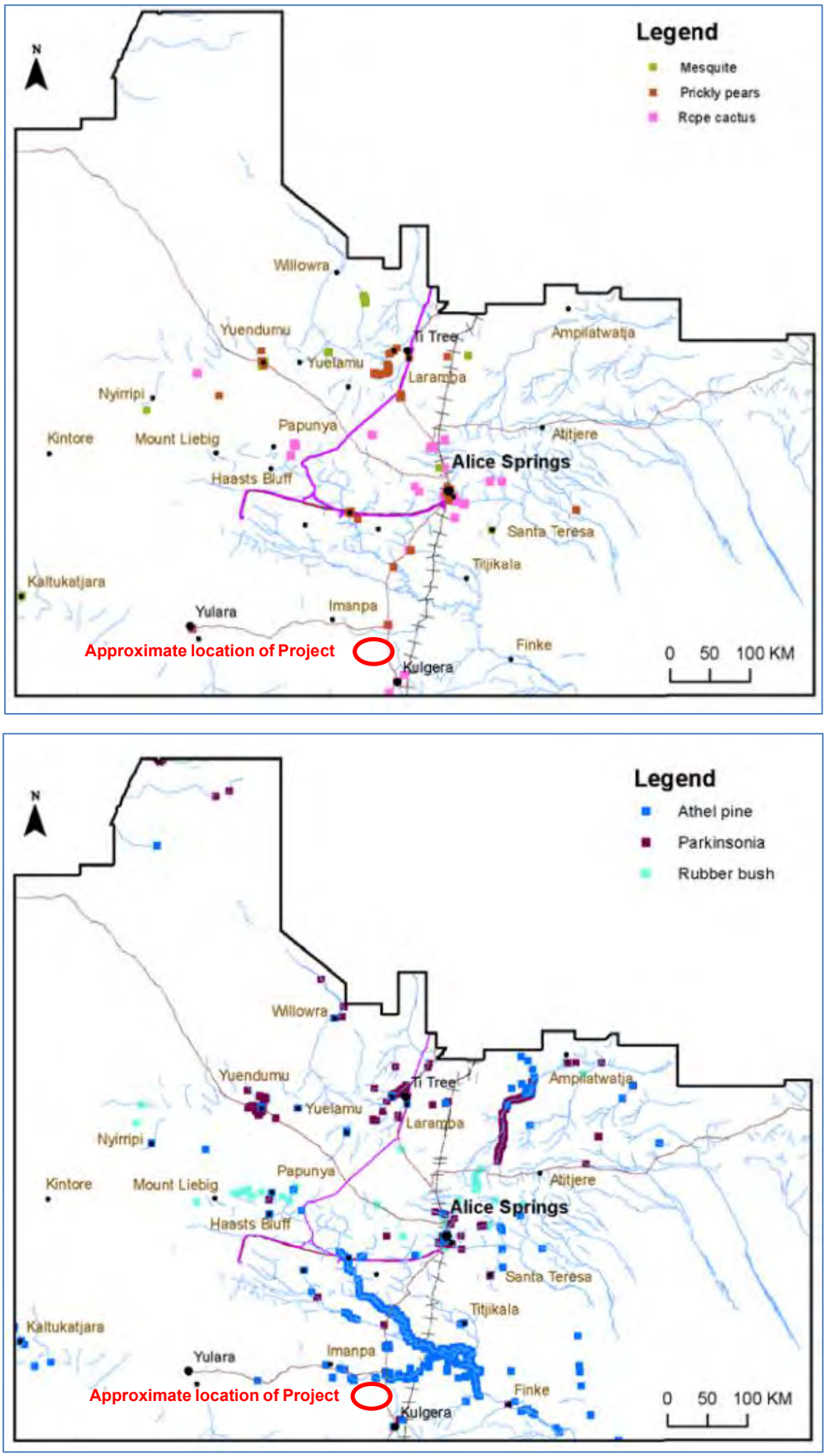


Figure 4-2. Map of priority weeds for strategic control in the Alice Springs Region (DEPWS 2021)

4.2 Baseline weed survey

A weed survey of the Project was undertaken by GHD in 2022. This involved a ground survey of the proposed Project components – including well pad, access road (existing station track), borrow pits and other footprint areas (survey tracks shown on Figure 4-3).

Two weed species were recorded within the well pad at very low densities (i.e. present as isolated plants) – Buffel Grass (*Cenchrus ciliaris*) and Bitter Paddy Melon (*Citrullus colocynthis*). Both species do not require management under the NT *Weed Management Act* (i.e. they are not declared species) and are considered as environmental weeds under the WM Act. However, Buffel Grass is a Category 2 species in the *Alice Springs Regional Weeds Strategy 2021-2026* (DEPWS 2021), which means that the species warrants strategic control across the landscape due to the high impact they have on land managers and on broader economic and environmental values.

Athel Pine was not observed within or in close vicinity to the Project footprint.

No weeds were observed in other project components.

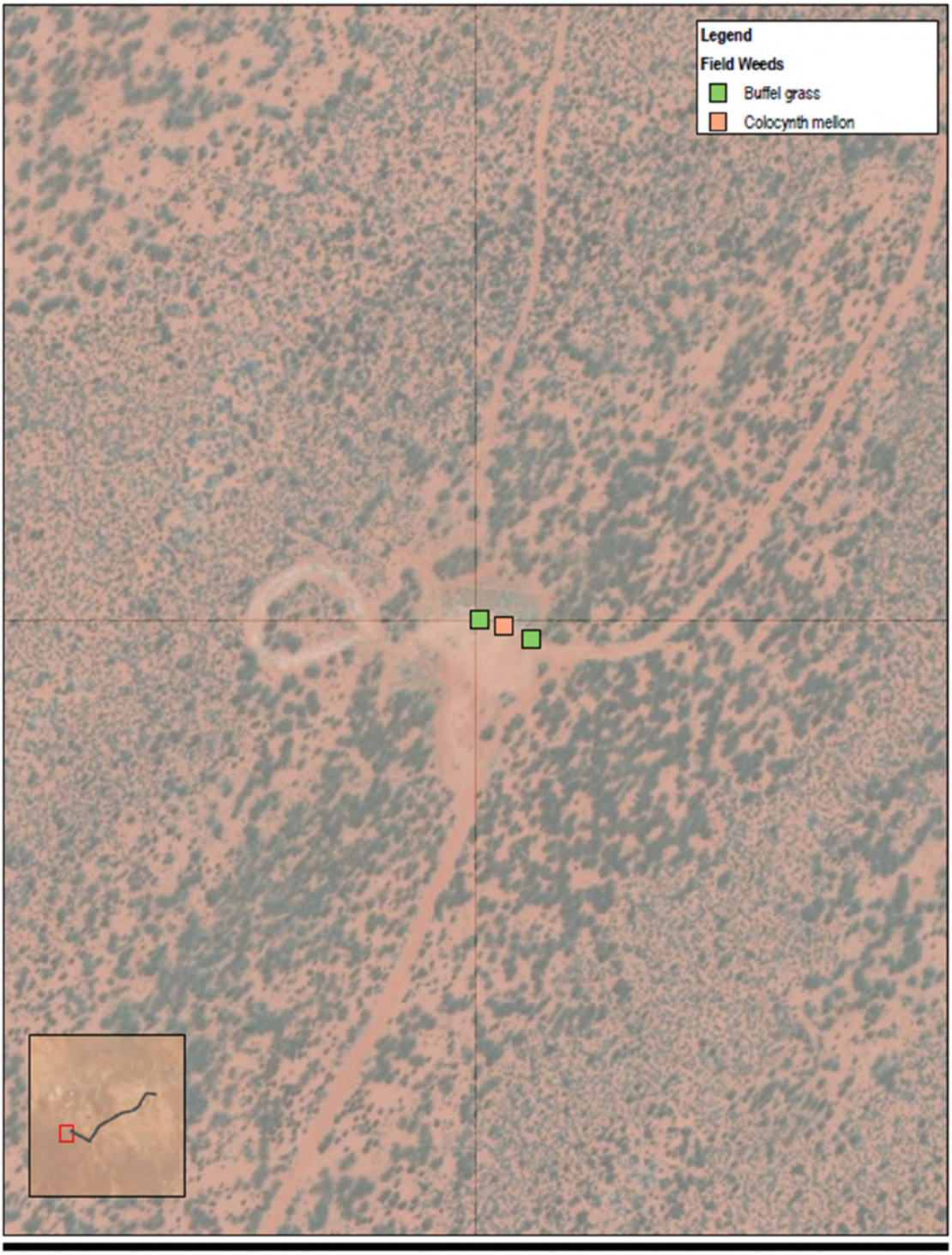


Figure 4-3. Map of baseline weed survey effort and results (extract from GHD ecological assessment)

5 WEED RISK MITIGATION MEASURES

The EMP risk assessment process identified weed introduction and/or spread risks associated with the scope of this Project. Table 5-1 documents these risks, as well as the mitigation measures that will be implemented to reduce this risk.

Table 5-1. Weed risk and mitigation measures

Weed risk	Mitigation measures	Measurement criteria	Responsible person
Introduction of new weed species	All vehicles/machinery/equipment entering from Stuart Highway to be cleaned and free of soil and vegetative matter, and have a valid weed hygiene declaration prior to entering.	A register of vehicle / equipment / machinery inspection will be kept and maintained.	Dedicated Weed Officer
	Site environmental inductions for all personnel and contractors to include vehicle weed hygiene requirements	All project staff undertake an environmental induction, recorded in the Training Register	Dedicated Weed Officer
	Spot checks on vehicle / equipment / machinery to ensure inspections are completed correctly	Recorded in register of vehicle / equipment / machinery inspection	Dedicated Weed Officer
Weed spread resulting from vehicles/plant traversing existing weed infestations	All personnel and contractors made aware of existing infestation locations and educated in the identification of priority weeds in the region.	All project staff undertake an environmental induction, to be recorded in the Training Register (as described in EMP) Weed maps (of known occurrences / infestations) and factsheets included as part of environmental induction	Dedicated Weed Officer
	Key operational staff to attend weed identification training delivered by the NT Weed Management Branch	To be recorded in the Training Register (as described in EMP)	Dedicated Weed Officer
	All vehicles, machinery and equipment to stay on formed access tracks, except for those involved in clearing	Importance of staying on tracks covered in site induction.	Dedicated Weed Officer
	Pre-clearance weed survey of areas to be cleared	Map all infestation so plan can be made to avoid spread.	Dedicated Weed Officer
	All infestations of priority weeds along the access track or near the well pad, campsite, gravel pits, water bores or along the access track will be demarcated and avoided, where possible.	Maintain demarcation during drilling to the end of EPT operations and inspect (and rectify if needed) weekly	Field Representative
	If infestations cannot be avoided, treat prior to traversing using methods set out in Section 6; or carry out washdown protocols at allocated area.	Work plan to reflect additional tasks required	Dedicated Weed Officer
	Avoid clearing and vehicle movements within creek (drainage) channels to minimise the chance of weed spread (or weed introduction) along channels.	No vegetation clearing creek channels. Vehicle movements will be limited to existing tracks (and vehicles will be subject to weed hygiene measures when transiting on tracks).	Dedicated Weed Officer

Weed risk	Mitigation measures	Measurement criteria	Responsible person
	Vehicles/plant to be cleaned and free of soil and vegetative matter prior to moving beyond all weed infestations / occurrences.	Spot checks on vehicle / equipment / machinery to ensure inspections are completed correctly.	Field Representative / Dedicated Weed Officer

6 ANNUAL ACTION PLAN

The annual action plan in Table 6-1 details the survey and control activities for weeds recorded within the Project area. At this stage, the only weeds identified within the footprint are Buffel Grass (*Cenchrus ciliaris*) and Bitter Paddy Melon (*Citrullus colocynthis*), both observed at drill pad at low densities. No specific controls/actions have been proposed for these weeds because of low density and that these species are not declared under the WMA. However, Santos are committed to not spreading these weeds within and outside the Project footprint, therefore weed monitoring post disturbance (after suitable rainfall to allow germination/growth) is proposed to detect and map the extent of any infestations so that controls can be applied – see proposed control for Buffel Grass in Table 6-1.

Athel Pine was not observed within or in close vicinity to the Project footprint; so management of existing infestations of Athel Pine is not required. However, it is a species of concern for the region and as such, works will be conducted to ensure species is not introduced to the project area by implementation of strict weed hygiene measures. It is known that Athel Pine can spread via vegetative growth under good conditions (i.e. fragments of the plant can develop roots if partly buried or deposited in wet soil), so works will ensure that machinery entering the project area has not come into contact with Athel Pine prior to entering the project area.

If monitoring or inspections detected declared or priority weed species within the Project footprint, these species will be managed as per advice from suitably qualified person, and control methods will be implemented where necessary as per the NTWeed Management Handbook 2021.

The action plan will be revised after each monitoring event to ensure that all weed species recorded within the project footprint are suitable treated / controlled.

Table 6-1. Annual action plan

Weed Management Area	Weed species	Management objective	Survey / monitoring time/s	Treatment time/s	Control method/s	Herbicide
Well pad (and all areas where observed within footprint)	Buffel Grass (*Cenchrus ciliaris*)	Prevent spread	Annual survey post wet season.	Treatment will only occur when plants are in growth phase	Consider: Herbicide treatment when grass is green. Herbicide recommended: Glyphosate 360g/L at a rate of 1.5L / 100L. Foliar spray to be applied when actively growing seedlings or adults. Preferably treat prior to seeding. In accordance with the NT Weed	

Weed Management Area	Weed species	Management objective	Survey / monitoring time/s	Treatment time/s	Control method/s	Herbicide
					Management Handbook 2021.	
Disturbed footprint.	Declared and priority weeds	Prevent the introduction of declared and priority weeds	Annual survey post wet season. All vehicles to comply with weed hygiene monitoring requirements prior to entering site.	Immediately if declared and priority weeds are found	In accordance with the *NT Weed Management Handbook 2021.*	

7 WEED MONITORING

The requirements for weed monitoring within each component of the Project are outlined below.

During drilling activities, monitoring for weed incursions will be ongoing (as part of weekly site inspections), as all operational staff will have a responsibility to report new weed incursions to the Project's Dedicated Weed Officer. Should new weed incursions be identified, appropriate controls will be undertaken, and follow-up surveys will be within three months (or as per advice from weed officer) to ensure effective eradication of the incursions.

Weed monitoring will be undertaken by a suitably qualified person, with experience in the detection and identification of weed species known to occur in the region.

Weed inspections and monitoring will focus on all Project components associated with the drilling activities, including the following areas:

- Known weed locations/infestations
- Access track(s)
- Well pad (and associated infrastructure)
- Camp site
- Borrow pits

A weed survey will occur on an annual basis (most likely in conjunction with rehabilitation monitoring), and will occur March to June to coincide with the end of summer rainfall period (noting that rainfall is highly unpredictable in this region).

7.1 Recording

All weed monitoring and survey activities will be recorded in accordance with *the NT Weed Data Collection Guidelines* available at: https://nt.gov.au/environment/weeds/weed-mapping-and-data-sharing.

The following attributes of any new weed infestations will be recorded into a GPS-enabled device:

- Site ID
- Weed name
- ID confidence
- Date of record
- Coordinate information
- Recorder / organisation
- Infestation size (i.e. 5m2, 20m2, 50m2, 100m2)
- Infestation density:
    - 1 = Absent, no weeds of this species in the area
    - 2 = < 1%; very few, not many weeds
    - 3 = 1 – 10%; more than one or two isolate plants
    - 4 = 11 – 50%; Many plants, covering up to half the area
    - 5 = > 50%; Weed forms the dominant cover

Weed data will be submitted as an Excel spreadsheet to the Weeds Management Branch (refer Appendix B for an example template).

7.2 Reporting

The Project's Dedicated Weed Officer will submit the annual weed monitoring survey as a component of the EMP environmental reporting requirements. This will include:

- Submission of weed data collected
- Details of survey and monitoring events, including dates, personnel, maps and track data
- An overview of declared weed control events (as applicable)

This annual survey will be submitted to the NT Government's Onshore petroleum weed management officer.

7.3 Notification procedure

Any new declared and/or priority weed incursions will be reported to the NT Weed Management Branch by the Project's dedicated weed officer. Initial notification will be verbal, followed by written notification of preliminary species identification and location within seven working days.

8 REFERENCES

Department of Environment, Parks and Water Security (DEPWS) (2021). *Alice Springs Regional Weeds Strategy 2021-2026*. https://depws.nt.gov.au/__data/assets/pdf_file/0003/291513/alice-springs-regional-weed-mgt-plan-2021-2026.pdf

Weed Management Branch (2015a) Northern Territory Weed Management Handbook, Department of Land Resource Management, Northern Territory Government, Darwin

Weed Management Branch (2015b). Northern Territory Weed Data Collection Manual, Department of Land Resource Management, Northern Territory Government, Darwin

APPENDIX A WEED HYGIENE DECLARATION

Weed Hygiene Declaration

This declaration is valid for transport and movement of vehicles and equipment from _____ to _____ (provide locations) and will stay current pursuant to the definition of clean in Definitions.

VEHICLE DESCRIPTION

Make: _____ Registration # or engine number: _____

Was clean prior to entry to _____ (destination)

Add equipment examined to the Equipment Register

Certifier name _____

Certifier qualification _____ Qualification date _____

DECLARATION

I, _____ (name),of _____ (street)

_____ town _____ state _____ telephone

declare the information I provided in this declaration is true and correct and I have read the accompanying explanatory notes before completion of this declaration.

Signature _____ Date _____

EXPLANATORY NOTES

This certification process was developed to fulfill one of the stated purposes of the NT *Weed Management Act* and the Qld Land Protection *(Pest and Stock Route Management) Act 2002*.

It applies to, as a minimum, all weeds listed as weeds in the relevant jurisdiction and any plants that a stakeholder does not want transported or introduced.

DEFINITIONS

Clean:

- Means that no soil or organic matter is present on vehicles or equipment
- Vehicles and equipment are considered clean if, after certified weed free, it does not touch soil or vegetative material, ie for a vehicle this means it travels on sealed or well-maintained unsealed roads.

Equipment means anything other than a vehicle.

Vehicle includes anything used for carrying a thing or person by land, water or air.

Weed reproductive material means any part of a plant that is capable of producing another plant by sexual or asexual means. This includes seeds, bulbs, rhizomes, tuber, stem, leaf cuttings or a whole plant.

Well-maintained unsealed road means roads that do not have vegetation growing on or encroaching onto the area occupied by traffic.

Checklist-Cars, 4WD, trucks and trailer

Vehicle Rego Number	Date of inspection

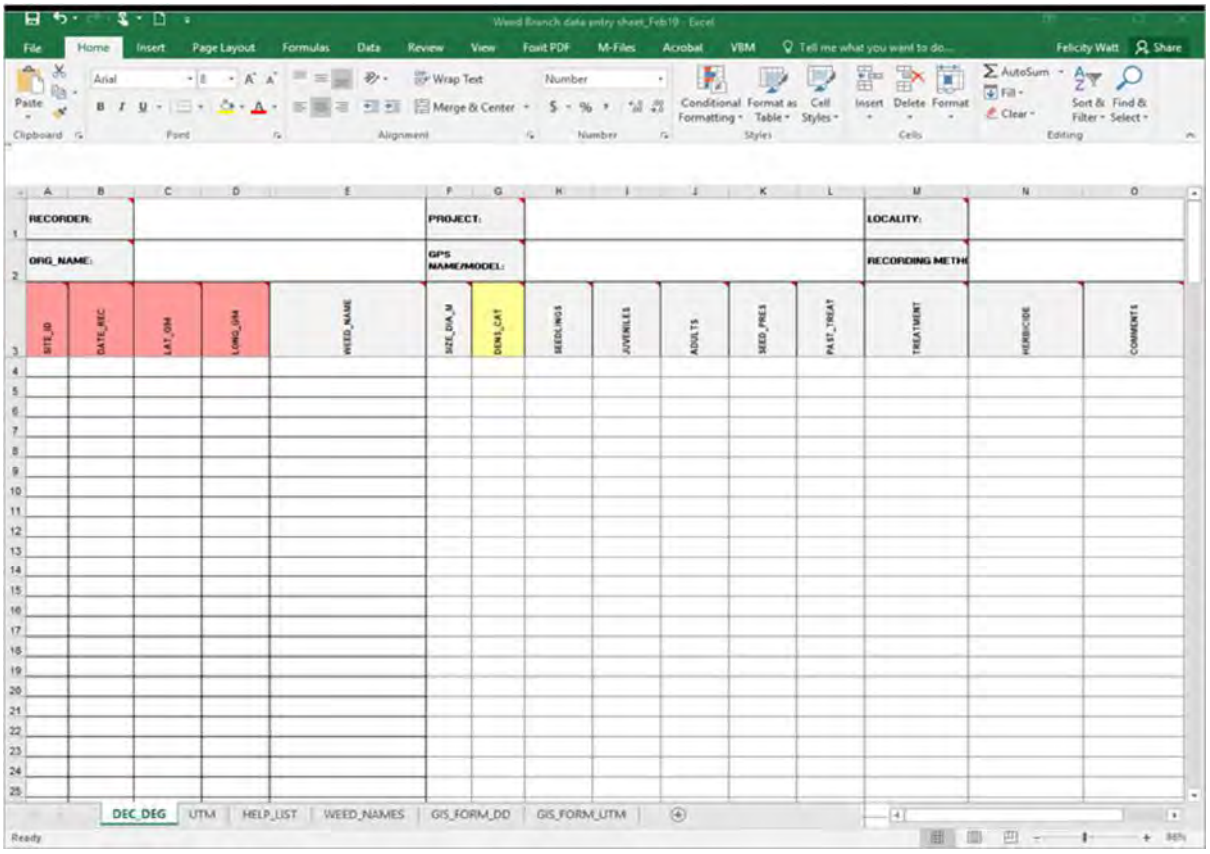
INTERIOR	**Pass** ☐	**Fail** ☐
• Inspect foot wells • Inspect under mats and carpet as well as the pile of carpet		
BOOT OR TRAY	**Pass** ☐	**Fail** ☐
• Inspect under mats or carpet • Inspect inside spare tyre area/behind spare tyre • Inspect other recesses in the boot/rear of the vehicle • Inspect recess of boot lid		
ENGINE BAY	**Pass** ☐	**Fail** ☐
Inspect all areas of the engine bay with a particular focus on areas listed below • Inspect the radiator • Inspect the grill • Inspect the top of transmission gearbox • Inspect the recess under windscreen wipers • Inspect air filter box		
UNDERSIDE OF VEHICLE	**Pass** ☐	**Fail** ☐
• Inspect the wheel arches, wheel trims, flares, step treads, bumpers • Inspect the mud flaps • Inspect the tyre rims (particularly the rear side) • Inspect the top of axels and differentials • Inspect the top of muffler and surrounds • Inspect the spare tyres on 4WDs and station wagons (they are often suspended underneath). Remove to check • Inspect top side of any bash plates **Note:** these are potentially a high risk area as contaminants collect inside the horizontal positioned rim of the spare tyre.		
CARGO	**Pass** ☐	**Fail** ☐
• Inspect all equipment, list in the equipment register below		
FOR UTILITIES AND TRUCKS	**Pass** ☐	**Fail** ☐
• Inspect the floor of the tray. Inspect channels of tail gates and tray drop sides • Inspect side guards. • Inspect under chassis rails, including within steel sections • Inspect the gaps in the floor welds or boards and bolt holes on tray.		
TRAILERS	**Pass** ☐	**Fail** ☐
• Inspect wheels • Inspect guards and trays • Inspect channels and draw bar • Inspect underbody		

Checklist-Cars, 4WD, trucks and trailer

Vehicle Rego Number	Date of inspection

EQUIPMENT REGISTER

APPENDIX B WEED CONTROL RECORDING TEMPLATE



Methane Emissions Management Plan

Appendix 10

Amadeus Basin: Jacko Bore 1DW1 Drill and Test Program

EP125

Santos QNT Pty Ltd

Date	Rev	Description	Initiated	Reviewed	Approved
14/02/2023	1	Approved for Use	KR, VC, TS, NF	RA, LD	MD
16/06/2023	2	Approved for Use	TS	LD	MD
15/12/2023	3	Approved for Use for STO5-5			RD

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1. Background

Santos QNT Pty Ltd (the Interest Holder) proposes an appraisal program in the Amadeus Basin from 2023 onwards. This Methane Emissions Management Plan (MEMP) supports this Environmental Management Plan (**EMP**) and its revisions.

Under the *Petroleum (Environment) Regulations* (PER), interest holders in petroleum titles must prepare and submit an EMP. The approval of an EMP is necessary for an Activity that has an environmental impact or risk and is one of several approvals required for the Activity to proceed. An approved EMP is a statutory document that is enforceable.

The Code of Practice for Petroleum Activities in the Northern Territory (the Code) sets out the mandatory requirements for management plans for methane emission monitoring, leak management, detection, and reporting. *The Code* states that an EMP for a petroleum activity must include a Methane Emissions Management Plan.

2. Scope

This MEMP covers the works, risks, controls, monitoring and reporting of methane emissions associated with drilling, completions, well testing and ongoing operations associated with the EMP and its revisions.

3. Purpose

Following *the Code*, this MEMP has been designed to outline the measures taken by the Interest Holder to manage the methane emissions risks associated with the exploration works. This MEMP aims to reduce emissions to a level that is As Low As Reasonably Practicable (ALARP) and acceptable via emissions detection and management. The active monitoring and management described in this MEMP are to reduce fugitive methane emissions from petroleum works.

4. Principles

This MEMP aims to reduce emissions to ALARP via emissions detection and management. The Interest Holder aims to reduce fugitive methane emissions from the Activity through active monitoring and management.

5. Activity Description

All associated works, including drilling, well testing, and the ongoing operation of the appraisal well, will be conducted as per the requirements of *the Code*. A description of the Activity is described in **Table 5—1** below. The Activity under this **EMP** does not include any production, compression, or transportation of hydrocarbons by flowline.

Table 5—1 Activity and Emissions Description Summary

Activity	Emission Description	Controls	Emission Monitoring and Frequency
Drilling and Completions	• Methane is expected to be encountered; emissions are expected to be small (<1 tonne) and restricted to outgassing of hydrocarbon from intersecting geological formations brought to the surface.	• While drilling, the well is kept overbalanced to prevent gas influx from geological formations migrating into the wellbore.	• Due to low emission levels, gas is qualitatively monitored in mud streams as a concentration (not flow rate).
Extended Production Test (EPT)	• The completed well is unloaded to allow hydrocarbons and fluid to flow to the surface. • All fluids and hydrocarbons will be diverted to a separator and, in turn, to a flare system, releasing a small amount into the atmosphere from produced fluid. Flaring will be used rather than venting; venting will only be used where flaring is not feasible. • Small volumes (kg/day) of methane are entrained within the produced fluid and are unable to be diverted to the flare. These volumes will be released into the atmosphere. • Small emissions (<1 tonne) of methane may be released before the onset of flaring, as the hydrocarbon production rate may not be enough to sustain an initial flare.	• Wellheads are designed per *the Code* and API standards to minimise loss of methane containment. • Gas is sent to a flare during well testing to abate methane emissions. Venting will be avoided. • Calibrated Personal Gas Detectors (PGD) will be used during all operational visits.	• Operational personnel will carry and monitor calibrated PGDs during visits to the well site. • Emission monitoring will be ongoing during well testing.
Ongoing Well Operations Suspension	• Methane emissions are restricted to unplanned leaks from wellheads, which may include surface casing venting.	• Operation staff will carry PGDs during visits to well sites. • Routine wellhead maintenance, as per the Interest Holder's standards, will be carried out. • The well and the equipment on the well pad will be inspected for leaks in accordance with the *Code.*	• PGDs will be used during well-testing works. • Leak detection tests will be conducted until well abandonment in accordance with the *Code*.

6. Risk Assessment

An assessment of the environmental risks and impacts posed by the Activity under the **EMP**, and its revisions has been carried out. This risk assessment includes an assessment of the risks posed by leaks.

Appendix 04 presents the environmental risks associated with the regulated Activity. As demonstrated in the risk assessment, the risk assessment controls, and the by adhering to the standards listed in Error! Reference source not found., emissions will be reduced to ALARP and acceptable.

7. Equipment Selection

The uncontrolled emissions of natural gas during drilling and well-testing works represent potential environmental hazards. All equipment will be selected to minimise the emissions during the works and have the requirements shown below in **Table 7—1.**

Table 7—1 ISO/API Standards for Material Selection

Component	Applicable Standards
Casing	• ISO 11960: Steel pipes for use as casing or tubing for wells.
Couplings	• ISO 13679: Procedures for testing casing and tubing connections.
Cement and Additives	• American Petroleum Institute Recommended Practice (API RP), 10B-2 Recommended Practice for Testing Well Cements.
Drilling Fluids	• ISO 10414-1: Recommended Practice for the Field-Testing Water-Based Drilling Fluids. • American Petroleum Institute (API) 13B-1 and 13B-2 Recommended Practices.
Well Control Equipment	• API STD 53: Blow-Out Prevention Equipment Systems for Drilling Wells. • API 16A (ISO 13533): Specification for Drill-through Equipment. • API 16D: Specification for Control Systems for Drilling Well Control Equipment and Control Systems for Diverter Equipment.
Wellheads	• API 6A: Specification for Wellhead and Christmas Tree Equipment. • ISO 10423: Petroleum and Natural Gas Industries – Drilling and Production Equipment – Wellhead and Christmas Tree Equipment.

Leak detection equipment will be consistent with *the Code*, including standard leak detection instruments (section D.5.3 of *the Code*). Ongoing well maintenance will be conducted following the Well Operations Management Plan (WOMP).

8. Monitoring Methodology and Monitoring Frequency

Mandatory inspections will be completed on all surface infrastructure (vents, flanges, valves, connections, drains, pressure relief vents, etc.) of the appraisal well following sections D.5.3 (*Standard Leak Detection Instruments*), D.5.2 (*Inspection Frequency and Procedure*), and D.5.5 (Leak Classification) of *the Code*.

8.1 Monitoring Method

Routine inspections will be carried out to detect potential fugitive methane emissions derived from project works to mitigate them as soon as practicable.

Leak testing will be undertaken in accordance with *the Code*. These types of inspections require access to the equipment's surface and are effective at pinpointing leaks. All gas leak surveys will be conducted by properly trained and competent personnel using appropriate gas detection instruments, which are calibrated and maintained following the Original Equipment Manufacturer's requirements.

8.2 Inspection and Monitoring Frequency

Personnel conducting inspections will carry PGD during inspections and be trained and competency assured to ensure suitably qualified. Inspections will be carried out at the well sites as per **Table 7—2** Monitoring Program of the EMP.

8.3 Leak Classification, Repair, and Notification

Each leak will be classified, repaired, and reported in accordance with *the Code*.

8.4 Remediation Work and Leak Response

Remediation works will only commence after a risk assessment has been undertaken. The risk assessment will consider the required Personal Protective Equipment (PPE) and the Emergency Response/Contingency Plan (**Appendix 13**) (Section D.5.6.2 (d) of *the Code)*.

Table 8—1 outlines the relevant leak response in relation to the leak location.

Table 8—1 Leak Response According to Location

Leak Location	Response
Well Equipment	• Wherever possible, higher-order controls, such as containment by repair, will be implemented. (Section D.5.6.2 (d) ii of *the Code*).
Well Casings (or adjacent to well casings)	• Repairs will be completed as soon as reasonably practicable. • The following points will be considered when responding to a leak: o Well location.

	o Personnel and public safety. o Potential environmental harm. o Likelihood of well access by the public or landholders. o Landholder/community leak-related concerns.

9. Reporting

9.1 Leaking Report

A written closeout report will be submitted in accordance with *the Code*.

9.2 Greenhouse Gas Emissions Estimates

Emissions from exploration, well construction, and workovers will be measured. These emissions will be measured using methods consistent with the *National Greenhouse and Energy Reporting (Measurement) Determination 2008* [AUSTRALIAN GOVERNMENT, 2008].

The Interest Holder's reporting will be in accordance with sections D.5.6. *Leak Remediation and Notification* and D.5.9 *Venting and Flaring* of *the Code*.

The Interest Holder will estimate and report all greenhouse gas emissions as per the requirements of the *Australian Government's Clean Energy Regulator* and the *National Greenhouse Energy Reporting Act* as required [AUSTRALIAN GOVERNMENT, 2007].

If the Interest Holder's operations are below the reporting threshold specified by the *Commonwealth National Greenhouse and Energy Reporting Act* (2007), scope 1 emissions will still be reported for the approved regulated Activity in this **EMP** to the Northern Territory Government under *the Code* [AUSTRALIAN GOVERNMENT, 2007].

9.3 Annual Reporting

An annual report will be provided to the Northern Territory Government including:

- The results of leak detection surveys outlining the following:
  - The extent of compliance with the leak management plan.
  - A summary of monitoring undertaken during the period.
  - A summary of minor and significant leaks identified during the reporting period, including:
    - The date of identification.
    - Repair for each leak and those leaks that could not be repaired.

An explanation as to why any component could not be repaired and what actions will be taken to either decommission the component or otherwise remedy the problem.

10. References

DEPWS, & DITT. (2019). *Code of Practice: Onshore Petroleum Activities in the Northern Territory*. Parks and Water Security Department of Environment Department of Environment, Parks and Water Security Retrieved from **https://depws.nt.gov.au/__data/assets/pdf_file/0011/705890/code-of-practice-onshore-petroleum-activity-nt.pdf**

US EPA. (2017). *Method 21 - Determination of Voliatile Organic Compound Leaks* United States Environmental Protection Agency. Method 21. Retrieved from **https://www.epa.gov/sites/default/files/2017-08/documents/method_21.pdf**

Changes to standard: **https://www.ecfr.gov/current/title-40**

Australian Government. (2007). *National Greenhouse and Energy Reporting Act 2007*. (Act No. 13, 2021. Compilation No. 21).Office of Parliamentary Counsel Canberra Retrieved from **http://classic.austlii.edu.au/au/legis/cth/consol_act/ngaera2007403/**

Australian Government. (2008). *National Greenhouse and Energy Reporting (Measurement) Determination 2008* Retrieved from **https://www.legislation.gov.au/Details/F2017C00508**

NT Government. (2016). *Petroleum (Environment) Regulations 2016*. Northern Territory Government: Northern Territory Government. Retrieved from **https://legislation.nt.gov.au/en/Legislation/PETROLEUM-ENVIRONMENT-REGULATIONS-2016**

Stakeholder Engagement Log

Appendix 11

Amadeus Basin: Jacko Bore 1DW1 Drill and Test Program

EP125

Santos QNT Pty Ltd

Date	Rev	Description	Initiated	Reviewed	Approved
13/02/2023	1	Approved for Use	KR, VC	AR, MM, LD, JH	MD
16/06/2023	2	Approved for Use	TS, VC	AR, MM, JH	MD
15/12/2023	3	Approved for Use for STO5-5	TS, VS	NF	RD

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1. Overview

This appendix contains a log of communications with Stakeholders, in relation to EP 125, to the date of submission.

Table 1—1 provides an overview of the stakeholders as per Schedule 1 clg(1)(a) of the *Petroleum (Environment) Regulations* [NT Government, 2016].

Table 1—1 Contact Details of Stakeholders Directly Impacted by the Proposed Activity

Stakeholder	Role / Position	Phone Number	Email / Other Contact
Pastoralists / Managers			
[redacted]	Owners/Station Managers – Lyndavale Pty Ltd – Lyndavale Station Represented by Emanate Legal (Nicholas Taylor)	[redacted]	[redacted]
[redacted]	Owners/Station Managers – Lyndavale Pty Ltd – Lyndavale Station Represented by Emanate Legal (Nicholas Taylor)	[redacted]	[redacted]
Central Land Council (on behalf of the Imanpa community's Traditional Owners)			
[redacted]	Manager Minerals and Energy	[redacted]	[redacted]
[redacted]	Minerals and Energy Officer	[redacted]	[redacted]
[redacted]	Minerals and Energy Officer	[redacted]	[redacted]
[redacted]	Minerals and Energy Officer	[redacted]	[redacted]
[redacted]	Minerals and Energy Officer	[redacted]	[redacted]
[redacted]	Employment Facilitator	[redacted]	[redacted]

Stakeholder	Role / Position	Phone Number	Email / Other Contact
[redacted]	Manager - Minerals and Energy	[redacted]	[redacted]
[redacted]	Anthropologist - South Central Region	[redacted]	[redacted]
Minerals Title Holder			
[redacted]	Director Core Uranium Pty Ltd	[redacted]	[redacted]
[redacted]	Principal Consultant M & M Walter Consulting	[redacted]	[redacted]
[redacted]	Managing Director Terralith Metals Pty Ltd	[redacted]	[redacted]

Table 1—2 Contact Details of Further Parties Informed of the Proposed Activity

Further Party	Role / Position	Phone Number	Email / Other Contact
Landholders / Managers			
[redacted]	Owners/Station Managers – Erldunda Land Trust Erldunda Station	[redacted]	[redacted]
[redacted]	Accommodation Provider	[redacted]	[redacted]

2. Engagement Log

Table 2—1 Engagement with Stakeholders

Stakeholder	Role / Position	Date	Type of Contact 9 (1)(f)	Method of Contact	Matters Raised	Written Responses Received from Stakeholder(s) 9 (1)(c)	Interest Holder's Assessment of the Merits of Any Objection or Claim Made 9 (1)(d)	Statement of Interest Holder's Response, or Proposed Response, to Each Objection or Claim Made by a Stakeholder 9 (1)(e)
Pastoralists / Managers								
[redacted]	Owners/Station Managers – Lyndavale Pty Ltd – Lyndavale Station	2022.01.08 – 2022.01.25	Emails / phone call	Consultation	Various emails regarding Interest Holder's proposed 2023 drilling activities on Lyndavale Station including maps. Phone hook-up timing confirmed. See **Appendix 4.1.1.1**.	N/A	N/A	N/A
[redacted]	Owners/Station Managers – Lyndavale Pty Ltd – Lyndavale Station	2022.01.26	Phone call	Consultation	Phone hook-up with [redacted] to discuss the proposed Mt Kitty 2 well and associated activities. No issues raised and survey and approvals work to progress.	N/A	N/A	N/A
[redacted]	Owners/Station Managers – Lyndavale Pty Ltd – Lyndavale Station	2022.02.07	Email	Notice of Entry	Notice of Entry provided to [redacted] to allow scouting survey to be completed to finalise scope of work to be included in a proposed Land Access Agreement. See **Appendix 4.1.1.2**.	Notice of Entry acknowledged by phone.	N/A	N/A
[redacted]	Owners/Station Managers – Lyndavale Pty Ltd – Lyndavale Station	2022.02.10 & 2022.02.22	Phone call	Consultation	Peter Rogers (Land Access Field Supervisor) discussed upcoming survey plans with [redacted]	N/A	N/A	N/A
[redacted]	Owners/Station Managers – Lyndavale Pty Ltd – Lyndavale Station	2022.02.26	In person	Consultation	Peter Rogers, James Laverty (Civil Supervisor) and Justin Horan (Drilling Superintendent) met with [redacted] to discuss the proposed activity at Mt Kitty 2 and associated works.	N/A	N/A	N/A
[redacted]	Owners – Lyndavale Pty Ltd – Lyndavale Station	2022.04.21	Email	Consultation	Various emails to [redacted] to arrange a catchup to discuss plans for Mt Kitty 2 and associated activities.	N/A	N/A	N/A

Stakeholder	Role / Position	Date	Type of Contact 9 (1)(f)	Method of Contact	Matters Raised	Written Responses Received from Stakeholder(s) 9 (1)(c)	Interest Holder's Assessment of the Merits of Any Objection or Claim Made 9 (1)(d)	Statement of Interest Holder's Response, or Proposed Response, to Each Objection or Claim Made by a Stakeholder 9 (1)(e)
					Maps and other relevant information provided to John and Anne for discussion/consideration.			
[redacted]	Owners – Lyndavale Pty Ltd – Lyndavale Station	2022.04.26	In person	Consultation	Meet with [redacted] at their Tailem bend farm to discuss proposed Mt Kitty 2 and associated activities. Discussion around water supply bore locations to be provided to asset team, no significant issues raised.	[redacted] verbally flagged that water bore locations for them longer term would be more beneficial if they were constructed east of the Mt Kitty 2 wellsite towards the Lyndavale homestead.	Interest Holder to consider this preference during planning but are unable to commit due to uncertainty in subsurface water locations and deliverability.	N/A
[redacted]	Owners – Lyndavale Pty Ltd – Lyndavale Station	2022.09.14	Email	Consultation	Proposal for face-to-face discussion on 27th September.	Confirmation on face-to-face discussion. Additional confirmation 25th September 2022. See **Appendix 4.1.1.3**.	N/A	N/A
[redacted]	Owners/Station Managers – Lyndavale Pty Ltd – Lyndavale Station	2022.09.27	In person / via Skype	Consultation	Meet with [redacted] at Lyndavale to discuss various topics, also had [redacted] join the catchup via Skype. Discussed the latest with proposed Mt Kitty 2 activities including upcoming ecology surveys and well integrity inspection for Mt Kitty 1. Also provided a pastoralist engagement pack detailing proposed Mt Kitty 2 activities for their consideration and review. See **Appendix 4.1.1.3** for organisational emails.	N/A	N/A	N/A
[redacted]	Owners/Station Managers – Lyndavale Pty Ltd – Lyndavale Station	2022.09.28	Email	Notice of Entry	Notice of Entries provided to [redacted] for the ecology surveys for Mt Kitty 2 and associated activities and well integrity inspection at Mt Kitty 1. See **Appendix 4.1.1.4** for email discussing notice of entry.	Notice of Entry acknowledged via SMS notification.	N/A	N/A

Stakeholder	Role / Position	Date	Type of Contact 9 (1)(f)	Method of Contact	Matters Raised	Written Responses Received from Stakeholder(s) 9 (1)(c)	Interest Holder's Assessment of the Merits of Any Objection or Claim Made 9 (1)(d)	Statement of Interest Holder's Response, or Proposed Response, to Each Objection or Claim Made by a Stakeholder 9 (1)(e)
[redacted]	Owners/Station Managers – Lyndavale Pty Ltd – Lyndavale Station	2022.10.05	Email	Notice of Entry	Updated Notice of Entry provided to [redacted] for well integrity inspections at Mt Kitty 1. See **Appendix 4.1.1.4** for email discussing notice of entry.	Notice of Entry acknowledged via SMS notification.	N/A	N/A
[redacted]	Owners/Station Managers – Lyndavale Pty Ltd – Lyndavale Station	2022.10.18	Email	Notice of Entry	Notice of Entry for Cultural Heritage survey at Mt Kitty 2. See **Appendix 4.1.1.5** for email discussing notice of entry.	Notice of Entry acknowledged via SMS notification.	N/A	N/A
[redacted]	Owners/Station Managers – Lyndavale Pty Ltd – Lyndavale Station	2022.11.15	Email	Notice of Entry	Email from [redacted] confirming Notice of Entry for Cultural Heritage survey. [redacted] also advised of bushfires on Mt Ebenezer Station if we had personnel planning to be in the area.	Notice of Entry acknowledged. See **Appendix 4.1.1.5**.	N/A	N/A
[redacted]	Owners/Station Managers – Lyndavale Pty Ltd – Lyndavale Station	2022.11.19	Email	Pastoral Engagement Packs	Pastoral engagement information pack for both Mt Kitty #2 and Dukas #2 projects provided to [redacted] See **Appendix 4.3** for Pastoralist Engagement Pack. See **Appendix 4.1.1.6** for correspondence.	Receipt of pastoral engagement packs acknowledged.	N/A	N/A
[redacted]	Owners/Station Managers – Lyndavale Pty Ltd – Lyndavale Station	2023.01.17	Email	Notice of Entry	Notice of Entry for Mt Kitty 1 and Dukas 1 wells leak detection visits provided to [redacted] See **Appendix 4.1.1.6** for notification email.	N/A	N/A	N/A
[redacted]	Owners/Station Managers – Lyndavale Pty Ltd – Lyndavale Station	2023.01.30	Email	Notice of Entry	Notice of Entry for civil contractor tender visits provided to [redacted]	Notice of Entry acknowledged. See **Appendix 4.1.1.8**.	N/A	N/A
[redacted]	Owners/Station Managers – Lyndavale Pty Ltd – Lyndavale Station	2023.02.28	Email	Consultation	Email advising Stanes that I would be looking to send the Form 15 and draft LAA for Mt Kitty 2 project provided to [redacted]. Offer for a phone hook-up to discuss the Form 15 and draft LAA.	Email from [redacted] confirming would be good to catchup to discuss and later in the afternoon would suit. Confirmation of phone hook-up. See **Appendix 4.1.1.9**.	N/A	N/A

Stakeholder	Role / Position	Date	Type of Contact 9 (1)(f)	Method of Contact	Matters Raised	Written Responses Received from Stakeholder(s) 9 (1)(c)	Interest Holder's Assessment of the Merits of Any Objection or Claim Made 9 (1)(d)	Statement of Interest Holder's Response, or Proposed Response, to Each Objection or Claim Made by a Stakeholder 9 (1)(e)
					See **Appendix 4.1.1.9**.			
[redacted]	Owners/Station Managers – Lyndavale Pty Ltd – Lyndavale Station	2023.03.01	Phone hook-up	Form 15 and draft LAA	Microsoft Teams meeting with [redacted] to discuss the Form 15 and draft LAA. Hook-up lasted approximately and hour. [redacted] advised this was all ok and that when the documents were received, they would be provided to [redacted] legal representative.	N/A	N/A	N/A
[redacted]	Owners/Station Managers – Lyndavale Pty Ltd – Lyndavale Station	2023.03.01	Email	Form 15 and draft LAA	Form 15 and draft LAA emailed to [redacted]	(2023.03.14) Email received from [redacted] legal representative acknowledging they would be acting on behalf [redacted] for the Mt Kitty #2 LAA. [redacted] legal representative proposed a phone hook-up to discuss the Mt Kitty 2 LAA. See **Appendix 4.1.1.10**.	N/A	N/A
[redacted]	Owners/Station Managers – Lyndavale Pty Ltd – Lyndavale Station	2023.04.11	Email	Form 15 and draft LAA	Confirmation of meeting attendees and meeting link organisation.	Confirmation of meeting attendees. See **Appendix 4.1.1.11**.	N/A	N/A
[redacted] **Legal Representative**	Owners/Station Managers – Lyndavale Pty Ltd – Lyndavale Station	2023.04.12	Phone hook-up	Form 15 and draft LAA	Phone hook-up to discuss the Mt Kitty 2 LAA with [redacted] legal representative, [redacted] and Santos' representatives.	N/A	N/A	N/A
[redacted]	Owners/Station Managers – Lyndavale Pty Ltd – Lyndavale Station	2023.04.24	Email	Consultation	Email organising a phone hook-up to discuss access track upgrades as part of Mt. Kitty 2.	Confirmation of email for phone hook-up. See **Appendix 4.1.1.12**.	N/A	N/A
[redacted]	Owners/Station Managers – Lyndavale Pty Ltd – Lyndavale Station	2023.04.25	Phone	Consultation	Access track inspection with Santos and [redacted].	N/A	N/A	N/A
[redacted] **Legal Representative**	Owners/Station Managers –	2023.05.15	Email	Form 15 and draft LAA	[redacted] legal representative provides initial response to Santos' draft Mt. Kitty 2 LAA.	See **Appendix 4.1.1.13**.	N/A	N/A

Stakeholder	Role / Position	Date	Type of Contact 9 (1)(f)	Method of Contact	Matters Raised	Written Responses Received from Stakeholder(s) 9 (1)(c)	Interest Holder's Assessment of the Merits of Any Objection or Claim Made 9 (1)(d)	Statement of Interest Holder's Response, or Proposed Response, to Each Objection or Claim Made by a Stakeholder 9 (1)(e)
	Lyndavale Pty Ltd – Lyndavale Station							
Central Land Council (CLC)								
[redacted]	Manager Minerals and Energy – Central Land Council (CLC)	2021.12.13	Video conferencing call	Consultation	CLC requesting a basic program of information to include in their 2022 work schedule across the Central Land Council area. See **Appendix 4.1.2.1**.	N/A	N/A	N/A
[redacted]	Manager Minerals and Energy – Central Land Council (CLC)	2022.01.11	Email	Consultation	Preliminary high-level forward work program provided to CLC.	N/A	N/A	N/A
[redacted]	Minerals and Energy Officer – Central Land Council (CLC)	2022.01.31	Email	Consultation	CLC requested a SSCC application form to be signed for areas not previously certified by CLC SSCC. See **Appendix 4.1.2.2**.	N/A	N/A	(Reply 9/2/22) Interest Holder signed application form.
[redacted]	Minerals and Energy Officer – Central Land Council (CLC)	2022.03.15	Email	Consultation	Interest Holder's preliminary activity: scouting occurred at Dukas and Mt Kitty to provide more detail for planning/scheduling. See **Appendix 4.1.2.3**.	N/A	N/A	N/A
[redacted]	Minerals and Energy Officer – Central Land Council (CLC)	2022.03.25	Email	Consultation	Informing CLC of potential updates from scouting to previously provided information. See **Appendix 4.1.2.3**.	N/A	N/A	N/A
[redacted]	Minerals and Energy Officer – Central Land Council (CLC)	2022.04.01	Email	Consultation	Interest Holder's activity for Mahler, Dukas and Mt Kitty to provide more detail for planning/scheduling.	CLC confirmed receipt of update email regarding proposed planning updates. See **Appendix 4.1.2.3**.	N/A	N/A
[redacted]	Minerals and Energy Officer – Central Land Council (CLC)	2022.04.12	Phone (voicemail)	Consultation	Informed CLC of the expected updates for the exploration program and seek to understand the CLC schedule for the year and Interest Holder's activities are still in the schedule.	N/A	N/A	N/A

Stakeholder	Role / Position	Date	Type of Contact 9 (1)(f)	Method of Contact	Matters Raised	Written Responses Received from Stakeholder(s) 9 (1)(c)	Interest Holder's Assessment of the Merits of Any Objection or Claim Made 9 (1)(d)	Statement of Interest Holder's Response, or Proposed Response, to Each Objection or Claim Made by a Stakeholder 9 (1)(e)
[redacted]	Manager Minerals and Energy – Central Land Council (CLC)	2022.05.10	Email	Consultation	CLC seeking clarity on exploration program, specifically techniques to be used. See **Appendix 4.1.2.4**.	N/A	N/A	N/A
[redacted]	Manager Minerals and Energy – Central Land Council (CLC)	2022.05.19	Video conferencing call	Consultation	The regulated Activity the Interest Holder proposes to carry out. The location/s where the Interest Holder proposes to carry out the Activity. Outcome is to have On Country meetings to answer community queries.	N/A	N/A	N/A
[redacted]	Manager Minerals and Energy – Central Land Council (CLC)	2022.07.08	Email	Consultation	Interest Holder provided revised work programs. See **Appendix 4.2**.	(Reply 3/8/22) CLC acknowledged receipt of revised work programs and requested digital data. See **Appendix 4.1.2.5**.	N/A	Interest Holder provided digital data 4/8/22.
[redacted]	Manager Minerals and Energy – Central Land Council (CLC)	2022.07.12	Email	Consultation	Interest Holder proposed follow up discussion regarding status of the work program. See **Appendix 4.1.2.4**.	N/A	N/A	N/A
[redacted]	Manager Minerals and Energy – Central Land Council (CLC)	2022.07.25	Email	Consultation	Interest Holder proposed follow up discussion regarding status of the work program.	(Reply 26/7/22) CLC agreeing to follow up discussion and seeking clarity on work program, specifically techniques proposed to be used at Dukas and Mt Kitty. See **Appendix 4.1.2.4**.	N/A	N/A
[redacted]	Manager Minerals and Energy – Central Land Council (CLC)	2022.07.29	Video conferencing call	Consultation	Techniques to be used at Dukas location in proposed and future work programs.	N/A	N/A	Interest Holder re-affirmed it will consult if work program is to change in the future and reiterated its' commitment to working with CLC and the Traditional Owners.

Stakeholder	Role / Position	Date	Type of Contact 9 (1)(f)	Method of Contact	Matters Raised	Written Responses Received from Stakeholder(s) 9 (1)(c)	Interest Holder's Assessment of the Merits of Any Objection or Claim Made 9 (1)(d)	Statement of Interest Holder's Response, or Proposed Response, to Each Objection or Claim Made by a Stakeholder 9 (1)(e)
[redacted]	Manager Minerals and Energy – Central Land Council (CLC)	2022.08.03	Email	Consultation	Confirming Video Conferencing meeting key points.	(Reply 3/8/22) [redacted] re-introducing her role back with CLC and further queries on latest correspondence regarding work program information. Interest Holder informed of initial planning and logistics for on country meetings with Traditional Owners. See **Appendix 4.1.2.4**.	N/A	N/A
[redacted]	Minerals and Energy Officer – Central Land Council (CLC)	2022.08.04	Email	Consultation	Provision of digital data pertinent to the revised work programs.	N/A	N/A	N/A
[redacted]	Minerals and Energy Officer – Central Land Council (CLC)	2022.08.12	Email	Consultation	Response to queries from [redacted] email on 4/8/22 providing clarification and offering a video conferencing call to discuss further if required. See **Appendix 4.1.2.4**.	N/A	N/A	N/A
[redacted]	Minerals and Energy Officer – Central Land Council (CLC)	2022.08.22	Email	Consultation	Follow up of email offering further opportunity to discuss detail from email dated 12/8/22. Informing that Interest Holder will engage CSIRO for on country consultation.	(Reply 29/8/22) Informed CSIRO representative confirmed for week commencing 26 September and that two meetings are likely for the proposed project areas. Informed cost estimates for meetings will be provided. See **Appendix 4.1.2.4**.	N/A	(Reply 30/8/22) Interest Holder agreed to proposed dates.
[redacted]	Minerals and Energy Officer – Central Land Council (CLC)	2022.08.24	Email	Consultation	CLC providing cost estimate for on country Sacred Site Clearance survey and requesting approval. See **Appendix 4.1.2.7**.	N/A	N/A	(Reply 29/8/22) Interest Holder approved the estimated budget cost.

Stakeholder	Role / Position	Date	Type of Contact 9 (1)(f)	Method of Contact	Matters Raised	Written Responses Received from Stakeholder(s) 9 (1)(c)	Interest Holder's Assessment of the Merits of Any Objection or Claim Made 9 (1)(d)	Statement of Interest Holder's Response, or Proposed Response, to Each Objection or Claim Made by a Stakeholder 9 (1)(e)
[redacted]	Minerals and Energy Officer – Central Land Council (CLC)	2022.08.25	Email	Consultation	CLC seeking detail regarding work programs for explanation to the Traditional Owners for Dukas and Mt Kitty activities. See **Appendix 4.1.2.6**.	N/A	N/A	(Reply 29/8/22) Detail is provided in the revised work program. Additional information is unavailable until designs are finalized. (Reply 1/9/22) Provision of photo examples of well operations.
[redacted]	Minerals and Energy Officer – Central Land Council (CLC)	2022.08.29	Email	Consultation	CLC seeking detail regarding access track for Mt Kitty 1 operations. See **Appendix 4.1.2.6**.	N/A	N/A	(Reply 30/8/22) Response provided, referring to previous CLC SSCC from 2013- 2014.
[redacted]	Minerals and Energy Officer – Central Land Council (CLC)	2022.09.01	Email	Consultation	CLC have engaged pastoralists regarding their on ground Sacred Site Clearance surveys and helicopter usage in the vicinity of these cattle properties.	N/A	N/A	N/A
[redacted]	Minerals and Energy Officer – Central Land Council (CLC)	2022.09.19	Email	Consultation	Confirmation of on country meeting timings and attendees. Request for cost estimate.	(Reply 20/9/22) Reiterating the focus of the on-country presentation to community. Informed that cost estimate will be provided shortly. (Reply 21/9/22) Cost estimates for on country meeting. See **Appendix 4.1.2.4**.	N/A	Interest Holder provided approval of cost estimates on 21/9/22.
[redacted]	Minerals and Energy Officer – Central Land Council (CLC)	2022.09.27	On country consultation (Imanpa)	Consultation	Open discussion regarding the following for proposed Mt Kitty 2 and Dukas 2 Activity: • The regulated Activity the Interest Holder proposes to carry out. • The location/s where the Interest Holder proposes to carry out the Activity. • The anticipated environmental impacts and environmental risks of the Activity.	(Reply 12/10/22 from [redacted]) CLC thanking Interest Holder for effort put into meetings and information provided. Confirmation of take away points from on country meetings. See **Appendix 4.1.2.8**.	No objection or claim but Interest Holder and CLC agree the key points for Interest Holder to follow up on.	Interest Holder is engaging with DITT surrounding re-/co-naming of well. Local employment is being considered, in particular in civils tender process (ongoing).

Stakeholder	Role / Position	Date	Type of Contact 9 (1)(f)	Method of Contact	Matters Raised	Written Responses Received from Stakeholder(s) 9 (1)(c)	Interest Holder's Assessment of the Merits of Any Objection or Claim Made 9 (1)(d)	Statement of Interest Holder's Response, or Proposed Response, to Each Objection or Claim Made by a Stakeholder 9 (1)(e)
					• The proposed environmental outcomes concerning the Activity. • The possible consequences of carrying out the Activity to the stakeholder's rights or activities.			Site visits will be arranged when drill time becomes firm. Interest Holder is committed to returning to community if work program changes.
[redacted]	Minerals and Energy Officer – Central Land Council (CLC)	2022.10.05	Email	Consultation	See **Appendix 4.1.2.8** of this Appendix. • Outlines dates for community meetings. • Summary of follow up items for Interest Holder regarding proposed Mt Kitty 2 Activity: o Renaming/co-naming Mt Kitty to Jacko's Bore. o Opportunities to support local employment. o Plan site visits during drilling activity. o Return to community if any changes to current work program activities.	(Reply 31/10/22 from [redacted] CLC requesting information relating to employment opportunities. See **Appendix 4.1.2.8**.	No objection or claim but Interest Holder and CLC agree this is a key point for Interest Holder to follow up on.	Local employment is being considered, in particular in civils tender process (ongoing).
[redacted]	Minerals and Energy Officer – Central Land Council (CLC)	2022.10.19	Email	Consultation	Sacred Site Clearance Certificate (SSCC) status for: • South Amadeus EP 125 Mt Kitty 2 Program (this EMP). • South Amadeus EP 112 Dukas 2 Program (subsequent EMP). • South Amadeus EP 82 Mahler Program (subsequent EMP). See **Appendix 4.1.2.9**.	N/A	N/A	N/A
[redacted]	Minerals and Energy Officer – Central Land Council (CLC)	2022.11.02	Email	Consultation	Seeking an update on SSCC for our project areas in the Southern Amadeus.	N/A	N/A	N/A

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[redacted]	Manager Minerals and Energy – Central Land Council (CLC)	2022.11.09	Email	Consultation	Seeking an update on SSCC for our project areas in the Southern Amadeus.	N/A	N/A	N/A
[redacted]	Minerals and Energy Officer – Central Land Council (CLC)	2022.12.06	Email	Consultation	Seeking an update on SSCC for our project areas in the Southern Amadeus.	The Mt Kitty 2 finalised SSCC could not be confirmed. See **Appendix 4.1.2.9**.	N/A	N/A
[redacted]	Minerals and Energy Officer – Central Land Council (CLC)	2022.12.14	Email	Consultation	Seeking an update on SSCC for our project areas in the Amadeus. See **Appendix 4.1.2.9**.	N/A	N/A	N/A
[redacted]	Minerals and Energy Officer – Central Land Council (CLC)	2022.12.15	Email	Consultation	Seeking an update on SSCC for our project areas in the Southern Amadeus.	The Mt Kitty 2 finalised SSCC could not be confirmed. See **Appendix 4.1.2.9**.	N/A	N/A
[redacted]	Minerals and Energy Officer – Central Land Council (CLC)	2023.01.24	Phone	Consultation	Seeking an update on SSCC for our project areas in the Southern Amadeus. David provided the email address for Shaun OConnor, who is acting in Anthony's role. David advised it would be best to email both Raelene and Shaun. See **Appendix 4.1.2.10**.	N/A	N/A	N/A
[redacted]	Minerals and Energy Officer – Central Land Council (CLC)	2023.01.24	Email	Consultation	Seeking an update on SSCC for our project areas in the Southern Amadeus.	Awaiting response. See **Appendix 4.1.2.9**.	N/A	N/A
[redacted]	Employment Facilitator – Central Land Council (CLC)	2023.02.07	Phone	Consultation	Discussion regarding employment opportunities, identification, and existing business databases.	Additional information provided 9/2/23 via email. See **Appendix 4.1.2.11**.	N/A	N/A

Stakeholder	Role / Position	Date	Type of Contact 9 (1)(f)	Method of Contact	Matters Raised	Written Responses Received from Stakeholder(s) 9 (1)(c)	Interest Holder's Assessment of the Merits of Any Objection or Claim Made 9 (1)(d)	Statement of Interest Holder's Response, or Proposed Response, to Each Objection or Claim Made by a Stakeholder 9 (1)(e)
[redacted]	Minerals and Energy Officer – Central Land Council (CLC)	2023.03.14	Email	Consultation	Seeking an update on SSCC for our project areas in the Southern Amadeus.	See **Appendix 4.1.2.9**.	N/A	N/A
[redacted]	Minerals and Energy Officer – Central Land Council (CLC)	2023.05.03	Email	Consultation	SSCC for our project areas in the Southern Amadeus.	CLC issued the SSCC. CLC provided a response to conditions on 2023.05.08 via email. See **Appendix 4.1.2.12**.	N/A	Santos responded seeking clarity on SSCC conditions via email 2023.05.04.
Core Uranium Pty Ltd								
[redacted]	Director	2023.06.09	Email	Consultation & Engagement Pack	Notification of Santos' proposed activities and copy of Engagement Pack. See **Appendix 4.1.3.1**.	Response (2023.06.13), see **Appendix 4.1.3.2**.	N/A	N/A
Terralith Metals Pty Ltd and M & M Walter Consulting (MMWC)								
[redacted]	Principal Mining Title Consultant MMWC	2023.12.01	Email	Consultation & Engagement Pack	Notification of Santos' proposed activities, map, and copy of Engagement Pack. See **Appendix 4.1.4.1** and **4.1.4.2**.	Response (2023.12.01). Confirm receipt of email and engagement pack. **Appendix 4.1.4.1**.	N/A	N/A

3. References

NT Government. (2016). *Petroleum (Environment) Regulations 2016*. Northern Territory Government: Northern Territory Government. Retrieved from **https://legislation.nt.gov.au/en/Legislation/PETROLEUM-ENVIRONMENT-REGULATIONS-2016**

4. Appendices

4.1 Stakeholder Correspondence Emails

4.1.1 Lyndavale Station

4.1.1.1 2021.12.13 – 2022.01.25 | [redacted]

From: [redacted]
Sent: Tuesday, 25 January 2022 9:46 PM
To: Mayfield, Mark (Mark)
Subject: Re: ![EXT]: RE: touching base
Attachments: Amadeus Work Program_Dukas_Mt Kitty_January 2022.pdf; AMDEUS 188a.pdf; AMDEUS 188b.pdf; Amadeus Basin tenure map.pdf

Sorry for the late reply, Mark.

Would 9am SA time tomorrow suit?

Cheers,
[redacted]

Sent from my iPhone

On 25 Jan 2022, at 2:51 pm, Mayfield, Mark (Mark) [redacted] wrote:

G'da [redacted]
Tomorrow morning is fine with me although the kids may be carrying on in the background!! What time suits and just a call or do you want to try a video call...?
To assist with the chat please find attached the following info;

- A presentation pulled together by Sandy Menpes our Team Leader for that area that provides an overview of how/what/when/where what we may be looking to do
- A map showing proposed Dukas #2 well
- A map showing proposed Mt Kitty #2 well
- A map showing petroleum tenure in the area, I discussed this wit [redacted] at the cricket given that Peak Helium were looking to do seismic in their EP134 tenure. Santos still holds EP82, EP112, EP105 and EP112.
- It is likely that at some point in the future that Central Petroleum will exit the Joint Venture we have in place for EP112 and EP125, it is likely that Peak Helium may become our JV partner when Central exit the JV. Santos will remain operator and principal 75% interest holder

Obviously any of these proposed activities will not progress without a new LACA being in place but wanted to give you an idea of what is being considered at the moment. At this stage I'd like to get [redacted] up to do some survey work starting around 21st February for 7-8 days, this info will help inform any LACA that we propose. Once we have covered off I will look to send a Notice of Entry for [redacted] survey.
I will hear back from you with a time that suits for tomorrow morning.
Cheers,
Mark

From: [redacted]
Sent: Tuesday, 25 January 2022 8:28 AM
To: Mayfield, Mark (Mark [redacted]
Subject: RE: ![EXT]: RE: to g

Morning Mark,
I know tomorrow is Aus Day but I will be home in the morning if that suits you. Otherwise Friday morning would also work.
Cheers,
[redacted]

[redacted]

From: Mayfield, Mark (Mark [redacted].Mayfield@santos.com]
Sent: Sunday, 23 January 2022 2:32 PM
To: [redacted]
Subject: RE: ![EXT]: RE: touching base

G'da [redacted]
Just a follow up to see when you might be available for a catchup, have a look and let me know if can squeeze in somewhere along the line? Hopefully you copped some of that rain that has and is still floating around the place...!
Cheers,
Mark

From: Mayfield, Mark (Mark)
Sent: Saturday, 8 January 2022 5:13 PM
To: 'Lyndavale Cattle Co' [redacted]
Subject: RE: ![EXT]: RE: touching base

G'da [redacted]
As always no worries re getting back to me, I know you and [redacted] re busy and will get back to me when you can. All the best to you [redacted] or 2022.
Firstly thanks for organising Popeye to complete the repairs on the road, it is greatly appreciated. When possible I am happy to receive an invoice to account for the repairs to the access road to Dukas #1, I will also discuss the water runoff from the wellsite with our asset and civils teams to workout options to prevent water ingress into these pits.
I am on the road next week so if possible the week after would be good for a call, is it possible for us to do a Zoom, Microsoft Teams, Skype or other video call? I will also look to have a few maps done up to aid our discussions re proposed 2022 activities.
It was great to catchup wit [redacted] at the cricket, I did my usual trick of only making it to 2 of the 5 days.... Hopefully you guys can get down next year...?!
Let me know a day/time that might suit week after next and if a video call might be possible.
Catchup soon.
Cheers,
Mark

From: [redacted]
Sent: Friday, 7 January 2022 10:35 AM
To: Mayfield, Mark (Mark [redacted]
Cc: [redacted]
Subject: ![EXT]: RE: touching base

Morning Mark,
Apologies for the delay in getting back to you.
We hope you enjoyed the cricket. [redacted] aid they caught up with you.
Is there a day next week that would suit for us to give you a call to run through the plans for 2022?
Popeye has completed the repairs on the access road to Dukas #1 which was approximately 7 days. Unfortunately he completed the works before the November rains but the road has held up fairly well. Popeye took the front end loader out and filled in all the gutters then graded the entire access road. There has been a lot of erosion at the site itself. I think something will need to be done about the water running off and filling up the holes inside the drill site. Please see photos attached.
Cheers,
[redacted]

From: Mayfield, Mark (Mark [redacted]
Sent: Monday, 13 December 2021 6:44 PM
To: [redacted]
Cc: [redacted]
Subject: touching base

Hi [redacted]
I hope all is well wherever you are currently located...! It would be good to catchup either face to face or on the phone before Christmas, are you going to be able to get down for the cricket....?
It would be good to just briefly cover off what plans we have at the moment for 2022 on Lyndavale/Mt Ebenezer and will likely include the need for an extension the existing agreement or new agreement for us to access the Dukas #1 wellsite as the current agreement expires at the end of January 2022.
Have a look and let me know if you are going to be down south at all or I will try to get you on the phone later this week.
Thanks,
Mark

Santos
Mark Mayfield
Access Adviser - Land
EHS & Governance
Santos Limited 60 Flinders Street Adelaide SA 5000
[redacted]

santos.com

Santos Ltd A.B.N. 80 007 550 923
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4.1.1.2 ***2022.02.07 |*** [redacted]

From: Mayfield, Mark (Mark) [redacted]
Sent: Monday, 7 February 2022 8:11 PM
To: [redacted]
Cc:
Subject: Preliminary Activity Notifications for general maintenance inspections and survey activities for proposed wellsite locations [redacted] February 2022
Attachments: notice of preliminary activities - EP 125 - general maintenace inspections and survey activities for proposed wellsite locations [redacted] February 2022.pdf; AMDEUS 188b.pdf

G'day [redacted]

I hope you survived [redacted] irst hair cut the other week...! 😊

Further to our discussion on the phone the other week please find attached the Preliminary Activity Notification – Form 52 and map for the inspections and surveys we would like to undertake on Lyndavale, I will send a separate notification through for the Dukas locations on Mount Ebenezer shortly.

[redacted] will be in touch with you to discuss the inspections and surveys in more detail in the coming days hopefully including a time to catchup face to face with him and Lavo to cover off any specific requirements you had for the team before they get started.

It all should be fairly straight forward however if you have any questions/concerns please let me know and I will give you a call to discuss. Thanks as always.

Cheers,

Mark

Santos

Mark Mayfield
Access Advisor - Land
Onshore Development
S t L i it d 60 Fl d St t Ad l ide SA 5000
[redacted]
santos.com

4.1.1.3 2022.09.14 – 2022.09.26 | [redacted]

From: [redacted]
Sent: Monday, 26 September 2022 7:08 AM
To: Mayfield, Mark (Mark)
Subject: Re: ![EXT]: RE: catchup Tuesday 27th September

Categories: Tracked To Dynamics 365

Good morning Mark,

I'm just wondering if it would be possible for you to bring out some car batteries I've ordered with you tomorrow from Outback Batteries?

Look forward to catching up.

Cheers
[redacted]

Sent from my iPhone

On 14 Sep 2022, at 5:32 pm, Mayfield, Mark (Mark) [redacted] wrote:

G'da [redacted]
Awesome I will get myself sorted to be up there and we can discuss any proposed access for the remainder of 2022 and plans to allow Land Access Agreements to be progressed for operations in 2023. Look forward to catching up.
Cheers,
Mark

From: [redacted]
Sent: Wednesday, 14 September 2022 10:55 AM
To: Mayfield Mark (Mark) [redacted]
Cc: [redacted]
Subject: ![EXT]: RE: catchup Tuesday 27th September

Hi Mark,
That that day should work well with us. We will catch up with you then.

[redacted]

From: Mayfield, Mark (Mark [redacted]
Sent: Wednesday, 14 September 2022 9:33 AM
To: [redacted]
Cc [redacted]
Subject: catchup Tuesday 27th September

Hi [redacted]

Just a heads up that I am looking to be up that way in a couple of weeks and wanted to see if we could catchup… I was thinking the morning of Tuesday 27th September, I can get out there around 7am if that suits? Have a look and let me know when you have a chance.

Cheers,

Mark

Santos

Mark Mayfield
Access Adviser - Land
Onshore Development
Santos Limited, 60 Flinders Street, Adelaide SA 5000
[redacted]
santos.com

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4.1.1.4 2022.09.28 - 2022.10.05 | [redacted]

From: Mayfield, Mark (Mark) [redacted]
Sent: Wednesday, 5 October 2022 2:39 PM
To: [redacted]
Cc:
Subject: RE: Preliminary Activity Notifications for Mount Kitty #2 field ecology survey - Lyndavale - October 2022
Attachments: notice of preliminary activities - EP 125 - Mount Kitty #2 field ecology survey - Lyndavale - October 2022 updated.pdf

Hi [redacted]

Just FYI upon provision of this Notice of Entry to the NT Department of Industry, Tourism and Trade as we are required to do they have identified that the period of notification being 28th September 2022 to 11th October 2022 was not the required 14 days rather it was only 13 days... Please find attached updated Notice of Entry which pushes the start date for the survey back to 12th October, apologies for this oversight let me know if you have any questions/concerns?

Thanks,

Mark

Santos

Mark Mayfield
Access Adviser - Land
Onshore Development
Santos Limited 60 Flinders Street Adelaide SA 5000
[redacted]
santos.com

From: Mayfield, Mark (Mark)
Sent: Wednesday, 28 September 2022 5:42 PM
To [redacted]
Cc
Subject: Preliminary Activity Notifications for Mount Kitty #2 field ecology survey - Lyndavale - October 2022

G'da [redacted]

Great to catchup earlier in the week, appreciate your time as always especially when you've got a bit going on!

As discussed please find attached the Preliminary Activity Notification – Form 52 and map for the ecology survey we would like to undertake on Lyndavale around the proposed Mt Kitty #2 well pad and associated disturbances **commencing 11th October**.

Lavo will be supervising this work and will likely touch base a day or two prior. It all should be fairly straight forward however if you have any questions/concerns please let me know and I will give you a call to discuss. Thanks as always.

Cheers,

Mark

Santos

Mark Mayfield
Access Adviser - Land
Onshore Development
Santos Limited 60 Flinders Street Adelaide SA 5000
[redacted]
santos.com

4.1.1.5 2022.10.18 – 2022.11.15 | [redacted]

From: [redacted]
Sent: Tuesday, 15 November 2022 7:27 AM
To: Mayfield, Mark (Mark)
Subject: ![EXT]: Re: Preliminary Activity Notification for Dukas #2 cultural heritage survey - Mt Ebenezer - November 2022
Attachments: image001.jpg; image002.jpg; image003.jpg; image004.jpg

Hi Mark,

I'm not sure if you were aware or not but I just wanted to send you an email to let you know that there is quite a big bushfire on Mt Ebenezer and Palmer Valley at the moment right around the area of Dukas #2.

[redacted] nd I are in town at the moment but no baby yet so feel free to give me a call.

Cheers
[redacted]

On 9 Nov 2022, at 11:12 am, Mayfield, Mark (Mark) <Mark.Mayfield@santos.com> wrote:

Hi [redacted]
This is the last one for this week and hopefully next I promise!! I just wanted to let you know that while Lavo is out in the area that we would like him to just head out to the proposed Dukas #2 and Mt Kitty #2 wellsites just to capture some additional info that was missed during Peter Rogers visit last week. At this stage Lavo would be onsite around the 18th November just after he completes the work on the Dukas #1 well pad as per my previous note. Have a look and let me know if any questions or concerns?
That is it I promise and all the best again 😊
Cheers,
Mark

Mark Mayfield
Access Adviser - Land
Onshore Development
Santos Limited, 60 Flinders Street, Adelaide SA 5000
[redacted]
santos.com

From: Mayfield, Mark (Mark)
Sent: Tuesday, 18 October 2022 2:24 PM
To: [redacted]
Cc:

Subject: Preliminary Activity Notification for Dukas #2 cultural heritage survey - Mt Ebenezer - November 2022

G'da [redacted]
Please find attached the Preliminary Activity Notification – Form 52 and map for the cultural heritage survey we would like to undertake on Mt Ebenezer Station around the proposed Dukas #2 well pad and associated disturbances **commencing 1st November**. There will 1 4WD vehicle and 2 consultants undertaking this work.
Any questions or concerns please let me know.
Thanks,
Mark

Mark Mayfield
Access Adviser - Land
Onshore Development
Santos Limited, 60 Flinders Street, Adelaide SA 5000
[redacted]
santos.com

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4.1.1.6 ***2022.09.11 |*** [redacted]

From: Mayfield, Mark (Mark) [redacted]
Sent: Saturday, 19 November 2022 10:17 AM
To: [redacted]
Subject: Mt Kitty #2 and Dukas #2 project information - Lyndavale and Mt Ebenezer
Attachments: EP 112 Dukas Pastoralist Engagement Pack.pdf; EP 125 Mt Kitty Pastoralist Engagement Pack.pdf

Mornin [redacted]

Hopefully we have now completed all of our survey related work associated with both the Mt Kitty #2 and Dukas #2 drilling projects (hopefully..!) As covered off when we caught up back in September please find attached electronic copies of the information packs for both projects.

I believe we are also at the stage where we are ready to progress consideration of Land Access and Compensation Agreements (LAA's) so I will look to forward the relevant documentation through to you for provision to your legal representative as required.

I am just sending this note through to the Lyndavale admin address so as not to annoy [redacted] t this time. As always give me a call if anything you'd like to cover off, have a great weekend.

Thanks,

Mark

Santos

Mark Mayfield
Access Adviser - Land
Onshore Development
S t Li it d 60 Fli d St t Ad l ide SA 5000
[redacted]
santos.com

4.1.1.7 2023.01.17 | Ross & Jo Stanes

From: Mayfield, Mark (Mark) [redacted]
Sent: Tuesday, 17 January 2023 2:39 PM
To: [redacted]
Cc:
Subject: Leak detection testing - Mt Kitty #1 and Dukas #1

G'day [redacted]
I hope all is well and settling down after the silly season..! 😉 I just wanted to advise that we'd like to have a consultant in 1 x 4WD access Mt Kitty #1 and Dukas #1 to complete leak detection tests on the wells, this work is a compliance requirement for our NT government approvals and we would usually do with other operations while we are onsite however the testing has come up outside of other work. At this stage the consultant would be onsite this Friday and he would only be at each well for about half an hour, can you have a look and let me know if you see any issues with this work happening on Friday? Apologies for the short notice.
Thanks,
Mark

Santos

Mark Mayfield
Access Adviser - Land
Onshore Development
Santos Limited, 60 Flinders Street, Adelaide SA 5000
[redacted]
santos.com

4.1.1.8 2023.01.30 – 2023.02.09 | Ross & Jo Stanes

From: [redacted]
Sent: Thursday, 9 February 2023 9:31 AM
To: Mayfield, Mark (Mark)
Cc: [redacted]
Subject: ![EXT]: RE: Preliminary Activity Notification for Mount Kitty #2 civil contractor tender visit - Lyndavale - February 2023

Morning Mark,

Thanks for letting us know.

Much appreciated,
[redacted]

[redacted]

From: Mayfield, Mark (Mark [redacted]
Sent: Tuesday, 7 February 2023 4:16 PM
To: [redacted]
Cc:
Subject: RE: Preliminary Activity Notification for Mount Kitty #2 civil contractor tender visit - Lyndavale - February 2023

Hi [redacted]

I have been advised that my previous notification did not satisfy the 14 day notice requirement so please find attached an updated preliminary activity notification for the Mt Kitty #2 civil contractors tender visit that shifts the access date out by 1 day to the 14th February. As usual Lavo will be in touch to confirm specific details and if possible catchup with you both at the homestead one morning for a chat re the visit /other.

Thanks,

Mark

Santos

Mark Mayfield
Access Adviser - Land
Onshore Development
S t Li it d 60 Fli d St t Ad l ide SA 5000
[redacted]
santos.com

From: Mayfield, Mark (Mark)
Sent: Monday, 30 January 2023 5:55 PM

To: [redacted]
Cc: [redacted]
Subject: Preliminary Activity Notification for Mount Kitty #2 civil contractor tender visit [redacted] February 2023

G'day [redacted]

I hope the family is well 😊

Please find attached the Preliminary Activity Notification – Form 52 and maps for a civil contractor tender visit we would like to undertake on Lyndavale around the proposed Mt Kitty #2 well pad and associated disturbances. We have 8 contractors that have tendered for the civil work associated with the proposed Mt Kitty #2 drilling project and Lavo will be escorting them around to advise them of the scope of works at this stage. We would like to commence this visit on Monday 13th February and Lavo will be in touch as required.

If you'd like to discuss this planned visit or would like additional details please give me a call when convenient.

Thanks,

Mark

Santos

Mark Mayfield
Access Adviser - Land
Onshore Development
Santos Limited 60 Flinders Street Adelaide SA 5000
[redacted]

santos.com

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4.1.1.9 2023.02.28 – 2023.03.01 | [redacted]

From: [redacted]
Sent: Wednesday, 1 March 2023 10:44 AM
To: Mayfield, Mark (Mark)
Subject: Re: ![EXT]: Re: Mt Kitty #2 agreement

Categories: Tracked To Dynamics 365

Yes, no worries

On Wed, 1 Mar 2023 at 9:52 am, Mayfield, Mark (Mark [redacted] wrote:
Yep perfect mate, did you want to call me on mobile 04

From [redacted]
Sent: Wednesday, 1 March 2023 10:50 AM
To [redacted]
Subject: ![EXT]: Re: Mt Kitty #2 agreement

Hi Mark,

11am would suit us if that is still ok with you.

Cheers
[redacted]

On Tue, 28 Feb 2023 at 17:14, Mayfield, Mark (Mark [redacted] wrote:

Hi [redacted]

I hope your tribe are all fit and well. Just touching base as I reckon I am ready to send through the Mt Kitty #2 agreement for you to have a look at and send through to your lawyer, if you've got 10mins in the next couple of days would be good to just have a quick chat before I send just to fill in any gaps and just have a general catchup. I am around from about 11am tomorrow and should be right for a call for the remainder of the day/evening if that suited...

Thanks and cheers,

Mark

Santos
Mark Mayfield
Access Adviser - Land
Onshore Development
Santos Limited, 60 Flinders Street, Adelaide SA 5000
[redacted]
santos.com

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4.1.1.10 2023.03.01 – 2023.03.14 | Legal Representative

From: [redacted]
Sent: Tuesday, 14 March 2023 4:18 PM
To: [redacted]
Cc:
Subject: Agreement
Attachments: Form 15 - Negotiation Notice - Mount Kitty #2 [redacted]
Draft Land Access Agreement [redacted] Mt Kitty 2.docx

Attention: Mark Mayfield

[redacted]

Santos QNT Pty Ltd ACN 083 077 196 and Ordiv Petroleum Pty Ltd ACN 111 102 697 (collectively, Santos)

We refer previous communications, and in particular email correspondence from Santos: Mark Mayfield to Stanes on 1 March 2023 (copy below).

Relevant Matter

Negotiation of a Land Access Agreement (LAA) with Santos (**Matter**)

Relevant Land

[redacted]

Relevant Tenement

Exploration Permit 125 (**EP125**)

Retainer

We advise Emanate is retained to act on behalf of Stanes in relation to all dealings with Santos.

Future Communication

Emanate is retained in the matter, and the scope of Emanate's retainer includes engaging in regard to any *'Regulated Activity'* (RAs) that Santos intends to undertake on the Land.

In accord with Emanates' retainer, [redacted] irect Santos to provide all correspondence, documentation and the like in respect of the matter, **directly to Emanate** and not t [redacted] Emanate will then liaise wit [redacted] nd revert.

[redacted]

1. is not a person with specialised legal knowledge; and
2. have retained Emanate to act on their behalf to ensure his rights are protected and to relieve the stress and time involved in communicating with Santos.

Would you please ensure that any and all correspondence and/ or documentation in this matter are directed to Emanate.

Contact Person

We understand that you are the relevant contact person in this Matter for Santos.

If this is not the case, would you please confirm by reply, providing the relevant contact person's name and contact details so that we may contact them accordingly.

Negotiation Notice

[redacted] confirms receipt of Form 15 – Negotiation Notice provided by Santos in email correspondence under reference (copy attached).

Attached Negotiation Notice proposes negotiation start date as being, **8 March 2023.**

In accord with section 16(2)(a) of the *Petroleum Regulations 2020* (NT), the negotiation period for whic [redacted] nd Santos must take reasonable steps to negotiate a LAA:[1]

3. commenced on **Wednesday, 8 March 2023**; and
4. will expire on **Monday, 8 May 2023**, being sixty (60) days from the date of the Negotiation Notice.

In the interests of expediating negotiations with Santos in relation to the Matter [redacted]

5. is ready, willing and eager to engage in meeting with Santos (by way of videoconference or in person "round table" discussion); and
6. requests Santos' availability to meet with [redacted] together with Emanate, in the week commencing **20 March 2023**.

Would Santos please revert with their availability for meeting with [redacted] within the time frame detailed therein, including Santos' preferred mode of meeting.

Stanes' Position

[redacted]

7. confirms receipt of draft LAA provided by Santos in email correspondence under reference (copy attached);
8. wishes to work amicably with Santos, to provide any relevant access that is required; however
9. requires a fulsome LAA to be executed prior to such access.

Land Access Agreement (LAA)

[redacted]

10. together, with Emanate, has undertaken preliminary review of draft LAA;

11. is not agreeable to the terms detailed therein, particularly given that the current terms do not provid [redacted] ith any certainty in relation to Santos' proposed term / dates for access or the RAs proposed to be undertaken;

12. conducts a successful grazing operation on the Land in accord with a structured management plan; and

13. requires further information from Santos to fully ascertain the impact of Santos' proposed RAs on the Land an [redacted] peration.

Until such time as Santos has provided [redacted] with a full understanding of regulated activities proposed on Land (**what/ when/ where**), [redacted] s not in a position to:

14. understand the impacts of the RAs on Land;

15. understand the impacts of the activities on [redacted] razing Business operated on the Land;

16. understand, and begin to deal with other existing/ current or proposed activities on Land by other authority holders etc;

17. genuinely feel comfortable to enter into and reach agreement with Santos for the purpose of Santos' entry onto the Land;

18. accurately establish whether any compensation offer made by Santos is fair in the circumstances, or decide on a suitable counteroffer; and

19. propose appropriate changes to draft LAA.

Until such time as [redacted] s in receipt of information such that [redacted] can clearly establish the RAs that are proposed on the Land, [redacted] will not be in a position to properly participate in any negotiation with Santos.

Request for Further Information

In accordance with Section 7[2] of the *Petroleum (Environment) Regulations 2016 (NT)*, Santos must undertake the following:

20. The interest holder (Santos) must give each stakeholder [redacted] nformation about:

    20.1 the RAs the interest holder proposes to carry out;

    20.2 the location (or locations) where it is proposed to carry out the activity;

    20.3 the anticipated environmental impacts and environmental risks of the activity;

    20.4 the proposed environmental outcomes in relation to the activity;

    20.5 the possible consequences of carrying out the activity to the stakeholder's rights or activities;

20.6 allow a reasonable period for the stakeholder to respond to the information given by the interest holder.

to evidence the requisite '*Stakeholder Engagement*' has occurred.

For the abundance of clarity, we set out below a list of further information [redacted] requires to appropriately understand Santos' proposed access to the Land, and such properly participate in LAA negotiations:

21. The shortest possible Term for any LAA, noting:

21.1 draft LAA provided by Santos omits any reference as to the precise term of the LAA, and as such, there is no clarity regarding when the activities are to take place nor how long it is intended that the LAA remain in place between the parties; and

21.2 given the Term is not further defined within the LAA, the meaning of any reference to term is unclear and vague, making all relevant parts of the LAA invalid and unenforceable due to uncertainty.

22. Full details in respect of the proposed regulated activities, in particular:

22.1 the location, width and type of any existing and/ or new access tracks required by Santos (as shown on a Map to be attached to the LAA), noting Map currently provided by Santo does not sufficiently detail same;

22.2 full details (including but not limited to the location, width and type) of any other infrastructure (pipes / bores / gravel pits / laydowns etc) required by Santos to be constructed on the Land (as shown on a Map to be attached to the LAA);

22.3 the location of each entry/ exit point proposed to be utilised by Santos on the Land (as shown on a Map to be attached to the LAA), noting Map currently provided by Santos does not clearly identify where Santos intend to enter and exit the Land;

22.4 full details of the Central Campsite proposed by Santos, including size/ infrastructure required/ no. of man/ requirements for the camp/ proposed water use/ release of waste/ location within each drill pad/ site;

22.5 details of what activities will require 24 hour drilling (if any) and/ or the anticipated timeframes which Santos intend to undertake any drilling activities;

22.6 requirements to take/ purchase soil/ water/ gravel/ sand etc. from the Land;

22.7 impacts which the regulated activities may have on Stanes' property infrastructure;

22.8 what activities (if any) will require to be completed outside of daylight hours;

22.9 the approximate start date for the proposed RAs;

22.10 length of time that Santos will take to undertake the RAs, noting draft LAA provides an indicative duration only for each proposed activity;

22.11 frequency Santos will require to attend on the Land during the Term for the RAs – i.e. all at once, intermittently etc.;

22.12 proposed Land Access Protocols for the Land. This should have regard to Property specific requirements, including Biosecurity Plan, washdown bays, Covid Safe Plan etc. This item may require further discussion, having regard to [redacted] farm management practices / requirements;

22.13 full details of how Santos intend to comply with any existing Biosecurity Plan;

22.14 how Santos assessed compensation in this matter, including provision of any valuation assessment undertaken identifying the assessment of diminution in market value of the Land / compensation for the proposed activities; and

22.15 provision of any other information in relation to the activities proposed on the Land by Santos which would be relevant to Santos in making an accurate assessment of the impacts the activities will have on the Land and the compensatable effects which are to be paid by Santos (**Request for Further Information).**

Until such time as [redacted] as received response from Santos responding to [redacted] equest for Further Information, [redacted] will not be in a position to consider and revise draft LA o olly partake in the requisite Stakeholder Engagement process.

We look forward to hearing from Santos as soon as possible in this regard.

Professional Costs in Relation to Stakeholder Engagement / Land Access Negotiations

[redacted] appreciates that Santos is aware of its obligation to cover all reasonable legal or other professional costs including legal or accounting costs, and costs for gaining any advice or report necessarily incurred in connection with the negotiation of the LAA between the parties.[3]

In connection with the negotiation of LAA, for which [redacted] professional costs are covered, is Santos' strict compliance with stakeholder engagement procedure which must be undertaken by Santos before Santos is permitted to submit an EMP to the Northern Territory Minister for Environment.[4]

[redacted] considers that any legal or other professional costs incurred in relation to undertaking Stakeholder Engagement are payable by Santos.

Having regard to the intention of the *Petroleum Regulations 2020* (NT), stakeholder engagement is a necessary step and is in connection with the parties engaging prior to the ultimate entry into negotiations, and reaching agreement on a LAA that authorises an interest holder to carry out RA's on Land.

[redacted]

23. considers Santos would appreciate [redacted] is intent on informing itself fully in relation to the EMP and ultimately any Land Access negotiations;

24. considers Santos appreciate the costs involved in same are not insignificant; and

25. must not be out of pocket for direct costs and expenses in relation to Santos' proposed access to the Land.

[redacted] has incurred and will continue to incur these costs to enabl [redacted] o:

26. undertake / engage in *Stakeholder Engagement*; and

27. ultimately be in a position to enter meaningful discussions / negotiations with Santos in regard to Santos's RA on the Land, and any Land Access Agreement (LAA) to be entered by the Parties.

It follows [redacted] equires Santos commit to [redacted] reasonable costs, including reasonable legal or accounting costs in relation to this Matter, prior to [redacted] ontinuing any discussions, negotiations or engagement in regard to Santos' proposed RA's to be undertaken on the Land.

Any commitment from Santos must be binding, such that Santos must pa [redacted] costs whether or not Santos is granted an approved EMP, or that the parties successfully negotiate any LAA.

Future Action

Should you wish to discuss the foregoing, please do not hesitate to contact Nicholas Taylor on [redacted]

Kind Regards,

Nicholas Taylor
D: +61 7 4727 0110
M: +61 438 725 047
W: emanatelegal.com.au

emanate LEGAL

Offices: Brisbane | Townsville | Roma

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From [redacted]
Sent: Wednesday, March 1, 2023 5:18 PM
To: [redacted]
Subject: Form 15 - Negotiation Notice and draft Land Access Agreement for Mount Kitty #2 well on Lyndavale Station

H [redacted]

Thanks for your time again today, it was great to catchup as always. As discussed please find attached the following documents for your consideration;

1. Form 15 – Negotiation Notice for the Mount Kitty #2 well on Lyndavale Station
2. Draft Land Access Agreement for the Mount Kitty #2 well on Lyndavale Station

As I mentioned the Form 15 is the NT Government form that is required to be provided to the landholder to initiate the negotiation process for a Land Access Agreement (LAA) to be considered for proposed regulated operations on their property, the activities proposed for Mount Kitty #2 are regulated operations.

Please have a look at the Form 15 and draft LAA when possible, as discussed I am happy to catchup again to fill in any gaps just let me know when suits?

Thanks,

Mark

Mark Mayfield
Access Adviser – Land Onshore Development
Santos Limited, 60 Flinders Street, Adelaide SA 5000
[redacted]

santos.com

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[1] *Petroleum Regulations 2020* (NT) 16 Negotiation (2) The period for the negotiation: (a) must be for a period of at least 60 days from the receipt of the negotiation notice by the designated person.

[2] *Petroleum (Environment) Regulations 2016* (NT) 7 Stakeholder engagement (1) During the preparation of an environment management plan, an interest holder for the plan must carry out stakeholder engagement in accordance with this regulation. (2) The interest holder must: (a) give each stakeholder information about: (i) the regulated activity the interest holder proposes to carry out; and (ii) the location (or locations) where it is proposed to carry out the activity; and (iii) the anticipated environmental impacts and environmental risks of the activity; and (iv) the proposed environmental outcomes in relation to the activity; and (v) the possible consequences of carrying out the activity to the stakeholder's rights or activities; and (b) allow a reasonable period for the stakeholder to respond to the information given by the interest holder. (3) In this regulation: stakeholder means: (a) a person or body whose rights or activities may be directly affected by the environmental impacts or environmental risks of the regulated activity proposed to be carried out; or (b) an agent or representative of a person or body mentioned in paragraph (a).

[3] *Petroleum Regulations 2020* (NT) 15 Interest holder to seek access agreement (3) A negotiation notice must include: (g) a statement to the effect that the designated person's reasonable costs, including reasonable legal or accounting costs, and reasonable costs for gaining any advice or report, necessarily incurred in connection with the negotiation between the parties, will be covered by the interest holder.

[4] *Petroleum (Environment) Regulations 2016* (NT) 7 Stakeholder engagement (1) During the preparation of an environment management plan, an interest holder for the plan must carry out stakeholder engagement in accordance with this regulation. (2) The interest holder must: (a) give each stakeholder information about: (i) the regulated activity the interest holder proposes to carry out; and (ii) the location (or locations) where it is proposed to carry out the activity; and (iii) the anticipated environmental impacts and environmental risks of the activity; and (iv) the proposed environmental outcomes in relation to the activity; and (v) the possible consequences of carrying out the activity to the stakeholder's rights or activities; and (b) allow a reasonable period for the stakeholder to respond to the information given by the interest holder. (3) In this regulation: stakeholder means: (a) a person or body whose rights or activities may be directly affected by the environmental impacts or environmental risks of the regulated activity proposed to be carried out; or (b) an agent or representative of a person or body mentioned in paragraph (a).

4.1.1.11 2023.04.11 | Legal Representative

From: Nicholas Taylor [redacted]
Sent: Tuesday, 11 April 2023 3:29 PM
To: Mayfield, Mark (Mark)
Cc:
Subject: [redacted]
g

Categories: Tracked To Dynamics 365

Attention: Mark Mayfield

[redacted]

Santos QNT Pty Ltd ACN 083 077 196 and Ordiv Petroleum Pty Ltd ACN 111 102 697 (collectively, Santos)

We refer previous communications, and in particular email correspondence from Santos: Mark Mayfield to Emanate: Nicholas Taylor on even date (copy below).

Relevant Matter

Negotiation of a Land Access Agreement (LAA) with Santos (**Matter**).

Relevant Land

[redacted]

Meeting with Santos

In anticipation of videoconference occurring tomorrow, **Wednesday, 12 April 2023** at **10:00am ACST**, would you please find below link to Microsoft teams meeting.

https://teams.microsoft.com/l/meetup-join/19%3ameeting_YjdlYmZiYWQtY2ExOC00MjA0LWJmNWItNzU5ZjFkOTg1ZTQ1%40thread.v2/0?context=%7b%22Tid%22%3a%2265711acc-98d0-44d9-86a3-e53bb913e43b%22%2c%22Oid%22%3a%22a30275f3-ae01-43a6-a5f2-521d65a78736%22%7d

Should you have any issues accessing the videoconference by way of the link provided, would you please contact this Office.

As previously advised, we confirm the following attendees will be attending the videoconference:

Stanes' Attendees: [redacted]
Emanate: Nicholas Taylor

Santos' Attendees: Mark Mayfield
Jonathon Hyde
Steve Roberts
Jessica Day

Future Action

Should you wish to discuss the foregoing, would you contact Barry Taylor or Nicholas Taylor.

Regards,

Nicholas Taylor
[redacted]
emanate LEGAL
Offices: Brisbane | Townsville | Roma

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From: Mayfield, Mark (Mark [redacted]
Sent: Tuesday, April 11, 2023 11:18 AM
To: Nicholas Taylor [redacted]
Cc: Barry Taylo[redacted] Marie Barnsley [redacted]
Subject: RE: [231160] Stanes : Santos QNT : Lyndavale Land Access Agreement

Dear Nicholas,

I can confirm that Santos is available to attend a videoconference with Stanes as requested on **Wednesday, 12 April 2023** at **10:00am.**

The Santos attendees for the videoconference will be;

- Mark Mayfield – Access Adviser, Land (Santos)
- Jonathon Hyde - Lead Amadeus, New Ventures (Santos)
- Steve Roberts - Lead Drilling & Completions Project Engineer (Santos)
- Jessica Day – Corporate Lawyer (Santos)

Please provide videoconference meeting details (preferably Microsoft Teams) as soon as you are able?

Regards,

Mark

Santos
Mark Mayfield
Access Adviser - Land
Onshore Development
Santos Limited, 60 Flinders Street, Adelaide SA 5000
[redacted]
santos.com

4.1.1.12 2023.04.24 – 2023.04.25 | [redacted]

From: Mayfield, Mark (Mark) [redacted]
Sent: Tuesday, 25 April 2023 7:43 AM
To: [redacted]
Cc:
Subject: Re: ![EXT]: Re: [redacted] ccess road inspection

Morning [redacted]

That would be great thanks mate, spoke to Lavo yesterday and Thursday would be spot on for him.

Cheers,

Mark

Get Outlook for Android

From: [redacted]
Sent: Tuesday, April 25, 2023 7:09:31 AM
To: Mayfield Mark (Mark) [redacted]
Cc [redacted]
Subject: ![EXT]: Re: Lyndavale access road inspection

Good Morning Mark

Thursday morning should work. I'll send him a message to try and line up a time.

Kind Regards,

[redacted]

On Mon, 24 Apr 2023 at 12:10, Mayfield, Mark (Mar [redacted] wrote:

G'day [redacted]

As discussed during the teleconference for the Mt Kitty #2 access agreement I just wanted to see if you would be available later this week to catchup with Lavo to have a look at the Lyndavale access road to scope any potential upgrades that you believe may need to be considered as part of the Mt Kitty #2 project. Lavo should be down Erldunda way from tomorrow so if you had an hour or 2 to have a look at this one morning this week would be good, let me know a day/time that might suit?

Cheers,

Mark

Santos

Mark Mayfield
Access Adviser - Land
Onshore Development
S t Li lt d 60 Fli d St t Ad l id SA 5000
[redacted]
santos.com

Santos Ltd A.B.N. 80 007 550 923
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4.1.1.13 2023.05.10 - 2023.05.15 | Legal Representative

From: Baldock, Richard (Richard) [redacted]
Sent: Monday, 15 May 2023 8:4
To: Mayfield Mark (Mark)
Subject: [redacted]
Attachments: [redacted]

Fyi

Regards

Santos

Richard Baldock
Senior Corporate Lawyer
S t Li it d 32 T b t St t B i b QLD 4000
[redacted]
santos.com

From: Jessica Day [redacted]
Sent: Monday, 15 y
To: Baldock, Richard (Richard) [redacted]
Cc: William Oxby [redacted]
Subject: ![EXT]: FW: [231160] Stanes : Santos QNT : Lyndavale Land Access Agreement [JWSDOCS-DOCUMENTS.FID750993]

Hi Richard,

Attached draft Land Access Agreement from the Stanes.

We will revert with our comments.

Kind regards
Jess

Jessica Day
Associate | Johnson Winter Slattery
[redacted]

IMPORTANT NOTICE
[redacted]

From: Nicholas Taylor [redacted]
Sent: Friday, 12 May 2023 7:41 AM
To: William Oxby [redacted] Jessica Day [redacted]
Cc: Barry Taylor [redacted]; Genie Hearn [redacted]
Paige Caldwell [redacted]
Subject: [231160] [redacted] Santos QNT : [redacted] and Access Agreement

Attention: Jessica Day

[redacted]

Santos QNT Pty Ltd ACN 083 077 196 and Ordiv Petroleum Pty Ltd ACN 111 102 697 (collectively, Santos)

We refer previous communications, and in particular email correspondence from Santos' solicitor: Jessica Day to Emanate Legal: Nicholas Taylor on 10 May 2023 (copy below).

Relevant Matter

Negotiation of a Land Access Agreement (LAA) with Santos (**Matter**).

Relevant Land

[redacted]

Relevant Tenement

Exploration Permit 125 (EP125) (**Petroleum Interest**).

Land Access Agreement (LAA)

For Santos' review and consideration, would you please find attached [redacted] raft LAA [redacted] **LAA**), detailing [redacted] proposed changes and requirements by way of tracked-change' and/ or comment.

Santos will note changes gave been made to the previously agreed LAA, to fall in line with the standard minimum protections, as well as for drafting clarity.

Emanate is in the process of drafting a Matrix detailing the relevant clauses in the attached LAA and how they provide for each SMP required.

Reservation of Rights

[redacted] reserves all of their rights in relation to the Matter, including their right to further amend draft LAA.

Future Action

We await receipt of further draft LAA from Santos.

Should you have any queries regarding the foregoing, please do not hesitate to contact Nicholas Taylor.

Kind Regards,

Nicholas Taylor

[redacted]

W: emanatelegal.com.au

emanate LEGAL

Offices: Brisbane | Townsville | Roma

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From: Jessica Day [redacted]
Sent: Wednesday, May 10, 2023 10:37 AM
To: Nicholas Taylor [redacted]
Cc: Barry Taylor [redacted]

Subject [redacted] | Land Access Agreement [JWSDOCS-DOCUMENTS.FID750993]

Dear Nicholas,

We refer to the meeting of 12 April 2023 in relation to the negotiation of the draft Land Access Agreement which was provided to your client on 1 March 2023.

The outcome of the meeting was that your firm would provide your client's proposed draft Land Access Agreement for Santos' consideration.

Would you please confirm the likely timing for provision of your client's proposed draft Land Access Agreement.

Kind regards

Jessica Day
A[redacted] Wi[redacted] Slattery
[redacted]

Website | LinkedIn | vCard

4.1.2 Central Land Council (CLC) Communications

4.1.2.1 2021.12.13 | [redacted]

From: [redacted]
To:
Cc:
Subject: ![EXT]: RE: Amadeus Project 2022 SSCC for 3 wells
Date: Monday, 13 December 2021 4:43:32 PM

Hi [redacted]

Thanks for sending this document through. Lovely to meet you all today. Looking forward to working with you in the new year.

Happy holidays.

Regards

[redacted]

SENIOR MINERALS AND ENERGY OFFICER
Central Land Council
27 Stuart Highway, Alice Springs NT 0870
T 08 8951 6262
F 08 8958 2809
[redacted]
clc.org.au

From: Menpes, Sandra (Sandra [redacted]
Sent: Monday, 13 December 2021 3:51 PM
To: [redacted]
Cc: Kreicbergs, Haydn (Haydn) [redacted] Rutch, Andrew (Drew) [redacted]
Subject: Amadeus Project 2022 SSCC for 3 wells

Caution: This message was sent from outside the CLC. Please do not click links or open attachments unless you know the sender, and are sure the content is safe. Forward any suspicious messages to **Suspect Mail**

Hi [redacted]

Thank you for your time today and lovely to meet you (virtually [redacted]

Attached is the slide pack from our meeting today showing the three planned well locations in EPs 82, 112 and 125. As discussed, we will now work on work program documents for each well to get to you before you are back in the office on Monday January 10.

Wishing you a safe, healthy and happy holiday season,

Sandy

Santos

Sandy Menpes
Team Leader Amadeus Basin Exploration
Onshore New Ventures
Santos Limited, 60 Flinders Street, Adelaide SA 5000
[redacted]
santos.com

Santos Ltd A.B.N. 80 007 550 923
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4.1.2.2 **2022.01.31 |** [redacted]

From: [redacted]
To:
Cc:
Subject: Fwd: ![EXT]: CLC Sacred Site Clearance Certificate Santos EP 82, EP 112, EP 125
Date: Monday, 31 January 2022 1:40:57 PM
Attachments: Santos QNT Pty Ltd Sacred_Site_Clearance_Application.pdf

---

[redacted] please see below.

Begin forwarded message:

From [redacted]
Date: 31 January 2022 at 1:39:37 pm AEST
To: "Kreicbergs, Haydn (Haydn) [redacted]
Subject: ![EXT]: CLC Sacred Site Clearance Certificate Santos EP 82, EP 112, EP 125

Hi [redacted]
Thanks for provision of your work program, dated 11 January 2022. I can acknowledge receipt. As this work program includes works not yet approved under a current CLC Sacred Site Clearance Certificate (SSCC), new SSCCs will be required. Could you complete the attached SSCC application form so I can progress this?
With Kind regards
[redacted]

[redacted]
MINERALS AND ENERGY OFFICER
Central Land Council
27 Stuart Highway, Alice Springs NT 0870
T 08 8951 6247
F 08 8958 2809
[redacted]
clc.org.au

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4.1.2.3 2022.03.15 – 2022.04.01 | [redacted]

From: [redacted]
To:
Cc:
Subject: ![EXT]: RE: South Amadeus work program update
Date: Friday, 1 April 2022 12:47:10 PM

Dea [redacted]

My sincere apologies for the late response to your mail. I do appreciate these update [redacted] did tell me she had a conversation with you while I was away on a work trip, and that you had tried to contact me.
I have not had a chance to review your updates, but will do in the next week and will contact you for more details, if necessary.

Have a good weekend.

Thank you.

Regards

[redacted]

Central Land Council
27 Stuart Highway, Alice Springs NT 0870
T 08 8951 6262

[redacted]

clc.org.au

From: Rutch, Andrew (Drew [redacted]
Sent: Friday, 1 April 2022 11:02 AM
To [redacted]
Cc
Subject: FW: South Amadeus work program update
Importance: High

Caution: This message was sent from outside the CLC. Please do not click links or open attachments unless you know the sender, and are sure the content is safe. Forward any suspicious messages to **Suspect Mail**

Mornin [redacted]

Not too sure if you are receiving these updates but I will continue to keep CLC updated on our progress.

Kind regards

Santos

Drew Rutch
Cultural Heritage and Aboriginal Engagement
Santos Limited 32 Turbot Street, Brisbane QLD 4000
[redacted]

www.santos.com/

From: Rutch, Andrew (Drew)
Sent: Friday, 25 March 2022 9:28 AM
To [redacted]
Cc
Subject: RE: South Amadeus work program update
Importance: High

Mornin [redacted]

Just reaching out to advise you by way of update.

Santos is scouting further detail for our EP82, 112, 125 work program areas.

Once we have this detail we can update CLC and AAPA on specifics in relation to these three project sites.

Details such as prospective access roads, infrastructure and their locations, all of which can inform the on country assessments for our sacred site clearance certificates and subsequently the AAPA certificates.

Should you require further detail please do not hesitate to contact me.

Kind regards

Santos

Drew Rutch
Cultural Heritage and Aboriginal Engagement
Santos Limited, 32 Turbot Street, Brisbane QLD 4000
[redacted]
www.santos.com/

From: Rutch, Andrew (Drew)
Sent: Tuesday, 15 March 2022 11:42 AM
To [redacted]
Subject: South Amadeus work program update

Morning [redacted]

Just reaching out to advise you by way of update. I have previously tried to give you a verbal update but it appears I continue to miss you in the office.

Santos is currently scouting further detail for our EP82, 112, 125 work program areas.

Once we have this detail we can update CLC and AAPA on specifics in relation to these three sites.

Details such as prospective borrow pit locations and numbers, access roads, infrastructure and their locations, all of which can inform the on country assessments for our sacred site clearance certificates and subsequently the AAPA certificates.

Should you require further detail please do not hesitate to contact me.

Kind regards

Santos

Drew Rutch
Access Adviser
Cultural Heritage and Aboriginal Engagement
Environment and Access
Santos Limited, 32 Turbot Street, Brisbane QLD 4000
[redacted]
www.santos.com/

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4.1.2.4 2022.05.10 – 2022.09.21 | [redacted]

[redacted]

From: [redacted]
To:
Cc:
Subject: ![EXT]: Santos Information Meeting [redacted] ommunity EP"s 112 - 125 and [redacted] Community EP 82 September 2022 - Cost Estimate
Date: Wednesday, 21 September 2022 9:28:31 AM
Attachments: SANTOS Information Meeting MR0941 19 September 2022.pdf
Importance: High

Morning,
Awaiting approval for this Cost Estimate for the Information Meeting a [redacted] community and [redacted] ommunity September 2022.

[redacted]
MINERALS AND ENERGY OFFICER
Central Land Council
27 Stuart Highway, Alice Springs NT 0870
T 08 8951 6247
F 08 8958 2809
[redacted]
clc.org.au

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From: [redacted]
To:
Cc:
Subject: RE: ![EXT]: RE: CM: EP82, 112 & 125 - Southern Amadeus work program 2022
Date: Tuesday, 20 September 2022 4:57:51 PM

Hi Drew
[redacted] will send a cost estimate shortly.
The focus of the presentation should be the 2022 work program particularly the drilling of the wells proposed. People will appreciate information on the target, how gas is formed, what its used for, the nature of drilling proposed, what the site will look like during operations, amount of vehicle activity involved, access routes, how long the drilling operation will be and what is likely to happen as a result including what success means and what happens if nothing is found.
Also of interest is whether or not the well will be fracced or if this is likely in the future and when Santos may make such a decision. Management of activities and environmental protection especially for drilling will be of interest.
I am sure you are aware but the proposed access into Mahler well site is via the Titjikala Road. The road passes very close to the community and within some 50 metres of the school. Increased traffic and safety of community members and dust will be of a concern.
People may also ask about employment opportunities.
Large size(AO) posters of the presentation will be helpful as well as handouts.
I look forward to seeing you at the meetings.
Regards
[redacted]

[redacted]
MINERALS AND ENERGY OFFICER
Central Land Council
27 Stuart Highway, Alice Springs NT 0870
T 08 8951 6243
F 08 8958 2813
[redacted]
clc.org.au

From: Rutch, Andrew (Drew) [redacted]
Sent: Monday, 19 September 2022 10:42 AM
To: [redacted]
Cc [redacted]
Subject: RE: ![EXT]: RE: CM: EP82, 112 & 125 - Southern Amadeus work program 2022

Morning [redacted]

By way of an update, Santos has locked in our schedule for attending meetings at-
Tuesday 27 at [redacted] for Dukas and Mt Kitty);
Thursday 29 at [redacted] (for Mahler).

From Santos, Jonathan Hyde and Tim Morris and myself will be attending.

However, we are yet to receive a cost estimate for community attendance.

Also in regards to handouts, could you confirm if it is information pertaining to gas industry exploration practices?

Kind regards

Drew Rutch
Access Adviser
Cultural Heritage and Aboriginal Engagement
Santos Limited, Brisbane QLD 4000
[redacted]

From: Kreicbergs, Haydn (Haydn [redacted]
Sent: Tuesday, 30 August 2022 9:26 AM
To [redacted]
Cc: [redacted]Hyde, Jonathon (Jonathon) [redacted]Rutch, Andrew (Drew) [redacted]
Subject: Re: ![EXT]: RE: CM: EP82, 112 & 125 - Southern Amadeus work program 2022

Hi [redacted]

Thanks for the update.

Please lock that date in.

Regards
Haydn

On 29 Aug 2022, at 1:49 pm, [redacted] rote:

Hi Haydn
I just tried calling you. I was not available last week so apologies for not contacting you earlier.
[redacted] locked in for the week commencing 26 September. I am looking at 2 meetings that week – Tuesday 27 at Imanpa (for Dukas and Mt Kitty) and Thursday 29 at Titjikala (for Mahler).
I hope those days suit you. Santos could give an outline of the drilling programs for approximately 45 minutes and then you would leave the meeting. Damian would follow with his presentation and questions and answers session.
We would aim to start at 10 am. The Imanpa meeting will be in the community meeting room (aged care) and the Titjikala meeting will be at the basketball court. Handouts for people would be appreciated as well as posters of the various activities planned.

[redacted] will provide a cost estimate for the meetings which will include fuel to assist people getting to the meetings, CLC costs and lunch for the attendees. Please don't hesitate to contact me should you have any questions.

Kind regards

[redacted]

MINERALS AND ENERGY OFFICER
Central Land Council
27 Stuart Highway, Alice Springs NT 0870
T 08 8951 6243
F 08 8958 2813
[redacted]
clc.org.au

From: Kreicbergs, Haydn (Haydn) [redacted]
Sent: Monday 22 August 2022 8:57 AM
To [redacted] Hyde Jonathon (Jonathon) [redacted] Rutch, Andrew (Drew) [redacted]
Subject: RE: CM: EP82, 112 & 125 - Southern Amadeus work program 2022

H [redacted]

Trust you are well.

Just following up regarding the email below to see if you need anything else from our end.

We are now looking to engage with the CSIRO and lock in dates for the community consultation.

Can you please update on status?

Thanks, and Regards
Haydn

Santos

Haydn Kreicbergs
Manager Cultural Heritage, Aboriginal Engagement & Land
Santos Limited, 32 Turbot Street Brisbane QLD 5000
[redacted]
santos.com

From: Kreicbergs, Haydn (Haydn)
Sent: Friday, 12 August 2022 3:29 PM
To [redacted]
Cc: Densley, Matthias (Matt) [redacted] Hyde, Jonathon (Jonathon)

[redacted] Rutch, Andrew (Drew) [redacted]
Subject: RE: CM: EP82, 112 & 125 - Southern Amadeus work program 2022

H [redacted]

Responses to your queries below.

Please advise any queries or if a VC to discuss is required.

We look forward to progressing next steps.

Kind Regards
Haydn

Santos

Haydn Kreicbergs
Manager Cultural Heritage, Aboriginal Engagement & Land
Santos Limited, 32 Turbot Street Brisbane QLD 5000
[redacted]

santos.com

From [redacted]
Sent: Wednesday, 3 August 2022 6:04 PM
To: Kreicbergs, Haydn (Haydn) [redacted]
[redacted]
Cc: Densley, Matthias (Matt) [redacted] Hyde, Jonathon (Jonathon)
[redacted] Rutch, Andrew (Drew) [redacted]
Subject: ![EXT]: RE: CM: EP82, 112 & 125 - Southern Amadeus work program 2022

Hi Haydn
I hope you are well.
I am working part –time for the CLC coordinating consultations with traditional owners/native title holders and affected communities regarding the Santos 2022 Southern Amadeus Work Program. Since hydraulic fracturing is associated with gas exploration and is an approved activity in the NT, and there are significant concerns about the process and gas exploration generally, the CLC needs to ensure that those affected are fully informed and consulted. I note Santos is committed to engagement with affected Aboriginal people and supports meetings as required.

1. Correct – Santos is committed to best practice engagement for the lifecycle of its operations

The exchange with Anthony below gives assurances that no hydraulic fracturing is planned for this work program, but Santos reserves the right to utilise fraccing in the future. Can you please confirm this reservation also applies to Mt Kitty and Mahler.

2. That is correct

With respect to Dukas, the CLC understands that exploration is incremental and results

will guide future exploration options including fraccing, possibly in 2024 according to the Work Program, if the well is successful.
The Work Program states that a deviated/horizontal sidetrack may be completed at both Mt Kitty and Mahler. If the drilling of an horizontal sidetrack is a possibility and fraccing is anticipated in the next 2-4 years then an open and frank conversation about what is planned and what could happen in the future is best discussed now before work starts. Is there any other reason for drilling a horizontal sidetrack?

3. Correct – data obtained during the drilling and possible testing of Dukas 2 in 2023-24 will guide future exploration and appraisal activities in the area. The primary objective of Dukas 2 is a naturally fractured reservoir however the presence of this reservoir and degree of natural fracturing is currently unproven at the location. Ideally, a vertical well will intersect sufficient reservoir and natural fractures to flow at economic rates. The reason for capturing the possibility of drilling a horizontal well in the future is to increase the likelihood of intersecting sufficient reservoir and natural fractures to flow at economic rates in the event that a vertical well doesn't achieve this. One reason fracture stimulation is captured as a provisional future activity is for the scenario where the reservoir and natural fractures are insufficient to flow at economic rates.

I am starting to plan and work on logistics for the meetings with scheduling discussions to follow and need clarity on these points as they are important for designing the format and focus of the meetings. I understand Santos representatives will be willing to attend the meetings which is appreciated and you have provided a document with descriptions of all activities at each stage of exploration which will be useful. I believe Anthony has indicated to you that the CLC hopes Damian Barrett from the CSIRO can be involved.

Should you wish to discuss this further please don't hesitate to call me on 0417816035. I have retired (sort of) and I am based in Adelaide.

Kind regards

[redacted]

MINERALS AND ENERGY OFFICER
Central Land Council
27 Stuart Highway, Alice Springs NT 0870
T 08 8951 6243
F 08 8958 2813
[redacted]
clc.org.au

From: Kreicbergs, Haydn (Hayd [redacted]
Sent: Wednesday 3 August 2022 8:05 AM
To [redacted]
Cc: Densley Matthias (Matt) [redacted] Hyde Jonathon (Jonathon) [redacted] Rutch, Andrew (Drew) [redacted]
Subject: RE: CM: EP82, 112 & 125 - Southern Amadeus work program 2022

H [redacted]

Thanks for your time last Friday.

As discussed, we have summarised and provided responses to your questions below. We look forward to progressing arrangements for the community consultation and as discussed, we will take your advice on how we can develop a best practice engagement strategy.

We will also keep you updated on any developments regarding beneficial gas.

1. The amended work program states that Hydraulic Fracture Stimulation is only planned at the Dukas location. Can you please confirm this, and also confirm that fracking is not now, nor will in the future be utilised for the Mahler or Mt Kitty locations?
1. Santos can confirm that no Hydraulic Fracture Stimulation is planned for the current work program but reserves it's right to undertake authorised and approved activities for any future activities at the Dukas location.
2. For the Dukas well, can you please set-out the results that would lead to a decision to hydraulically fracture the well in a future work program?
2. Santos is currently undertaking an incremental exploration program. The results of the Dukas location will determine if Hydraulic Fracture Stimulation is a scenario for any future work programs. Santos is committed to engaging and informing the Native Title Parties for the lifecycle of its operations. Santos priority is to ensure the Native Title Parties are fully informed via best practice engagement and consultation on all aspects of it's operations.
3. Page four of your letter notes that Santos is committed to ensuring that traditional owners are "adequately consulted and informed" about projects. Can you please clarify if Santos will respect the wishes of traditional owners if, during consultation, traditional owners request that it not be conducted on their country, or will Santos go ahead with fracking despite objections?
3. Santos confirms it is committed to working with the Central Land Council to ensure the Native Title Parties are fully informed via best practice engagement and consultation on all aspects of it's operations. Whilst Santos reserves it's right to undertake authorised and approved activities, we reiterate we are committed to engaging and consulting with the Native Title Parties to ensure they are fully informed so they can make informed decisions. Santos looks forward to building long term relationships with the Native Title Parties.

Kind Regards
Haydn

Santos

Haydn Kreicbergs
Manager Cultural Heritage, Aboriginal Engagement & Land
Santos Limited 32 Turbot Street Brisbane QLD 5000
[redacted]
santos.com

From [redacted]
Sent: Wednesday, 27 July 2022 10:17 AM
To: Kreicbergs, Haydn (Haydn) [redacted]
Subject: I[EXT]: RE: CM: EP82, 112 & 125 - Southern Amadeus work program 2022

Thanks Haydn

[redacted]
MANAGER - MINERALS AND ENERGY
Central Land Council
27 Stuart Highway, Alice Springs NT 0870
T 08 8951 6261 **M** 0437 894 170
08 89 8 2809
[redacted]
clc.org.au

From: Kreicbergs, Haydn (Haydn) [redacted]
Sent: Wednesday, 27 July 2022 6:59 AM
To [redacted]
Cc: Rutch, Andrew (Drew) <Drew.Rutch@santos.com>; [redacted]
Subject: RE: CM: EP82, 112 & 125 - Southern Amadeus work program 2022

Morning [redacted]

Friday morning sounds good to discuss and clarify the matters raised below.

I will send a Teams invite.

Regards
Haydn

Santos

Haydn Kreicbergs
Manager Cultural Heritage, Aboriginal Engagement & Land
Santos Limited, 32 Turbot Street Brisbane QLD 5000
[redacted]
santos.com

From [redacted]
Sent: Tuesday, 26 July 2022 6:23 PM
To: Kreicbergs, Haydn (Haydn) [redacted]
Cc: Rutch, Andrew (Drew) [redacted]
Subject: I[EXT]: RE: CM: EP82, 112 & 125 - Southern Amadeus work program 2022

Good morning Haydn,

Thanks for prompting me. It would be good to talk about it this week so that we can all have some certainty [redacted] out on field work most of the week, but back here on Friday. Are you available 10am CST Friday?

In regards to the revised work program sent b [redacted] CLC is still seeking confirmation on the following points, which I hope you can provide on Friday:

1. The amended work program states that Hydraulic Fracture Stimulation is only planned at the Dukas location. Can you please confirm this, and also confirm that fracking is not now, nor will in the future be utilised for the Mahler or Mt Kitty locations?
2. For the Dukas well, can you please set-out the results that would lead to a decision to hydraulically fracture the well in a future work program?
3. Page four of your letter notes that Santos is committed to ensuring that traditional owners are "adequately consulted and informed" about projects. Can you please clarify if Santos will respect the wishes of traditional owners if, during consultation, traditional owners request that it not be conducted on their country, or will Santos go ahead with fracking despite objections?

Th k

[redacted]

MANAGER - MINERALS AND ENERGY
Central Land Council
27 Stuart Highway, Alice Springs NT 0870
T 08 8951 6261 **M** 0437 894 170
F 08 8958 2809
[redacted]
clc.org.au

From: Kreicbergs, Haydn (Haydn) [redacted]
Sent: Monday, 25 July 2022 1:57
To [redacted]
Cc: Rutch, Andrew (Drew) [redacted]
Subject: RE: CM: EP82, 112 & 125 - Southern Amadeus work program 2022

Hi [redacted]

Just following up below.

Any update on a suitable time to discuss?

Thanks
Haydn

Haydn Kreicbergs
Manager Cultural Heritage, Aboriginal Engagement & Land
Santos Limited, 32 Turbot Street Brisbane QLD 5000

Santos [redacted]

santos.com

From: Kreicbergs, Haydn (Haydn)
Sent: Tuesday 12 July 2022 12:03 PM
To [redacted]
Cc: Rutch, Andrew (Drew) [redacted]

Subject: RE: CM: EP82, 112 & 125 - Southern Amadeus work program 2022

Hi [redacted]

Trust you are well.

Just touching to check on availability for a follow up discussion regarding the status of the work program and the other matters we discussed at the meeting held 19 May.

Do you have availability later this week or early next ?

Regards
Haydn

Santos

Haydn Kreicbergs
Manager Cultural Heritage, Aboriginal Engagement & Land
S t Li lt d 32 T b t St t B i b QLD 5000
[redacted]

santos.com

From [redacted]
Sent: Thursday, 12 May 2022 10:30 AM
To: Kreicbergs, Haydn (Haydn) [redacted]
Cc: Menpes, Sandra (Sandra) [redacted] Rutch, Andrew (Drew) [redacted] Chinwe Ezeigbo [redacted] Raelene Martin [redacted]
Subject: ![EXT]: RE: CM: EP82, 112 & 125 - Southern Amadeus work program 2022

Morning Haydn,

That would be good. My preference would be Thursday, but in a pinch I can also manage Friday after about 2pm CST.

Best
[redacted]

[redacted]

MANAGER - MINERALS AND ENERGY
Central Land Council
27 Stuart Highway, Alice Springs NT 0870
T 08 8951 6261 **M** 0437 894 170
F 08 8958 2809
[redacted]
clc.org.au

From: Kreicbergs, Haydn (Haydn) [redacted]
Sent: Wednesday, 11 May 2022 7:57 AM
To: Anthony Alexopoulo [redacted]
Cc: Menpes, Sandra (Sandra) [redacted] Rutch, Andrew (Drew) [redacted]
Subject: RE: CM: EP82, 112 & 125 - Southern Amadeus work program 2022

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H [redacted]

Thanks for the note.

We view a meeting via VC a good opportunity to discuss and clarify the matters you have raised.

Does next Thursday-Friday work from your end ?

Kind Regards
Haydn

Santos
Haydn Kreicbergs
Manager Cultural Heritage, Aboriginal Engagement & Land
Santos Limited, 32 Turbot Street Brisbane QLD 5000
[redacted]
santos.com

From [redacted]
Sent:
To: Kreicbergs, Haydn (Haydn) [redacted]
Cc: Menpes, Sandra (Sandra) [redacted] Rutch, Andrew (Drew) [redacted]
Subject: ![EXT]: CM: EP82, 112 & 125 - Southern Amadeus work program 2022

Hi Haydn,

I am writing in regards to the proposed Santos Southern Amadeus 2022 work program encompassing areas of EPs 82, 112, and 125, which are covered by an Indigenous Land Use Agreement (ILUA) executed on 18 July 2007.

We met on 13 December 2021, and at that time Santos outlined its plan to drill exploration wells Dukas 2 on EP112, Mahler 1 on EP 82 and Mt Kitty on EP 125. Subsequently a work program was received by the CLC on 11 January 2022.

Upon reviewing the work program, it is evident that Santos intend to utilise horizontal drilling and carry out fracture integrity testing of tight reservoir rocks. Whilst this work program declares that hydraulic fracturing will not be utilised in the 2023 works the exploration program utilises methods that are intended to later facilitate hydraulic fracturing and the work program notes that a possible additional program (2023+) could include fracture stimulation and additional deviated/horizontal drilling out of the same wells.

The ILUA was executed when hydraulic fracturing was not a well-known or topical issue in central Australia. Since then there have been a moratorium and two separate inquiries into hydraulic fracturing in the NT, as well as intensive public debate. Hydraulic fracturing is often raised with the CLC as a significant issue of concern by traditional owners and it is a well-known issue of public interest. It was disappointing then, that the potential future use of hydraulic fracturing by Santos in the Southern Amadeus basin was not raised at our December 2021 meeting, and instead was included with no other notice within the work program received in January 2022.

The CLC's position is not for or against hydraulic fracturing. Instead we ensure traditional owners are supported to make informed decisions about their country, take instructions and represent those views on their behalf.

Traditional owners have not been consulted on and did not explicitly agree to the use of hydraulic fracturing as part of the ILUA process. The CLC strongly encourages Santos to follow international best practice, and seek the free prior informed consent of native title holders and any affected communities prior to further planning or development of a fracture program. The CLC would assist with this process. Investment by Santos in this process now would contribute to establishing a relationship that needs to be maintained through the life of this project.

The CLC is happy to discuss ways that this consultation process could be achieved. CLC would also like to know from Santos the position it would take if such consultation indicated that traditional owners do not support hydraulic fracturing on their land.

We suggest a meeting to discuss these matters. I look forward to your response.

Regards

[redacted]

MANAGER - MINERALS AND ENERGY
Central Land Council

27 Stuart Highway, Alice Springs NT 0870
T 08 8951 6261 **M** 0437 894 170
E 08 8958 2809
[redacted]

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4.1.2.5 2022.07.08 – 2022.07.14 | [redacted]

From: [redacted]
To:
Cc: [redacted] Kreicbergs, Haydn (Haydn)
Subject: RE: EP82, 112 & 125 - Southern Amadeus revised work program 2022
Date: Thursday, 14 July 2022 10:25:00 AM

Good Morning [redacted]

Could you please confirm that the revised work plans provided have been received and are locked into your current work schedule?

We are keen to establish with the CLC some definite consultation timeframes in the coming weeks to ensure there is clear communication on our proposed work activities with Traditional Owners.

Kind regards

Drew Rutch
Access Adviser
Cultural Heritage and Aboriginal Engagement
e QLD 4000
[redacted]

From: Rutch, Andrew (Drew)
Sent: Friday 8 July 2022 11:08 AM
To [redacted]
Cc [redacted] Kreicbergs, Haydn (Haydn)
[redacted] Sandra (Sandra) [redacted] yde,
Jonathon (Jonathon [redacted]
Subject: EP82, 112 & 125 - Southern Amadeus revised work program 2022

Good Morning Anthony and Chinwe

Please find attached the revised work program for the proposed Santos Southern Amadeus 2022 works in areas of EPs 82, 112, and 125, which are covered by an Indigenous Land Use Agreement (ILUA) executed on 18 July 2007.

As per previous discussions, Santos is providing the revised work programs for the South Amadeus and will work with CLC on further consultation regarding hydraulic fracture stimulation information.

Should you require the GIS data shapefiles, please do not hesitate to contact me on the details below.

Kind regards

Santos

Drew Rutch
Access Adviser
Cultural Heritage and Aboriginal Engagement
Environment and Access
Santos Limited, 32 Turbot Street, Brisbane QLD 4000
[redacted]
www.santos.com/

4.1.2.6 2022.08.23 – 2022.08.29 [redacted]

From: [redacted]
To:
Cc: Hyde, Jonathon (Jonathon)
Subject: ![EXT]: RE: Some further details required from the company so that we can adequately explain the proposed works to the traditional owners
Date: Monday, 29 August 2022 6:17:36 PM
Importance: High

Dear Drew and Jonathan,
Further,
when Mt Kitty 1 was drilled, was the access road in to the well site:
a) from the Stuart Highway via the existing Erldunda homestead track route (as per CLC SSCC 2013-047 sacred site clearance certificate, dated 1-7-2013), or
b) via a southern route, coming north from Victory Downs station (as per a 2011 CLC certificate, C2011-072, dated 18-10-2011)?
Please can you indicate a map or a source to show this?
Many thanks

[redacted]

MINERALS AND ENERGY OFFICER
Central Land Council
27 Stuart Highway, Alice Springs NT 0870
T 08 8951 6260
[redacted]
clc.org.au

Please note, I work part time. I'm not available on Fridays.

From: [redacted]
Sent: Monday, 29 August 2022 4:01 PM
To: 'Rutch, Andrew (Drew)' <Drew.Rutch@santos.com>; [redacted]
Cc: Hyde, Jonathon (Jonathon [redacted]
Subject: RE: Some further details required from the company so that we can adequately explain the proposed works to the traditional owners

Thanks Drew, very helpful.
I wonder: please could you send photos of the Dukas 1 well in operation?

From: Rutch, Andrew (Drew [redacted]
Sent: Monday, 29 August 2022 9:44 AM
To: [redacted]
Cc: [redacted] Hyde, Jonathon (Jonathon) <Jonathon.Hyde@santos.com>
Subject: RE: Some further details required from the company so that we can adequately explain the proposed works to the traditional owners

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know the sender, and are sure the content is safe. Forward any suspicious messages to **Suspect Mail**

Hi [redacted]

Further to our phone calls on Friday.

I have provided responses to the dot points with the limited information we have and attached reference material for the queries. It is Santos' approach to be guided by Traditional Owners as to where cultural heritage exists in the project areas and to make appropriate adjustments to planned activities so as to avoid impacts.

Ultimately a proportion of the information requested will be in the draft (Environmental Management Plan) EMP which Santos must consult on and provide a draft for Traditional Owner review.

- Turkey nest locations and dimensions; locations will only be determined once Santos knows where it can construct them, this is also the case for pits/ bores/ access routes. The size of these nests is yet to be determined as the area of disturbance will be determined by areas cleared eg. See attached the Dukas 1 Well site layout as each of the two nests are approximately 35 metres in diameter.
- The approx. water usage numbers for now are –
  - EP125 (Kitty) 35ML (Mega Litres); EP82 (Mahler) 79ML; EP112 (Dukas) 36ML – Santos will comply with its Water Licence and maybe subject to change
  - A large amount will be used for the development of access tracks

- The approx. number of gravel pits for now are-
  - Mt Kitty upto 25 pits (a combined total of both new and existing)
  - Mahler upto 45 pits (a combined total of both new and existing)
  - Dukas upto 40 pits (a combined total of both new and existing)

- The maximum drill radius is dependant on information collected once on the ground.

- There is currently no designed camp / drill location layout as previously mentioned it will be depend on the feedback of soil makeup to establish structures and most importantly if heritage exists in the general location nominated for the well activities/ pits/ bores/access routes. Attached is a general picture of a well site with assets setup around it.

- Attached an aerial image of Dukas 1 well site with the extra structures and pits. The well tower is laying down in this image. A line showing approx. length measures is drawn to show the general size of the location.

Regards

Drew Rutch
Access Adviser
Cultural Heritage and Aboriginal Engagement
Santos Limited, Brisbane QLD 4000

[redacted]

From: [redacted]
Sent: [redacted]
To: Kreicbergs, Haydn (Haydn [redacted] utch, Andrew (Drew) [redacted]
Cc: [redacted]
Subject: ![EXT]: FW: Some further details required from the company so that we can adequately explain the proposed works to the traditional owners

Haydn,
Are you able to provide requested information in relation to Dukas EP112 and Mount Kitty 125

Re: Some further details required from the company so that we can adequately explain the proposed works to the traditional owners

In relation to Dukas EP112 and Mount Kitty 125 can you please ask the company to provide the following further work program details:

- Identify with GPS points the proposed bores and associated dam/turkey nests along with the area/dimensions *(Refer Santos Work Program Attachment 1 : Table 1. Summary of proposed Work program - F)*
- Provide upper limit of how much water they anticipate using from local bores *(Refer Santos Work Program Attachment 1 : Table 1. Summary of proposed Work program - F)*
- Any proposed gravel pits and their area/dimensions and upper limit amount of soils and gravel to be used *(Refer Santos Work Program Attachment 1 : Table 1. Summary of proposed Work program - C)*
- Details regarding the maximum radius of Drill holes *(Refer Santos Work Program Attachment 1 : Table 1. Summary of proposed Work program - C)*
- A visual/drawn diagram of the drill site with an interpretive key (identifying demountables/camp, drill area and related infrastructure, water storage, chemical storage, slurry pond, etc.). *(Refer Santos Work Program Attachment 1 : Table 1. Summary of proposed Work program - C)*
- Photo of the drill camp that can be printed in A4 that are suitable to show *(Refer Santos Work Program Attachment 1 : Table 1. Summary of proposed Work program - C)*
- Photos of major pieces of equipment used that can be printed in A4 that are suitable to show *(Refer Santos Work Program Attachment 1 : Table 1. Summary of proposed Work program - C)*

Cheers

[redacted]

MINERALS AND ENERGY OFFICER
Central Land Council
27 Stuart Highway, Alice Springs NT 0870

T 08 8951 6247
F 08 8958 2809
[redacted]
clc.org.au

From: [redacted]
Sent: Wednesday, 24 August 2022 1:56 PM
To: [redacted]
Cc: [redacted]
Subject: FW: Some further details required from the company so that we can adequately explain the proposed works to the traditional owners

Hi [redacted] following the conversation this morning I have forwarded the further information required for the work programs for EP112 and EP125 for next week.

Please refer to my email below.

[redacted]

ANTHROPOLOGIST - SOUTH CENTRAL REGION
27 Stuart Highway Alice Springs NT 0870
[redacted]

From: [redacted]
Sent: Tuesday, 23 August 2022 10:03 AM
To [redacted]
Cc: [redacted]
Subject: Some further details required from the company so that we can adequately explain the proposed works to the traditional owners

H [redacted]

Re: Some further details required from the company so that we can adequately explain the proposed works to the traditional owners

In relation to Dukas EP112 and Mount Kitty 125 can you please ask the company to provide the following further work program details:

- Identify with GPS points the proposed bores and associated dam/turkey nests along with the area/dimensions *(Refer Santos Work Program Attachment 1 : Table 1. Summary of proposed Work program - F)*
- Provide upper limit of how much water they anticipate using from local bores *(Refer Santos Work Program Attachment 1 : Table 1. Summary of proposed Work program - F)*
- Any proposed gravel pits and their area/dimensions and upper limit amount of soils and gravel to be used *(Refer Santos Work Program Attachment 1 : Table 1. Summary of proposed Work program - C)*
- Details regarding the maximum radius of Drill holes *(Refer Santos Work Program*

Attachment 1 : Table 1. Summary of proposed Work program - C)

- A visual/drawn diagram of the drill site with an interpretive key (identifying demountables/camp, drill area and related infrastructure, water storage, chemical storage, slurry pond, etc.). *(Refer Santos Work Program Attachment 1 : Table 1. Summary of proposed Work program - C)*
- Photo of the drill camp that can be printed in A4 that are suitable to show *(Refer Santos Work Program Attachment 1 : Table 1. Summary of proposed Work program - C)*
- Photos of major pieces of equipment used that can be printed in A4 that are suitable to show *(Refer Santos Work Program Attachment 1 : Table 1. Summary of proposed Work program - C)*

Cheers

[redacted]

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4.1.2.7 **2022.08.24 – 2022.08.29 |** [redacted]

From: [redacted]
To: g y n (Haydn)
Cc: [redacted]
Subject: ![EXT]: RE: Cost estimate for approval - Mt Kitty 2, Dukas 2, Mahler wells
Date: Monday, 29 August 2022 10:26:16 AM

Thanks Haydn.
Regards [redacted]

[redacted]
MINERALS AND ENERGY OFFICER
Central Land Council
27 Stuart Highway, Alice Springs NT 0870
T 08 8951 6260
F 08 8958 2809
[redacted]
clc.org.au

Please note, I work part time. I'm not available on Fridays.

From: Kreicbergs, Haydn (Haydn [redacted]
Sent: Monday, 29 August 2022 9:31 AM
To [redacted]
Cc: [redacted] utch, Andrew (Drew)
[redacted]
Subject: RE: Cost estimate for approval - Mt Kitty 2, Dukas 2, Mahler wells

Hi [redacted]

Approved.

Kind Regards
Haydn

Santos

Haydn Kreicbergs
Manager Cultural Heritage, Aboriginal Engagement & Land
Santos Limited, 32 Turbot Street Brisbane QLD 5000
[redacted]
santos.com

From [redacted]
Sent: Monday, 29 August 2022 9:30 AM
To: Kreicbergs, Haydn (Haydn [redacted]
Cc: [redacted]
Subject: ![EXT]: RE: Cost estimate for approval - Mt Kitty 2, Dukas 2, Mahler wells
Importance: High

Dear Haydn,

Please can you respond in writing?
Many thanks.

[redacted]
MINERALS AND ENERGY OFFICER
Central Land Council
27 Stuart Highway, Alice Springs NT 0870
T 08 8951 6260
F 08 8958 2809
[redacted]
clc.org.au

Please note, I work part time. I'm not available on Fridays.

From [redacted]
Sent: Wednesday, 24 August 2022 5:13 PM
To: Kreicbergs, Haydn [redacted]
Cc: [redacted]
Subject: Cost estimate for approval - Mt Kitty 2, Dukas 2, Mahler wells

Dear Haydn,
Attached is a cost estimate to cover 3 clearances for Santos, totalling $65,141.
Actual costs will be charged and CLC will work to minimise costs as practicable.
The Mt Kitty 2 and Dukas 2 work is planned for next week.
Any queries, please call me or [redacted]
Regards,
[redacted]

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4.1.2.8 2022.10.05 – 2022.10.31 | [redacted]

From: [redacted]
To: Rutch, Andrew (Drew)
Cc: [redacted] Hyde, Jonathon (Jonathon); Kreicbergs, Haydn (Haydn)
Subject: ![EXT]: FW: Key points for Santos re: Amadeus work program meetings
Date: Monday, 31 October 2022 2:50:50 PM
Importance: Low

Hello Drew,

Following on from the email below, can you please provide information relating to the employment opportunities that will be available for local Aboriginal community members throughout this project. The employment support team works closely with Traditional Owners and relevant project partners to support people into jobs and training as articulated within the Indigenous Land Use Agreement (Employment, Training and Aboriginal Contractors clause).

Our employment support team works closely with the local CDP providers, training providers and other service providers within community to support local Aboriginal people into employment.

As mentioned below, please provide information relating to the employment opportunities as soon as you can. By providing this information in a timely manner it allows the employment support team to work closely with local CDP providers and local Aboriginal community members to promote jobs and provide the relevant training required for the positions.

Information required:

- Job descriptions or information about the type of work.
- Information on the relevant tickets and licenses required for the type of work.
- The number of job opportunities available and the location in which the work is available.
- Information relating to remuneration and hours of work.
- Information relating to the rostered work (if applicable).

If you have any queries relating to the above, I am available to schedule a meeting or have a phone call to discuss further.

Kind regards,

[redacted]
EMPLOYMENT FACILITATOR
Central Land Council
27 Stuart Highway, Alice Springs NT 0870
T 08 8951 0660
F 08 8958 2813
E toni.facer@clc.org.au
clc.org.au

From [redacted]
Sent: Wednesday, 12 October 2022 11:42 AM
To: Rutch, Andrew (Drew) [redacted]
Cc [redacted] yde, J th (J th) [redacted] reicbergs, Haydn (Haydn [redacted]
Subject: RE: Key points for Santos re: Amadeus work program meetings
Importance: Low

Hi Drew
The CLC thanks Santos for the effort put into the meetings and information provided. Both information sessions were very informative. The CSIRO sessions were excellent with good discussion about hydraulic fracturing. The CLC notes that Santos emphasised that use of hydraulic fracturing is not planned for this work programme and Santos agreed to come back and present again should fraccing be planned in the future.

The CLC agrees with the six dot points you list as the key points from the meetings. Please keep the CLC updated on any progress through Raelene.
Drilling EMPs should be forwarded ASAP including any background studies such as water quality monitoring and fauna and flora surveys.

Regarding employment, the long lead times before the drilling of the wells and related civil works, should [redacted]ide a great opportunity to progress local Aboriginal employment. To this end, the contact details o [redacted] the CLC Employment Facilitator are included in this email [redacted] Please contact her directly and include [redacted] phone number is [redacted]

Kind regards
[redacted]

[redacted]
MINERALS AND ENERGY OFFICER
27 Stuart Highway, Alice Springs NT 0870
T 08 8951 6243

From: Rutch, Andrew (Drew) [redacted]
Sent: Wednesday 5 October 2022 12:23 PM
To [redacted]
Cc [redacted] yde, Jonathon (Jonathon) [redacted] reicbergs, Haydn (Haydn [redacted]
Subject: Key points for Santos re: Amadeus work program meetings

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Afternoon [redacted]

Please note below the actions that Santos has taken from last week's community consultations to support the next phase of the southern Amadeus work program.

The community meetings were held at the following locations.

- Imanpa (Tues 27th) and,
- Titjikala (Thurs 29th)

For context, these meetings were key requirements under the Indigenous Land Use Agreement in place with

the Native Title Parties and the Environmental Management Plan approval process. More importantly, Tim, Jono and I felt privileged to discuss our exciting 2023-24 Work Programs with key stakeholders.

NB. The key points for Santos to follow up on:

- Investigate possibilities for re-naming/co-naming Mt Kitty to Jacko's Bore
- Investigate opportunities to support local employment via a skills audit with Titjikala employment service and possible training/up-skilling of local workforce with CLC, where possible
- Plan site visits during drilling activity
- Collate suitable information when available on the development plan/market for potential products (when known) from the wells
- Information regarding Santos' contingency plan in the event of flooding at Mahler
- Return to either community if anything changes from the current work program activities

We thoroughly appreciated your facilitation of the consultations and are confident that the CSIRO appropriately represented the science behind hydraulic fracture stimulation, even though we do not propose using this proven technique in our 2023-24 Work Programs.

Julie-Ann, are there any CLC edits to these key points from the meetings?

Kind regards

Santos

Drew Rutch
Access Adviser
Cultural Heritage and Aboriginal Engagement
Environment and Access
[redacted] urbot Street, Brisbane QLD 4000

www.santos.com/

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4.1.2.9 **2022.10.19 – 2023.03.14 |** [redacted]

From: [redacted]
To: [redacted]
Cc: Hyde, Jonathon (Jonathon); Kreicbergs, Haydn (Haydn)
Subject: RE: Amadeus projects- EP82,112 & 125 - Mahler, Dukas and Mt Kitty
Date: Tuesday, 14 March 2023 1:19:00 PM
Importance: High

Good Afternoon [redacted]

Could you please confirm an distribution date for the outstanding Sacred Site Clearance Certificates?

The specific lodged applications are -
South Amadeus EP 125 Mt Kitty 2 Program
South Amadeus EP 112 Dukas 2 Program
South Amadeus EP 82 Mahler Program

Thanks

Drew Rutch
Access Adviser
Cultural Heritage and Aboriginal Engagement
S[redacted] ne QLD 4000
[redacted]

From: Rutch, Andrew (Drew)
Sent: Wednesday 1 March 2023 11:48 AM
To: [redacted]
Cc: Hyde, Jonathon (Jonathon [redacted]
Subject: RE: Amadeus projects- EP82,112 & 125 - Mahler, Dukas and Mt Kitty

Mornin [redacted]

Thanks for your email. We have previously provided responses to questions of a similar nature on the 14 October 2022 to other CLC officers. A large amount of the information provided was included in the correspondence dated – 14 January 2022.

For clarity, none of the dot points below were asked by CLC staff prior to or at on-country meetings concerning this project, nor was it raised to this specificity in previous correspondence. I have provided answers below in yellow highlight.

Could you please provide an update on the 3x SSCC?

regards

Drew Rutch
Access Adviser
Cultural Heritage and Aboriginal Engagement
Santos Limited, Brisbane QLD 4000
t: +61 7 3838 3693

From: [redacted]
Sent: Tuesday, 28 February 2023 5:11 PM
To: Rutch, Andrew (Drew) [redacted]
Subject: ![EXT]: RE: Amadeus projects- EP82,112 & 125 - Mahler, Dukas and Mt Kitty

Hello Drew,

We are progressing the planning for the EP 82 Mahler work, and to that end I do require some more information to assist us in our consultations with NTH's. The requests relate to being able to provide the detail to achieve prior and informed consent.

In particular, could you please provide the following, so that we can inform TO's, as well as seek specific instruction;

- How many wells, including re-drills etc., are being drilled on EP 82? This is not clear. - note the work program letter provided listed under scope section 3) 1 x vertical/deviated/horizontal well at the proposed Mahler location (drill, evaluate and flow test)
- The well being drilled is called Mahler? - Yes if approved. Nothing has previously been mentioned about the name via various consultation methods.
- Is there any drilling happening at Magee? - It is an "and/or" in the work program letter but it is not currently a priority, note the work program letter provided.
- In the EWP it states, '…Preparation and upgrading existing access tracks and roads to widen 5-10m within the approved area only, with new access roads will be created where necessary to allow vehicles access to the well pad locations.' Is this 5-10m wider than they are now, or in total? - Roads/access tracks could extend up to 10m either side of a centre line (i.e. up to 20m in width). Where possible and practical new access roads will be oriented to minimise or avoid disturbance to land systems and native flora. As mentioned in the Work program documents.- Annexure 1
- What is meant by upgrade of existing lease pads? - the work program and letter provided was for all three locations which mean such statements can be collective in reference. If there is no well pad, no upgrade of existing would apply.
- Does this infer additional drilling? If so, when? - as per the work program and letter provided. Possible additional program would be informed by the results of the campaign across all three locations.
- In the EWP it states, 'Drilling and flow testing from the wells', this is plural. Only one well? the work program provided was for all three locations which mean such statements are inclusive. note the work program letter provided listed under "scope" section 3.
- With regards to flaring, what is this (in your context) and how would we describe this to TOs? A flame extending from a pipe used to burn excess gas escaping from the well site (like a kerosene lamp) and to ensure flammable gases are safely and efficiently handled. It will be subject to rigorous environmental management plan approvals.
- What are the designs and dimensions of turkeys nests, so we can inform TOs. – Undetermined, these will be identified when CH is addressed and CH has informed us where activities can occur.
- How many turkeys nests? Undetermined, these will be identified when CH is addressed and CH has informed us where activities can occur.
- Please estimate total water use, broken down by sub-category of use, so we can inform

TOs - The water taken from water bores is limited by provisions of the NT Government Water Act and/or conditions of the relevant water extraction licences. Water will dominantly be used for civils activity, such as building the access track, for access track maintenance and dust suppression, with minor volumes used in drilling.

- Can you describe load-out facilities that you say may be constructed – a load-out or laydown yard is effectively a cleared pad and allows for the storage of equipment and materials required for the drilling phase in close proximity to the well pad
- Describe the fencing you plan to do, dimensions etc. so that we can inform TOs Undetermined, these will be identified when infrastructure locations are confirmed and CH has informed us where activities can occur. This impacts the length and locations of the fencing. subject to potential environmental management also.
- Please provide the potential gravel pit locations, so TOs can provide specific instructions - Undetermined, these will be identified when CH is addressed and CH has informed us where we can and cannot undertake activities.
- Please provide the potential locations of new water bores, so we can inform TOs - Undetermined, these will be identified when CH is addressed and CH has informed us where activities can occur.

Thanks, in advance

[redacted]
MANAGER - MINERAL AND ENERGY
Central Land Council
27 Stuart Highway, Alice Springs NT 0870
T 08 8951 6261 [redacted]
F 08 8958 2809
[redacted]
clc.org.au

From: Rutch, Andrew (Drew [redacted]
Sent: Tuesday 14 February 2023 10:15 AM
To: [redacted]
Cc: [redacted]
Subject: RE: Amadeus projects- EP82,112 & 125 - Mahler, Dukas and Mt Kitty
Importance: High

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Good Morning [redacted]

I hope you are well.

Could you please provide an expected date for the issuing of SSCC for the P82,112 & 125 - Mahler, Dukas and Mt Kitty?

Kind regards

Drew Rutch
Access Adviser
Cultural Heritage and Aboriginal Engagement
Santos Limited, Brisbane QLD 4000
[redacted]

From: [redacted]
Sent: Friday, 3 February 2023 5:11 PM
To: Rutch, Andrew (Drew) [redacted]
Cc: [redacted]
Subject: ![EXT]: RE: Amadeus projects- EP82,112 & 125 - Mahler, Dukas and Mt Kitty

Good Afternoon Drew,

This is a priority, my manager is assisting with this and will have the SSCC's to you as soon as possible.

[redacted]

MINERALS AND ENERGY OFFICER
Central Land Council
27 Stuart Highway, Alice Springs NT 0870
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F 08 8958 2809
E raelene.martin@clc.org.au
clc.org.au

From: Rutch, Andrew (Drew [redacted]
Sent: Friday, 3 February 2023 9:49 AM
To: [redacted]
Cc: [redacted]
Subject: RE: Amadeus projects- EP82,112 & 125 - Mahler, Dukas and Mt Kitty
Importance: High

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Good Morning [redacted]

Could please provide an update on our applications for Sacred Site Clearance Certificates?

regards

Drew Rutch
Access Adviser
Cultural Heritage and Aboriginal Engagement
Santos Limited Brisbane QLD 4000
[redacted]

From: Rutch, Andrew (Drew)
Sent: Tuesday, 24 January 2023 4:44 PM
To: Raelene Martin [redacted]
Cc [redacted]
Subject: RE: Amadeus projects- EP82,112 & 125 - Mahler, Dukas and Mt Kitty
Importance: High

Good Afternoon [redacted]

Happy New Year to you. I hope you have had a good break.

Could you please provide an update on the outstanding reports from the field based surveys and consultations in 2022 which have been conducted for **Dukas** and **Mt Kitty** aka. Jacko's Bore, when should Santos expect the SSCC to be issued?

Can you provide an update regarding our Tijikala consultations in 2022 concerning the **Mahler** site**,** have the on-country surveys taken place?

Are there any other Traditional Owners for this area who were not at the consultation?

Could you also update Santos as to when these SSCC's will be issued?

Kind regards

Drew Rutch
Access Adviser
Cultural Heritage and Aboriginal Engagement
Santos Limited Brisbane QLD 4000
[redacted]

From: [redacted]
Sent: Thursday 15 December 2022 2:23 PM
To: [redacted]
Subject: ![EXT]: RE: Amadeus projects- EP82,112 & 125 - Mahler, Dukas and Mt Kitty

Hi Drew,

Once I receive them I will work through them, this is in progress, I will keep in informed.

You keep safe too

[redacted]

MINERALS AND ENERGY OFFICER
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27 Stuart Highway, Alice Springs NT 0870
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E raelene.martin@clc.org.au
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From: Rutch, Andrew (Drew [redacted]
Sent: Wednesday, 14 December 2022 9:27 AM
To: [redacted]
Subject: RE: Amadeus projects- EP82,112 & 125 - Mahler, Dukas and Mt Kitty

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Mornin [redacted]

Any news on the outstanding SSCCs?

Regards

Drew Rutch
Access Adviser
Cultural Heritage and Aboriginal Engagement
Santos Limited, Brisbane QLD 4000
[redacted]

From: [redacted]
Sent: Tuesday, 6 December 2022 2:35 PM
To: Rutch, Andrew (Drew) [redacted]
Subject: ![EXT]: RE: Amadeus projects- EP82,112 & 125 - Mahler, Dukas and Mt Kitty

Good afternoon Drew,

I am also seeking a response like you, Once I receive it, I will keep you informed in regards to Mt Kitty – EP 125 and Dukas EP 112.

Keep safe

[redacted]

[redacted]

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Central Land Council
27 Stuart Highway, Alice Springs NT 0870
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F 08 8958 2809
[redacted]
clc.org.au

From: Rutch, Andrew (Drew [redacted]
Sent: Tuesday, 6 December 2022 12:10 PM
To: Raelene Martin [redacted]
Subject: RE: Amadeus projects- EP82,112 & 125 - Mahler, Dukas and Mt Kitty
Importance: High

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Afternoon [redacted]

I trust you are well.

I am seeking an update on the outstanding SSCC for the following project areas, noting the email below?

Mt Kittty
Dukas #2

Thanks

Drew Rutch
Access Adviser
Cultural Heritage and Aboriginal Engagement
Santos Limited, Brisbane QLD 4000
[redacted]

From: Rutch, Andrew (Drew)
Sent: Wednesday, 19 October 2022 9:20 AM
To: [redacted]
Cc: [redacted]
Subject: Amadeus projects- EP82,112 & 125 - Mahler, Dukas and Mt Kitty
Importance: High

Morning [redacted]

I hope you are well.

I am following up the lodged work programs listed below for the Sacred Site Clearance Certificates, as I am aware the process has progressed.

The specific lodged applications are -
South Amadeus EP 125 Mt Kitty 2 Program
South Amadeus EP 112 Dukas 2 Program
South Amadeus EP 82 Mahler Program

I understand the field based surveys and consultations have been conducted for **Dukas** and **Mt Kitty** aka. Jacko's Bore, when should Santos expect the SSCC to be issued?

I understand since the Tijikala consultations, the **Mahler** on country surveys is due to take place, could you also update me as to when this SSCC will be issued?

For your knowledge we are concurrently engaging with the Aboriginal Areas Protection Authority (AAPA) and they may contact CLC shortly regarding these same applications.

It is Santos' intentions to progress other regulatory submissions for approval in early November.

I look forward to your reply.

Kind regards

Drew Rutch
Access Adviser
Cultural Heritage and Aboriginal Engagement
Santos Limited, Brisbane QLD 4000
[redacted]

Santos Ltd A.B.N. 80 007 550 923
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4.1.2.10 ***2023.01.24 |*** [redacted]

From: David Young
To: Rutch, Andrew (Drew)
Subject: ![EXT]: Email contact
Date: Tuesday, 24 January 2023 3:06:22 PM

[redacted] – Acting Manager of M and E section

[redacted]

MINERALS AND ENERGY OFFICER
Central Land Council
27 Stuart Highway, Alice Springs NT 0870
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[redacted]
clc.org.au

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4.1.2.11 2023.02.09 | [redacted]

From: [redacted]
To: [redacted] ew)
Cc: [redacted]
Subject: ![EXT]: Phone call - Santos local employment
Date: Thursday, 9 February 2023 9:54:59 AM
Attachments: Ranger Works_Capability Statement_2020 21.PDF

Hi Drew,

Thanks you for the phone call the other day.

Please find further information in regards to our discussion on the phone:

- Ranger Works – attached capability statement
- Northern Territory Indigenous Business Network - Members List · NTIBN Portal

In regards to Dukkis and Mount Kitty please keep me in the loop as this work progresses, that way we can work collaboratively on referrals and supporting local Aboriginal people into work.

Once you can confirm the following information below, please email through:

- Work commencement and duration
- Job descriptions or information about the type of work.
- Information on the relevant tickets and licenses required for the type of work.
- The number of job opportunities available and the location in which the work is available.
- Information relating to remuneration and hours of work.
- Information relating to the rostered work (if applicable).

In regards to on the ground suppor [redacted] who oversees that CDP program in Mutitjulu and Imanpa will be able to assist us with referrals and work readiness support where required.

[redacted]

If you have any queries with the above information or would like to discuss anything further relating to employment and procurement, happy to schedule some time.

Kind regards,

[redacted]
EMPLOYMENT FACILITATOR
Central Land Council
27 Stuart Highway, Alice Springs NT 0870
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F 08 8958 2813
[redacted]
E.

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4.1.2.12 2023.05.03 – 2023.05.08 | [redacted]

From: [redacted]
To: Rutch Andrew (Drew)
Cc: [redacted] Kreicbergs, Haydn (Haydn); Hyde, Jonathon (Jonathon); Anderson, Ron
Subject: ![EXT]: RE: CLC Sacred Site Clearance Certificate No C2022-019 - Santos Ltd Mount Kitty Project
Date: Monday, 8 May 2023 11:44:03 AM

Hello Drew,

Thank you for your email. I have tried to call you, but have not been able to connect.

With regards to your queries;

A. You are correct, and the phrase should read Jacko's **Bore** drill site. Importantly, and as you state, it is requested that the project not be referred to as Mt Kitty.
B. Reference is included, by way of the planned works submitted by Santos, included in annexure B. A summary of those works are provided in the 'Proposed Works' section. The 'Special Conditions' section details the conditions imposed on the proposed works, which includes, 'Within RWA 1...no horizontal drilling is permitted'. The SSCC reflects the instructions of TO's.
C. Happy to discuss further.

With regards to the Mahler SSC, internal resources have been allocated and a series of dates proposed (June, July and September). As soon as a date has been confirmed you will be advised.

With regards to the Dukkas 2 SSCC, the certificate is being finalised. The access issue remains.

I am available for discussion at any time.

Kind regards,

[redacted]
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Central Land Council
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F 08 8958 2809
[redacted]
clc.org.au

From: Rutch, Andrew (Drew [redacted]
Sent: Thursday, 4 May 2023 11:54 AM
To: [redacted]
Cc: [redacted] reicbergs, Haydn (Haydn) [redacted] Hyde, Jonathon (Jonathon) [redacted] Anderson, Ron [redacted]
Subject: RE: CLC Sacred Site Clearance Certificate No C2022-019 - Santos Ltd Mount Kitty Project

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Good Afternoon [redacted]

Thankyou for the Mt Kitty (Jacko's Bore) SSCC. We note there are some issues in relation to the correspondence which creates some confusion for Santos and we would like to resolve as soon as possible.

I have outlined below the matters which immediately stand out as an area of concern within the correspondence–

A> The letter states *the request of Traditional Owners is to call the site Jacko's Drill Site.* When Santos attended the on country meetings with CLC facilitating in 2022, the request was made to refer to the Mt Kitty project as "Jacko's Bore" to ensure it did not confuse community as to the location and whose country it was. Santos confirmed this outcome with CLC officers in attendance and progressed a project name change based on these wishes with the Northern Territory Government and documentation/ notation in the project's subsequent Environmental Management Plan. This is also reflected on page 6 of your pdf certificate document.

B> There is also no reference to the intended activity of deviated/horizontal drilling for the project which Santos provided in the work plan scope and spoke about whilst meeting on country in 2022. It was not raised as a concern nor mentioned as unacceptable before or during these engagements. Why has this not been included in the list of certificate activities?

C> The referral to *Alternative Subject Land (ASL)* as a solution in dot point two of the certificate conditions is challenging. To undertake activities in this CLC permitted area is inconsistent with the AAPA certificate provided to Santos and does not provide the same alternatives. This ASL maybe inconsistent with our agreed land access conditions and would require environmental approvals for those mentioned activities to occur in the noted area too.

Could CLC please note our queries and provide clarity on the issued certificate?

We are happy to meet and provide further explanation.

Also could you please provide an update on the Mahler SSCC, the Dukas 2 SSCC access issue escalated for resolution.

Kind regards

Drew Rutch
Access Adviser
Cultural Heritage and Aboriginal Engagement
Santos Limited Brisbane QLD 4000
[redacted]

From: [redacted]

Sent: Wednesday, 3 May 2023 12:05 PM
To: Kreicbergs, Haydn (Haydn [redacted]
Cc: Rutch, Andrew (Drew) [redacted]

Subject: CLC Sacred Site Clearance Certificate No C2022-019 - Santos Ltd Mount Kitty Project

Good morning,

Please find attached the following documents:

- CLC Sacred Site Clearance Certificate No. C2022-019;
- A3 Map 2022-030o for emailing purposes only, a signed AO map will be sent with the original documents;
- Excel spreadsheet with coordinates for Map 2022-030o; and
- Shape files.

Should you have any queries, please do not hesitate to contact me.

Kind regards,

[redacted]
SENIOR ADMINISTRATION OFFICER - MINERALS AND ENERGY
Central Land Council
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F 08 8958 2809
[redacted]
clc.org.au

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4.1.3 Core Uranium

4.1.3.1 *Proposal Letter & Engagement Pack*

Santos

Santos QNT Pty Ltd
A.C.N. 083 077 196
Level 22, Santos Place
32 Turbot Street
Brisbane QLD 4000
Telephone: (07) 3838 3000
Facsimile: (07) 3838 3700

9 June 2023

[redacted]

Core Uranium Limited

[redacted]

Dear [redacted]

Proposed Jacko Bore 1DW1 Drill & Test Activity – Stakeholder Engagement under Environment Management Plan

We write for the purposes of stakeholder engagement regarding activity Santos QNT Pty Ltd (Santos) is proposing, where the environmental impacts or risk of the activity may affect Core Uranium Limited's (Core) rights or activities.

Santos is the operator of petroleum Exploration Permit 125 (EP 125), on behalf of a Joint Venture including Peak Helium (Amadeus Basin) Pty Ltd and Ordiv Petroleum Pty Ltd, which overlaps with Mineral Exploration Licence EL 32974 and the application for Mineral Exploration Licence EL 32971. According to Spatial Territory Resource Information Kit for Exploration (STRIKE), Core is the operator for ELs 32974 and 32971.

Santos is proposing to drill and test one helium appraisal well (Jacko Bore 1DW1) on an existing well pad, in the vicinity of ELs 32974 and 32971, as shown in the attached map (Attachment 1). Before undertaking this activity, Santos is required, under the *Petroleum (Environment) Regulations 2016,* to have in place an environment management plan (EMP), which first requires stakeholder engagement in relation to the regulated activity we propose.

Santos is hereby notifying you of our intent to conduct the abovementioned activity in the location indicated on the attached map and described within the Engagement Pack provided as Attachment 2. The intention is for operations to commence from December 2023 and is expected to be completed by September 2025, subject to obtaining requisite regulatory approvals.

Attachment 2 contains further information about the regulated activity proposed, the proposed activity location, the anticipated environmental impacts and environmental risks of the activity, the proposed environmental outcomes in relation to the activity, and possible consequences of carrying out the activity as may be relevant to Core's rights or activities. As noted above, the proposed activity may have possible consequences for Core in executing its rights or activities due to the abovementioned overlapping tenures, including insofar as we propose to use an access track that runs through EL 32974. On that note, we expect that the vast majority of heavy vehicle movements

Santos

are to be completed by April 2024 with minor light vehicle movements thereafter.

We would welcome the opportunity to consult with Core regarding our proposed regulated activity, including about possible consequences for Core's rights or activities such as whether and how the activity may affect Core's planned operations. It would be greatly appreciated if you please acknowledge receipt of this letter and indicate whether you require further information before Wednesday, 15 June 2023.

If you have any queries or otherwise wish to further discuss consultation regarding the proposed regulated activity, please do not hesitate to contact Jonathon Hyde, Lead Amadeus, o [redacted] or Jonathon.hyde@santos.com. Again, we ask that such contact please be made by 15 June 2023.

Yours sincerely,

Jonathon Hyde
Lead Amadeus
Santos QNT Pty Ltd

Santos

Attachment 1: Proposed Jacko Bore 1DW1 activity with overlapping Minerals Exploration Licence (EL32974) and Licence Application (EL32971)

Santos

Attachment 2: Jacko Bore 1DW1 (previously referred to as Mt Kitty 2) Stakeholder Engagement Pack

EP125 (Jacko Bore 1DW1) December 2023-September 2025 Work Program

Engagement Pack

(provided 9/6/2023)

Santos

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Santos

1 Purpose

Santos QNT Pty Ltd (**Santos**) has submitted an Environmental Management Plan (**EMP**) in support of the proposed 2023-2025 activities in Exploration Permit (**EP**) 125. EP 125 overlaps with Mineral Exploration Licence EL 32974 and the application for Mineral Exploration Licence EL 32971. According to Spatial Territory Resource Information Kit for Exploration (STRIKE), Core Uranium Limited (**Core**) is the operator for ELs 32974 and 32971. Santos delivers this document to Core to provide an understanding of:

a. The regulated activity the interest holder proposes to carry out (Section 2),
b. The locations where it is proposed to carry out the activity (Section 2),
c. The timeline of the proposed activity (Section 3),
d. The potential environment impacts, risks, controls, and environmental outcomes of the activity (Section 4),
e. The possible consequences of carrying out the activity to rights or activities (Section 5), and
f. A proposed plan for ongoing engagement (Section 5).

Santos proposes that any questions for feedback to the information provided in this pack is formalised via the form included in Appendix A. Santos will ensure that all responses are reviewed, and feedback provided as appropriate. Santos also offers a face-to-face meeting with the stakeholder where subject matter experts can present the information in this pack and answer any questions. It should also be noted that Santos is committed to ongoing stakeholder engagement and discussion throughout the life of the activities.

1.1 Background

Santos QNT Pty Ltd, a subsidiary of Santos, is Operator of the EP 125 Joint Venture in the Amadeus Basin and is actively exploring the permit with co-venturers Peak Helium (Amadeus Basin) Pty Ltd (**Peak**) and Ordiv Petroleum Pty Ltd, a subsidiary of Central Petroleum Ltd (**Central**) (*Figure 1*). The acreage was originally granted by the NT Minister for Mines and Energy under the *Petroleum Act* on 21 July 2005.

Since becoming Operator of EP 125 in 2013, Santos has acquired and processed 646 kilometres of seismic within the permit, followed by the drilling of Jacko Bore 1 (previously named Mt Kitty 1) in September 2013.

This Engagement Pack provides information in relation to the proposed activities in the vicinity of ELs 32974 and 32971 throughout 2023-25. This pack provides a detailed description of Santos' activities and how Santos proposes to manage the environmental impacts and risks associated with its activities, including how it will address its regulatory obligations and relevant Inquiry Recommendations that have underpinned the Code of Practice: Onshore Petroleum Activities in the Northern Territory (**the Code**). This pack aims to leverage off and simplify information within the EMP that has been submitted to DEPWS for assessment and approval.

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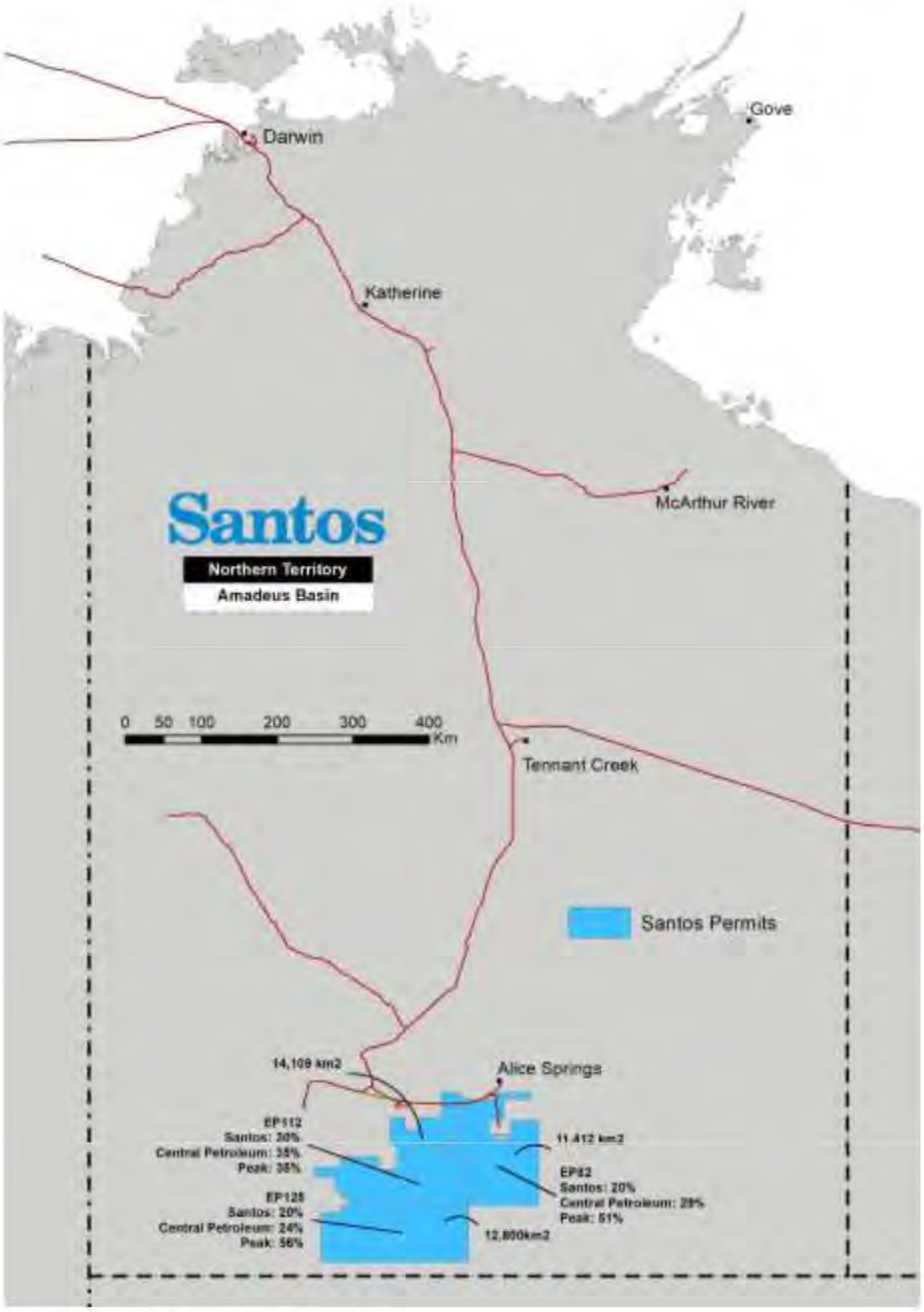

Figure 1: Location of related Santos Permit Area

Santos

2 Description and Location of the Regulated Activities

2.1 Santos has submitted an EMP seeking approval for:

a. Drilling of water bores:

- Installation of water production monitoring equipment and water bore headworks
- Groundwater extraction in accordance with Water Extraction Licence conditions.

Re-entry of Jacko Bore 1 well to kick-off and drill a deviated/horizontal sidetrack:

- The scope of the well will include drilling, evaluating and a flow test for up to 365 days.

c. Associated road, civil works and water bores.

2.2 The following scope of work is required to complete the key activities:

b. Civil engineering activity – upgrade of existing and creation of new access tracks, construction of an upgraded lease pad at Jacko Bore 1, and water extraction as required (note that water extraction requires a Water Extraction License to be in place and adhered to), identification and utilisation of existing borrow pits.

c. Exploration drilling (and associated infrastructure, e.g. drilling sumps).

d. Well evaluation – including wireline logging, formation testing, core acquisition, fluid sampling, open-hole formation testing, and other standard oilfield evaluation techniques as deemed appropriate.

e. Flow-back and production testing.

f. Well suspension and/or well decommissioning of the new well.

g. Ongoing site and well maintenance and monitoring, work-over and re-entry, and evaluation as required.

h. Water bore construction.

i. Groundwater sampling from existing nominal water bores (if present) and the installed bores subject to the proposed work program.

j. Operation of a camp during petroleum activities.

k. Subsequent and/or ongoing low impact activities include:

- Well maintenance, integrity checks and monitoring,
- Bore maintenance and flow monitoring,
- Access track maintenance,
- Plugging and/or abandonment of the well(s),
- Decommissioning of the well(s), and
- Rehabilitation activities.

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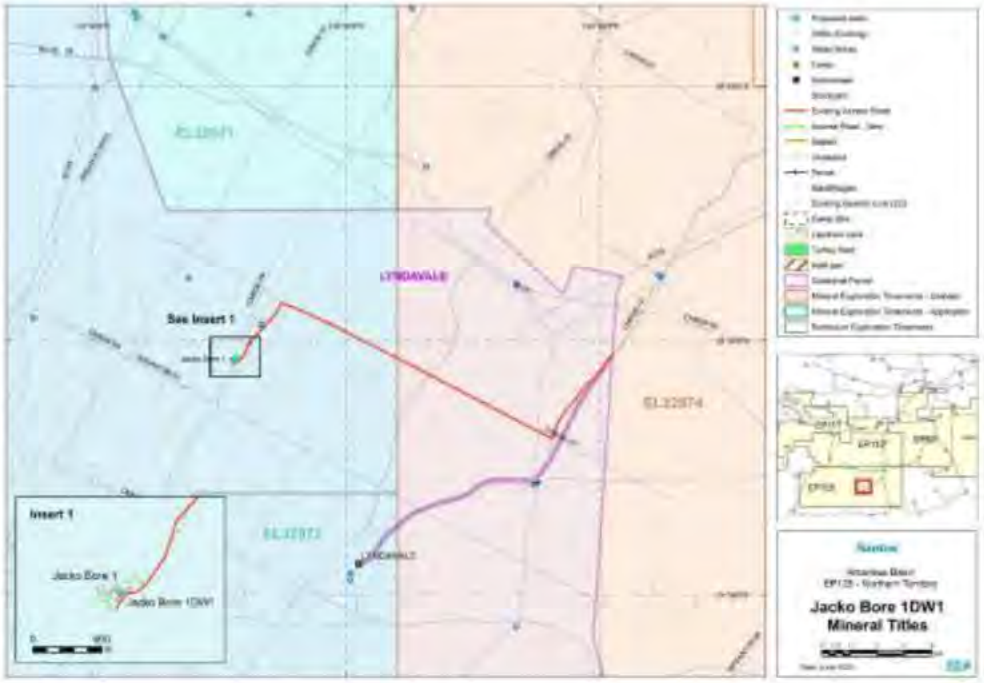

Figure 2: Jacko Bore 1DW1 location, including proposed access track, relative to overlapping Minerals Titles

The proposed location for infrastructure is within the Central Land Council (**CLC**) and Aboriginal Areas Protection Authority (**AAPA**) cleared subject land areas. It is noted that the nominated areas for infrastructure may change slightly to minimise environmental and heritage impacts. Such modifications will be made within the cleared survey areas.

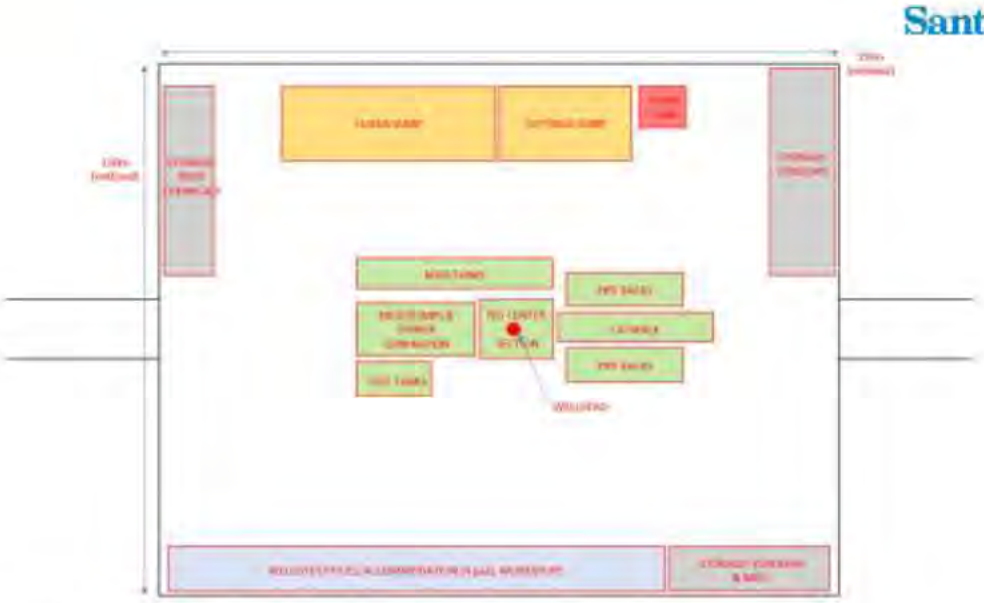

Figure 3: Conceptual lease schematic

Note: Figure 3 is a generic lease schematic which gives an indication of the potential lease layout on this well.

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3 Activity Timeline

Subject to approvals (e.g. environmental), activity at the Jacko Bore 1DW1 location is expected to commence in **Q4-2023** with the upgrade of the well lease pad, access tracks and water extraction bores.

The drilling of the Jacko Bore 1DW1 well is expected to follow this from **Q1-2024**.

Ensuing activity is dependent on the evaluation results of the Jacko Bore 1DW1 well, therefore two potential outcomes exist (1Q2024):

(i) Case and suspension of the Jacko Bore 1DW1 well

Subsequent possible extended flow test, for up to 365 days, through to ~3Q2025

(ii) Plug and Abandon Jacko Bore 1DW1 well

Remediate well site

The scenarios defined above represent the most likely outcome for activity in 2023-2025; Section 2 (2.2 j.) outlines further activity which would potentially occur in subsequent years. Activity beyond 2025 will depend upon results of the described 2023-2025 work program and is therefore difficult to predict with certainty.

4 Environmental Risk Summary

The risks and potential impacts associated with the drilling, testing and maintenance of Jacko Bore 1DW1 are covered in the EMP submitted to DEPWS. The risks and controls have been summarised in *Table 1*. The proposed scope and associated risks and controls have been submitted to DEPWS for formal assessment. Approval of this EMP is required prior to commencing any regulated activity.

Santos

Table 1: Environmental risks and controls of proposed activity

Aspect	Environmental Outcomes	Potential Impact / Risk	Controls
Waste	a. No adverse impacts on soil, surface water, groundwater, sensitive habitat and air quality b. Minimise creation of food sources or habitat for pest species c. Minimise waste generation through reduce, reuse, recycle programs	d. Additional wastewater to be stored onsite e. Additional drill mud cuttings to be stored and disposed of onsite	f. Evaporation to be used to minimise offsite transportation of any flowed liquids g. Site to be bunded for liquid storage h. Drill cuttings will be excavated from sump and dried within a lined containment area to enable additional cutting and mud volumes. Once completed, cuttings and muds will be mixed, buried and covered onsite in accordance with the Code
Traffic	i. Minimise the impact of traffic on amenity and tourism	j. Access to the site will most likely be concentrated during the December 2023 – September 2025 period k. Interference with business	l. Site is located away from sensitive receptors
Groundwater quality and use	m. To manage exploration activities to prevent unsustainable depletion of groundwater resources n. Preserve groundwater quantity and quality for livestock supplies (the surrounding water use)	o. Depletion of localised aquifers p. Crossflow between subsurface zones	q. Monitoring water use to ensure total extraction within Licence limits r. All wells designed to protect aquifers with engineered and verified well barriers in place in accordance with the Code
Emissions	s. Avoid environmental nuisance at sensitive receptors t. Minimise greenhouse gas emissions	u. No additional risks/impacts predicted	v. Site located away from sensitive receptors w. Maintain vegetation free safety zone around flare
Noise	x. Minimise impacts to sensitive receptors from noise	y. No additional risks/impacts predicted given distance to receptors	z. Activities are located away from sensitive receptors

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Aspect	Environmental Outcomes	Potential Impact / Risk	Controls
Dust	aa. Minimise impacts to sensitive receptors from dust	bb. No additional risks/impacts predicted.	cc. Dust suppression to be used on access tracks and adjacent sites to minimise dust emissions
Soils	dd. Avoid, minimise and control soil erosion and discharge of sediment or soil into waterways or established drainage systems ee. Minimise disturbance of soil, vegetation and drainage during site activities ff. Prevent the contamination of soil to maintain the viability of soil resources	gg. Localised contamination of soil	hh. Secondary containment in place ii. Spill management plan in place jj. Lined wastewater tanks in use kk. Site maintained to minimise sediment releases, with erosion and sediment control plan in place
Bushfire	ll. No bushfire as a result of the regulated activity mm. Avoid impacts on infrastructure, environmental habitat and fauna, impacts on culturally significant sites and community lands	nn. Regulated activities ignite a bushfire	oo. Existing bushfire management plan pp. Maintain vegetation free safety zone around flare qq. Vehicles drive on formed tracks and roads
Weeds	rr. Avoid the introduction of weeds ss. Avoid the spread of existing weeds	tt. Weeds introduced to the property	uu. All equipment and vehicles to be inspected, a weed hygiene certificate will be issued before entering the property. vv. Weed Management Plan ww. Annual weed survey

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Aspect	Environmental Outcomes	Potential Impact / Risk	Controls
Surface water	xx. Avoid and minimise the potential contamination caused by the discharge of sediment or contaminated storm water to waterways or established drainage systems yy. No releases of contaminants (wastes, wastewater, chemicals, hydrocarbons or drilling fluids) resulting in long-term contamination of the waters.	zz. Decreased surface water quality	aaa. No offsite releases of wastewater bbb. Site fully bunded during wastewater storage ccc. Site maintained to minimise sediment releases, with erosion and sediment control plan in place
Flora and fauna	ddd. Minimise disturbance to flora and fauna eee.	fff. No additional risks/impacts predicted.	ggg. Activity contained within approved areas hhh. Vegetation community surrounding the activity is regionally extensive and not threatened iii. Significant impacts to endangered flora and fauna are not anticipated

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5 Consequences for Stakeholder Rights and Activities

5.1 Stakeholder Rights

Santos respects the legal rights of Mineral Licence Holders and seeks sustainable relationships with all stakeholders. Santos proposes to achieve this via the following key principles:

a. Formal engagement aligned with the requirements of Regulation 7.2 (a) of the *NT Petroleum (Environment) Regulations*

b. Mutually agreed ongoing, regular engagement and communications.

5.2 Stakeholder Activities

The proposed activities detailed in this document are in the vicinity of in the vicinity of ELs 32974 and 32971. *Figure 2* displays the location of Jacko Bore 1DW1 relative to overlapping Minerals Titles.

Table 1 summarises the environmental impacts, risks associated with the proposed Regulated activities, highlighting the potential impacts / risks and controls. Detailed information will be contained in the EMP submitted for assessment and approval by DEPWS.

Key considerations when understanding the consequences to Minerals Title Holders' operations:

a. The proposed regulated activities are part of the exploration phase and are therefore temporary in nature. At the completion of the activities, Santos will rehabilitate disturbances.

A summary of the potential consequences of the activity and mitigation controls are summarised in *Table 2.*

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Table 2: Potential consequences and control measures

Activity	Potential Consequences to Activities	Mitigations for Consequence
Land		
Well pad and new access road	a. Restricted access to well lease pads during activity duration	b. Disturbance area optimised to conduct Regulated activity, to minimise a fenced area restricted for operations c. Short term use d. End of life rehabilitation to return land back to pre-existing state, or as agreed e. Full fencing of well pad
Existing Access Tracks	f. Traffic along access tracks g. Temporary access restrictions during rig mobilisations and heavy transport operations h. Interference	i. Ongoing maintenance of access tracks (existing and new as utilised by Santos operations) j. Road remains shared use asset
Air Traffic	k. Helicopters causing disturbance	l. Minimisation of use of helicopters m. Communication with stakeholders to ensure routes minimise impact
Lease pads	n. Contamination of soils from activities	o. All activities must comply with the Code, including spill management, wastewater management and waste management p. Site to be rehabilitated back to pre-disturbance level with no harmful contamination permitted q. Activity restricted to a small area, with no contaminates released to surrounding areas
Water		

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Activity	Potential Consequences to Activities	Mitigations for Consequence
Ground water	r. Water bore rates and/or quality	s. Monitoring water use to ensure total extraction within Licence limits. No material reduction in water quality or quantity predicted to surrounding groundwater extraction bores t. Aquifer protected through use of cement and steel casing barriers in accordance with the Code
Weeds		
Weed control	u. Noxious weeds	v. Baseline weeds survey completed w. Annual weed monitoring x. Vehicle and equipment to be clean and have valid weed hygiene certificates prior to access y. Weed identification in inductions z. Weed management plan
Air Quality		
Dust	aa. Dust	bb. Short period of high-volume traffic movements cc. Equipment movements to consider time of day to reduce impacts on traffic dd. Dust suppression utilised during high volume traffic movements and around sensitive features
Emissions	ee. Increased emissions from flares and wells	ff. Flares are used to reduce the risk associated with vented hydrocarbons gg. Leak detection monitoring in accordance with the Code
Light, Noise and Visual Amenity		

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Activity	Potential Consequences to Activities	Mitigations for Consequence
Light and noise	hh. Interaction with sensitive receptors	ii. Site location chosen to minimise impacts on sensitive receptors, including appropriate separation distances between sensitive receptors and activities jj. Short duration of drilling activities
Visual amenity	kk. Visual amenity	ll. Site location chosen to minimise impacts on sensitive receptors, including appropriate separation distances between sensitive receptors and activities mm. Short duration of activities nn. Site not located in a major thoroughfare, located away from the majority of stakeholder activities

5.3 Stakeholder Engagement Plan Feedback

Santos proposes further discussions with nominated representatives of Core to ensure a clear understanding of the activities and ongoing program.

Santos seeks a discussion frequency suitable to the nominated representatives for a phone call or meeting to discuss these activities and progress.

All feedback on the proposed activities and their potential impacts, risks and proposed controls should be provided to Santos via the feedback form in Appendix A.

Where possible, all comments and associated Santos responses will be documented within the final EMP submitted to DEPWS for assessment.

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6 Acronyms and Abbreviations

Acronym	Meaning
AAPA	Aboriginal Areas Protection Authority
DEPWS	(Northern Territory Government) Department of Environment, Parks and Water Security
DITT	(Northern Territory Government) Department of Industry, Tourism and Trade
EMP	Environmental Management Plan
EP	Exploration Permit
LAA	Land Access Agreement
CLC	Central Land Council
NT	Northern Territory
NTG	Northern Territory Government

Santos

Appendix A – Stakeholder Feedback Form

Stakeholder:					
Document Referenced:					
#	Ref	Comment	Date	Santos Feedback	Date

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Appendix B – General Wellsite Construction and Operations

Drilling Rig

Santos

Water bore drilling

Santos

Appendix C – General Petroleum Industry Activity Information

Protection of Groundwater Resources

Commercial in confidence
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Aquifer Isolation

- Drilling stopped at regular intervals so that purpose-built steel pipes or casing can be installed.
- Multiple layers of cement and steel casing separating the producing well from surrounding formations and aquifers.
- Specially formulated cement mixtures used.
- Casing is tested above operating pressures to ensure well integrity
- Wellbore design, construction and operations closely monitored and regulated.
- Regulators are kept fully informed on well bore integrity.
- Integrity of each casing and cement stage is verified prior to moving to next operation.

Well De-commissioning

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Permanent isolation and protection of aquifers and groundwater

- Once well is no longer economic to produce it needs to de-commissioned
- Cement plugs placed to isolate and protect aquifers from depleted hydrocarbon zones
- Placement and verification of plugs is critical step
- Well head cut off below ground level, cement cap
- Well cellar is backfilled
- Area around well, the lease and roads into the lease are then rehabilitated
- Top soil is replaced and recovery of site is monitored until landholder agrees restoration is satisfactory
- End goal is that site is restored to natural state
- Each well abandonment must be approved by the Designated Authority and must comply with government regulations

4.1.3.2 *Acknowledgement of Proposed Works*

CORE URANIUM

ACN 652 691 579
Suite 2, Level 6 Blue Tower
12 Creek Street, Brisbane Q 4000
PO Box 87, Morningside Q 4170

13 June 2023

To:
Santos QNT Pty Ltd
A.C.N. 083 077 196
Level 22, Santos Place
32 Turbot Street
Brisbane QLD, 4000

Re: Acknowledgement of Proposed Jacko Bore 1DW1 Drill & Test Activity – Stakeholder Engagement under Environment Management Plan

With this letter, we the directors of Core Uranium Pty Ltd ACN 652 691 579 hereby acknowledge Santos QNT Pty Ltd proposed Environment Management Plan submitted to the Northern Territory (NT) Minister for Environment and Natural Resources (DENR) and approve of these proposed activities to be completed.

Yours Sincerely

Krystal Wedge
Director
Core Uranium Pty Ltd

4.1.4 Terralith Metals Pty Ltd

4.1.4.1 2023.12.01 Notification of Activity – Emails

From: [redacted] <[redacted]@[redacted]>
Sent: Friday, 1 December 2023 5:15 PM
To: Hyde, Jonathon (Jonathon)
Cc: Admin - M & M Walter Consulting
Subject: ![EXT]: RE Jacko Bore 1DW1 Drill & Test Environment Management Plan: Stakeholder Engagement

Good afternoon Jonathon

We confirm receipt of your email below.

Thank you

Please note: Our office will be closed from 12pm on 22 December 2023 to 5 January 2024 (reopening Monday 8 January 2024).

Regards

[redacted]

M&M Walter Consulting

Ground Floor, 189 Hay Street, Subiaco

[redacted]

www.mmwc.com.au

CME

CHAMBER MINERALS & ENERGY
MEMBER SINCE 2004

M & M Walter Consulting (M & M) advise that failure to provide information or documentation as and when requested by M & M may lead to forfeiture, expiry or possible non compliance with legislation and or conditions of tenure and that M & M cannot and will not be held responsible. Any advice or opinions given by M & M are not to be considered legal advice.

This communication contains information which is confidential and may also be privileged. It is for the exclusive use of the intended recipient(s). If you are not the intended recipient(s) please note that any form of distribution, copying or use of this communication or the information in it is strictly prohibited and may be unlawful. If you have received this communication in error please return it to the sender. We would be grateful if you would also copy the communication to marcus@mmwc.com.au then delete and destroy any copies of it.

From: Hyde, Jonathon (Jonathon) [redacted]
Sent: Friday, December 1, 2023 3:02 PM
To: [redacted]
Cc: [redacted]
Subject: Jacko Bore 1DW1 Drill & Test Environment Management Plan: Stakeholder Engagement

You don't often get email from jonathon.hyde@santos.com. Learn why this is important

Dear Sue,

I'm contacting you for the purpose of stakeholder engagement regarding activity Santos QNT Pty Ltd (Santos) is proposing in the Amadeus Basin, where the environmental impacts or risk of the activity may affect Terralith Metals Pty Ltd's (Terralith) and/or M & M Walter Consulting's (MMWC) rights or activities due to Terralith being the registered applicant for an overlapping Minerals Title, while MMWC is registered as Terralith's agent. Please find attached a letter which contains information regarding our proposed activity, including a map and Engagement Pack as attachments.

Please don't hesitate to contact me on the details below with any queries or if you'd like to further discuss the proposed activity.

It would be greatly appreciated if you please acknowledge receipt of this letter before 8 December 2023.

Kind regards,
Jono

Jonathon Hyde
Lead Amadeus, Cooper Upstream
Santos
[redacted]
Santos.com | Follow us on LinkedIn, Facebook and Twitter

Santos acknowledges the Traditional Owners and Custodians of the lands on which we operate. We pay our respects to their Elders past, present and emerging.

Santos Ltd A.B.N. 80 007 550 923
Disclaimer: The information contained in this email is intended only for the use of the person(s) to whom it is addressed and may be confidential or contain privileged information. If you are not the intended recipient you are hereby notified that any perusal, use, distribution, copying or disclosure is strictly prohibited. If you have received this email in error please immediately advise us by return email and delete the email without making a copy. Please consider the environment before printing this email

4.1.4.2 *Letter and Attachments*

Santos

Santos QNT Pty Ltd
ABN 33 083 077 196
Santos
60 Flinders St. Adelaide
SA 5000 Australia

GPO Box 2455
Adelaide, SA 5001
Australia
(T) +61 8 8116 5000
santos.com

1 December 2023

Terralith Metals Pty Ltd
ACN 669 527 360
Unit 1/2 Laing Lane,
Mosman Park, WA 6012, Australia

c/o: **M & M Walter Consulting**
ABN 39 802 269 835
Ground Floor 189 Hay Street
Subiaco, WA 6008, Australia
sue@mmwc.com.au

Attn: [redacted]

Proposed Jacko Bore 1DW1 Drill and Test – Stakeholder Engagement under Environment Management Plan

Dear [redacted]

We write for the purposes of stakeholder engagement regarding activity Santos QNT Pty Ltd (**Santos**) is proposing, where the environmental impacts or risk of the activity may affect Terralith Metals Pty Ltd's (**Terralith**) and/or M & M Walter Consulting's (**MMWC**) rights or activities.

Santos is the operator of petroleum Exploration Permit 125 (EP 125), on behalf of a Joint Venture including Ordiv Petroleum Pty Ltd, which overlaps with the application for Mineral Exploration Licence (EL) 33596. According to Spatial Territory Resource Information Kit for Exploration (STRIKE), Terralith is the applicant for EL 33596 while MMWC is the agent and acts on behalf of Terralith.

Santos is proposing to drill and test one helium appraisal well (Jacko Bore 1DW1) on an existing well pad, in the vicinity of EL 33596, with a map provided as Attachment 1 Before undertaking this activity, Santos is required, under the *Petroleum (Environment) Regulations 2016*, to have in place an environment management plan (EMP), which first requires stakeholder engagement in relation to the regulated activity we propose.

Santos is hereby notifying Terralith and MMWC of our intent to conduct the abovementioned activity in the location indicated on the attached map and described within the Engagement Pack provided as Attachment 2. The intention is for operations to commence from August 2024 and is expected to be completed by November 2025, subject to obtaining requisite regulatory approvals.

Attachment 2 contains further information about the regulated activity proposed, the proposed activity location, the anticipated environmental impacts and environmental risks of the activity, the proposed environmental outcomes in relation to the activity, and possible consequences of carrying out the activity as may be relevant to Terralith's and/or MMWC's rights or activities. As noted above, the proposed activity may have possible consequences for Terralith and/or MMWC in executing its rights or activities due to the abovementioned overlapping tenures, including insofar as we propose to use an access track that runs through EL 33596. On that note, we expect that the vast majority of heavy vehicle movements to be completed by November 2024, with minor light vehicle movements thereafter.

We would welcome the opportunity to consult with Terralith and/or MMWC regarding our proposed regulated activity, including about possible consequences for Terralith's and/or MMWC's rights or activities such as whether and how the activity may affect Terralith's and/or MMWC's planned operations. It would be greatly appreciated if you please acknowledge receipt of this letter and indicate whether you require further information before Friday 8 December 2023.

Santos

If you have any queries or otherwise wish to further discuss consultation regarding the proposed regulated activity, please do not hesitate to contact Jonathon Hyde, Lead Amadeus, on [redacted] or [redacted]@[redacted] Again, we ask that such contact please be made by 8 December 2023.

Yours sincerely,

Jonathon Hyde
Lead Amadeus

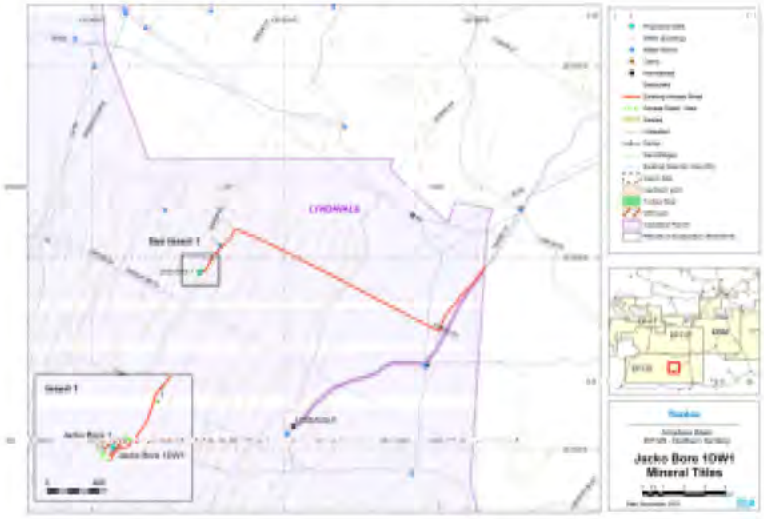
For and on behalf of
Santos QNT Pty Ltd

Santos

Santos QNT Pty Ltd
ABN 33 083 077 196
Santos
60 Flinders St. Adelaide
SA 5000 Australia

GPO Box 2455
Adelaide, SA 5001
Australia
(T) +61 8 8116 5000
santos.com

Attachment 1: Location of proposed Jacko Bore 1DW1 activity.



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Attachment 2: Stakeholder Engagement Pack

EP125 (Jacko Bore 1DW1) March 2024-December 2025 Work Program

Engagement Pack

(provided 1/12/2023)

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Santos

1 Purpose

Santos QNT Pty Ltd (**Santos**) has submitted an Environmental Management Plan (**EMP**) in support of the proposed 2024-2025 activities in Exploration Permit (**EP**) 125. EP 125 overlaps with the application for Mineral Exploration Licence EL 33596. According to Spatial Territory Resource Information Kit for Exploration (STRIKE), Terralith Metals Pty Ltd (**Terralith**) is the operator for EL 33596. Santos delivers this document to Terralith to provide an understanding of:

a. The regulated activity the interest holder proposes to carry out (Section 2),
b. The locations where it is proposed to carry out the activity (Section 2),
c. The timeline of the proposed activity (Section 3),
d. The potential environment impacts, risks, controls, and environmental outcomes of the activity (Section 4),
e. The possible consequences of carrying out the activity to rights or activities (Section 5), and
f. A proposed plan for ongoing engagement (Section 5).

Santos proposes that any questions for feedback to the information provided in this pack is formalised via the form included in Appendix A. Santos will ensure that all responses are reviewed, and feedback provided as appropriate. Santos also offers a face-to-face meeting with the stakeholder where subject matter experts can present the information in this pack and answer any questions. It should also be noted that Santos is committed to ongoing stakeholder engagement and discussion throughout the life of the activities.

1.1 Background

Santos QNT Pty Ltd, a subsidiary of Santos, is Operator of the EP 125 Joint Venture in the Amadeus Basin and is actively exploring the permit with co-venturer Ordiv Petroleum Pty Ltd, a subsidiary of Central Petroleum Ltd (**Central**) (Figure 1). The acreage was originally granted by the NT Minister for Mines and Energy under the *Petroleum Act* on 21 July 2005.

Since becoming Operator of EP 125 in 2013, Santos has acquired and processed 646 kilometres of seismic within the permit, followed by the drilling of Jacko Bore 1 (previously named Mt Kitty 1) in September 2013.

This Engagement Pack provides information in relation to the proposed activities in the vicinity of EL 33596 throughout 2024-25. This pack provides a detailed description of Santos' activities and how Santos proposes to manage the environmental impacts and risks associated with its activities, including how it will address its regulatory obligations and relevant Inquiry Recommendations that have underpinned the Code of Practice: Onshore Petroleum Activities in the Northern Territory (**the Code**). This pack aims to leverage off and simplify information within the EMP that has been submitted to DEPWS for assessment and approval.

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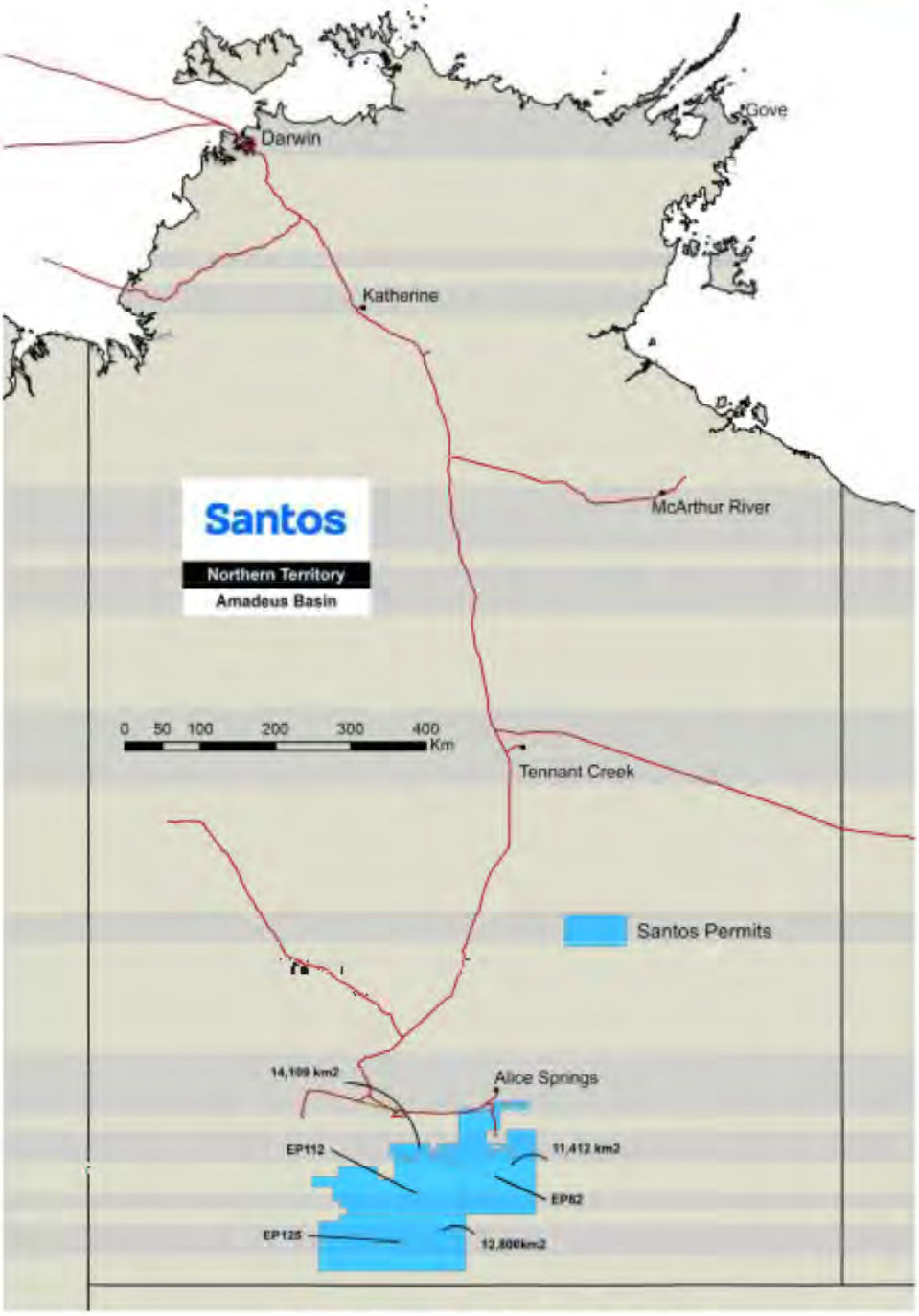

Figure 1: Location of related Santos Permit Area

Santos

2 Description and Location of the Regulated Activities

2.1 Santos has submitted an EMP seeking approval for:

a. Drilling of water bores:
   - Installation of water production monitoring equipment and water bore headworks
   - Groundwater extraction in accordance with Water Extraction Licence conditions.

b. Re-entry of Jacko Bore 1 well to kick-off and drill a deviated/horizontal sidetrack:
   - The scope of the well will include drilling, evaluating and a flow test for up to 365 days.

c. Associated road, civil works and water bores.

2.2 The following scope of work is required to complete the key activities:

a. Civil engineering activity – upgrade of existing and creation of new access tracks, construction of an upgraded lease pad at Jacko Bore 1, and water extraction as required (note that water extraction requires a Water Extraction License to be in place and adhered to), identification and utilisation of existing borrow pits.
b. Exploration drilling (and associated infrastructure, e.g. drilling sumps).
c. Well evaluation – including wireline logging, formation testing, core acquisition, fluid sampling, open-hole formation testing, and other standard oilfield evaluation techniques as deemed appropriate.
d. Flow-back and production testing.
e. Well suspension and/or well decommissioning of the new well.
f. Ongoing site and well maintenance and monitoring, work-over and re-entry, and evaluation as required.
g. Water bore construction.
h. Groundwater sampling from existing nominal water bores (if present) and the installed bores subject to the proposed work program.
i. Operation of a camp during petroleum activities.
j. Subsequent and/or ongoing low impact activities include:
   - Well maintenance, integrity checks and monitoring,
   - Bore maintenance and flow monitoring,
   - Access track maintenance,
   - Plugging and/or abandonment of the well(s),
   - Decommissioning of the well(s), and
   - Rehabilitation activities.

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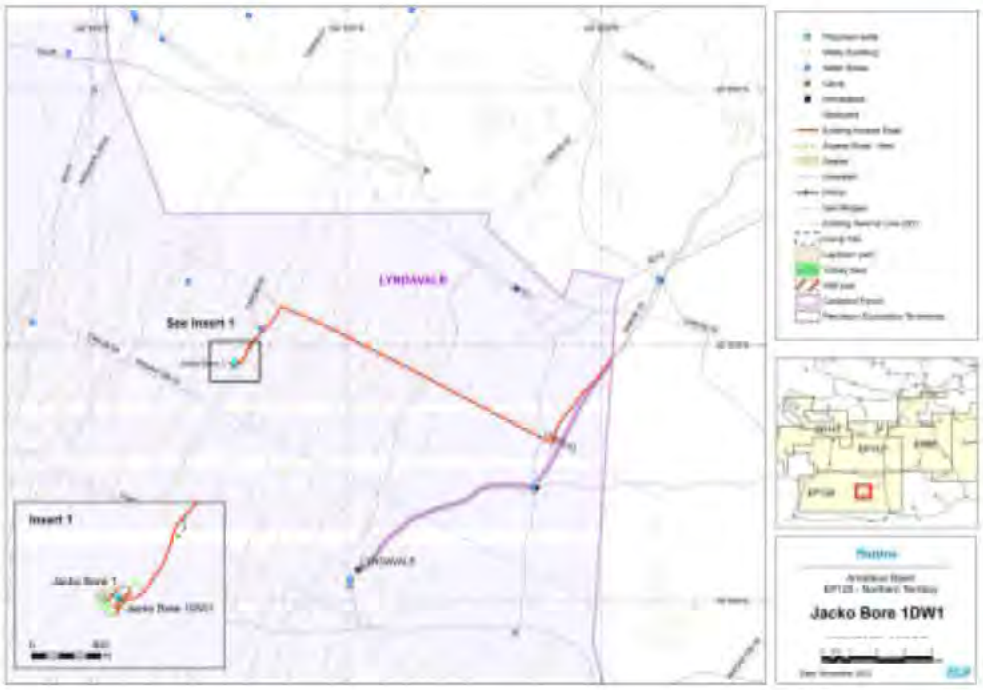

Figure 2: Jacko Bore 1DW1 location map.

The proposed location for infrastructure is within the Central Land Council (**CLC**) and Aboriginal Areas Protection Authority (**AAPA**) cleared subject land areas. It is noted that the nominated areas for infrastructure may change slightly to minimise environmental and heritage impacts. Such modifications will be made within the cleared survey areas.

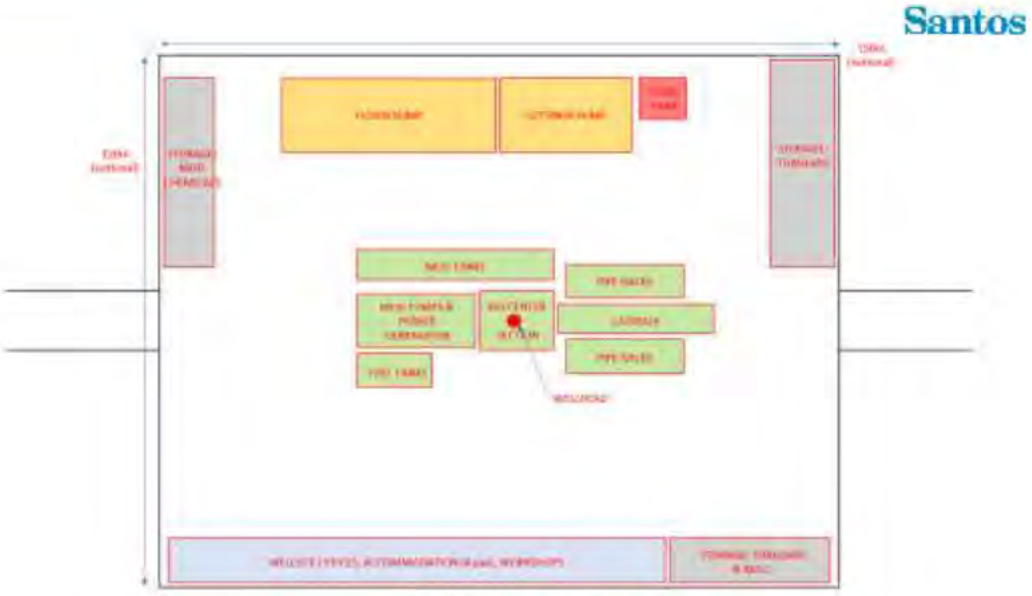

Figure 3: Conceptual lease schematic

Note: Figure 3 is a generic lease schematic which gives an indication of the potential lease layout on this well.

Santos

3 Activity Timeline

Subject to approvals (e.g. environmental), activity at the Jacko Bore 1DW1 location is expected to commence in Q3-2024 with the upgrade of the well lease pad, access tracks and water extraction bores.

The drilling of the Jacko Bore 1DW1 well is expected to follow this.

Ensuing activity is dependent on the evaluation results of the Jacko Bore 1DW1 well, therefore two potential outcomes exist (3Q2024):

(i) Case and suspension of the Jacko Bore 1DW1 well

- Subsequent possible extended flow test, for up to 365 days, through to ~3Q2025

(ii) Plug and Abandon Jacko Bore 1DW1 well

- Remediate well site

The scenarios defined above represent the most likely outcome for activity in 2024-2025; Section 2 (2.2 j.) outlines further activity which would potentially occur in subsequent years. Activity beyond 2025 will depend upon results of the described 2024-2025 work program and is therefore difficult to predict with certainty.

4 Environmental Risk Summary

The risks and potential impacts associated with the drilling, testing and maintenance of Jacko Bore 1DW1 are covered in the EMP submitted to DEPWS. The risks and controls have been summarised in Table 1. The proposed scope and associated risks and controls have been submitted to DEPWS for formal assessment. Approval of this EMP is required prior to commencing any regulated activity.

Santos

Table 1: Environmental risks and controls of proposed activity

Aspect	Environmental Outcomes	Potential Impact / Risk	Controls
Waste	a. No adverse impacts on soil, surface water, groundwater, sensitive habitat and air quality b. Minimise creation of food sources or habitat for pest species c. Minimise waste generation through reduce, reuse, recycle programs	d. Additional wastewater to be stored onsite e. Additional drill mud cuttings to be stored and disposed of onsite	f. Evaporation to be used to minimise offsite transportation of any flowed liquids g. Site to be bunded for liquid storage h. Drill cuttings will be excavated from sump and dried within a lined containment area to enable additional cutting and mud volumes. Once completed, cuttings and muds will be mixed, buried and covered onsite in accordance with the Code
Traffic	i. Minimise the impact of traffic on amenity and tourism	j. Access to the site will most likely be concentrated during the December 2023 – September 2025 period k. Interference with business	l. Site is located away from sensitive receptors
Groundwater quality and use	m. To manage exploration activities to prevent unsustainable depletion of groundwater resources n. Preserve groundwater quantity and quality for livestock supplies (the surrounding water use)	o. Depletion of localised aquifers p. Crossflow between subsurface zones	q. Monitoring water use to ensure total extraction within Licence limits r. All wells designed to protect aquifers with engineered and verified well barriers in place in accordance with the Code

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Aspect	Environmental Outcomes	Potential Impact / Risk	Controls
Emissions	s. Avoid environmental nuisance at sensitive receptors t. Minimise greenhouse gas emissions	u. No additional risks/impacts predicted	v. Site located away from sensitive receptors w. Maintain vegetation free safety zone around flare
Noise	x. Minimise impacts to sensitive receptors from noise	y. No additional risks/impacts predicted given distance to receptors	z. Activities are located away from sensitive receptors
Dust	aa. Minimise impacts to sensitive receptors from dust	bb. No additional risks/impacts predicted.	cc. Dust suppression to be used on access tracks and adjacent sites to minimise dust emissions
Soils	dd. Avoid, minimise and control soil erosion and discharge of sediment or soil into waterways or established drainage systems ee. Minimise disturbance of soil, vegetation and drainage during site activities ff. Prevent the contamination of soil to maintain the viability of soil resources	gg. Localised contamination of soil	hh. Secondary containment in place ii. Spill management plan in place jj. Lined wastewater tanks in use kk. Site maintained to minimise sediment releases, with erosion and sediment control plan in place
Bushfire	ll. No bushfire as a result of the regulated activity mm. Avoid impacts on infrastructure, environmental habitat and fauna, impacts on culturally significant sites and community lands	nn. Regulated activities ignite a bushfire	oo. Existing bushfire management plan pp. Maintain vegetation free safety zone around flare qq. Vehicles drive on formed tracks and roads

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Aspect	Environmental Outcomes	Potential Impact / Risk	Controls
Weeds	rr. Avoid the introduction of weeds ss. Avoid the spread of existing weeds	tt. Weeds introduced to the property	uu. All equipment and vehicles to be inspected, a weed hygiene certificate will be issued before entering the property. vv. Weed Management Plan ww. Annual weed survey
Surface water	xx. Avoid and minimise the potential contamination caused by the discharge of sediment or contaminated storm water to waterways or established drainage systems yy. No releases of contaminants (wastes, wastewater, chemicals, hydrocarbons or drilling fluids) resulting in long-term contamination of the waters.	zz. Decreased surface water quality	aaa. No offsite releases of wastewater bbb. Site fully bunded during wastewater storage ccc. Site maintained to minimise sediment releases, with erosion and sediment control plan in place
Flora and fauna	ddd. Minimise disturbance to flora and fauna	eee. No additional risks/impacts predicted.	fff. Activity contained within approved areas ggg. Vegetation community surrounding the activity is regionally extensive and not threatened hhh. Significant impacts to endangered flora and fauna are not anticipated

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5 Consequences for Stakeholder Rights and Activities

5.1 Stakeholder Rights

Santos respects the legal rights of Mineral Licence Holders and seeks sustainable relationships with all stakeholders. Santos proposes to achieve this via the following key principles:

a. Formal engagement aligned with the requirements of Regulation 7.2 (a) of the *NT Petroleum (Environment) Regulations*

b. Mutually agreed ongoing, regular engagement and communications.

5.2 Stakeholder Activities

The proposed activities detailed in this document are in the vicinity of EL 33596. Figure 2 displays the location of Jacko Bore 1DW1.

Table 1 summarises the environmental impacts, risks associated with the proposed Regulated activities, highlighting the potential impacts / risks and controls. Detailed information will be contained in the EMP submitted for assessment and approval by DEPWS.

Key considerations when understanding the consequences to Minerals Title Holders' operations:

a. The proposed regulated activities are part of the exploration phase and are therefore temporary in nature. At the completion of the activities, Santos will rehabilitate disturbances.

A summary of the potential consequences of the activity and mitigation controls are summarised in Table 2.

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Table 2: Potential consequences and control measures

Activity	Potential Consequences to Activities	Mitigations for Consequence
Land		
Well pad and new access road	a. Restricted access to well lease pads during activity duration	b. Disturbance area optimised to conduct Regulated activity, to minimise a fenced area restricted for operations c. Short term use d. End of life rehabilitation to return land back to pre-existing state, or as agreed e. Full fencing of well pad
Existing Access Tracks	f. Traffic along access tracks g. Temporary access restrictions during rig mobilisations and heavy transport operations h. Interference	i. Ongoing maintenance of access tracks (existing and new as utilised by Santos operations) j. Road remains shared use asset
Air Traffic	k. Helicopters causing disturbance	l. Minimisation of use of helicopters m. Communication with stakeholders to ensure routes minimise impact
Lease pads	n. Contamination of soils from activities	o. All activities must comply with the Code, including spill management, wastewater management and waste management p. Site to be rehabilitated back to pre-disturbance level with no harmful contamination permitted q. Activity restricted to a small area, with no contaminates released to surrounding areas
Water		

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Activity	Potential Consequences to Activities	Mitigations for Consequence
Ground water	r. Water bore rates and/or quality	s. Monitoring water use to ensure total extraction within Licence limits. No material reduction in water quality or quantity predicted to surrounding groundwater extraction bores t. Aquifer protected through use of cement and steel casing barriers in accordance with the Code
Weeds		
Weed control	u. Noxious weeds	v. Baseline weeds survey completed w. annual weed monitoring x. Vehicle and equipment to be clean and have valid weed hygiene certificates prior to access y. Weed identification in inductions z. Weed management plan
Air Quality		
Dust	aa. Dust	bb. Short period of high-volume traffic movements cc. Equipment movements to consider time of day to reduce impacts on traffic dd. Dust suppression utilised during high volume traffic movements and around sensitive features
Emissions	ee. Increased emissions from flares and wells	ff. Flares are used to reduce the risk associated with vented hydrocarbons gg. Leak detection monitoring in accordance with the Code
Light, Noise and Visual Amenity		

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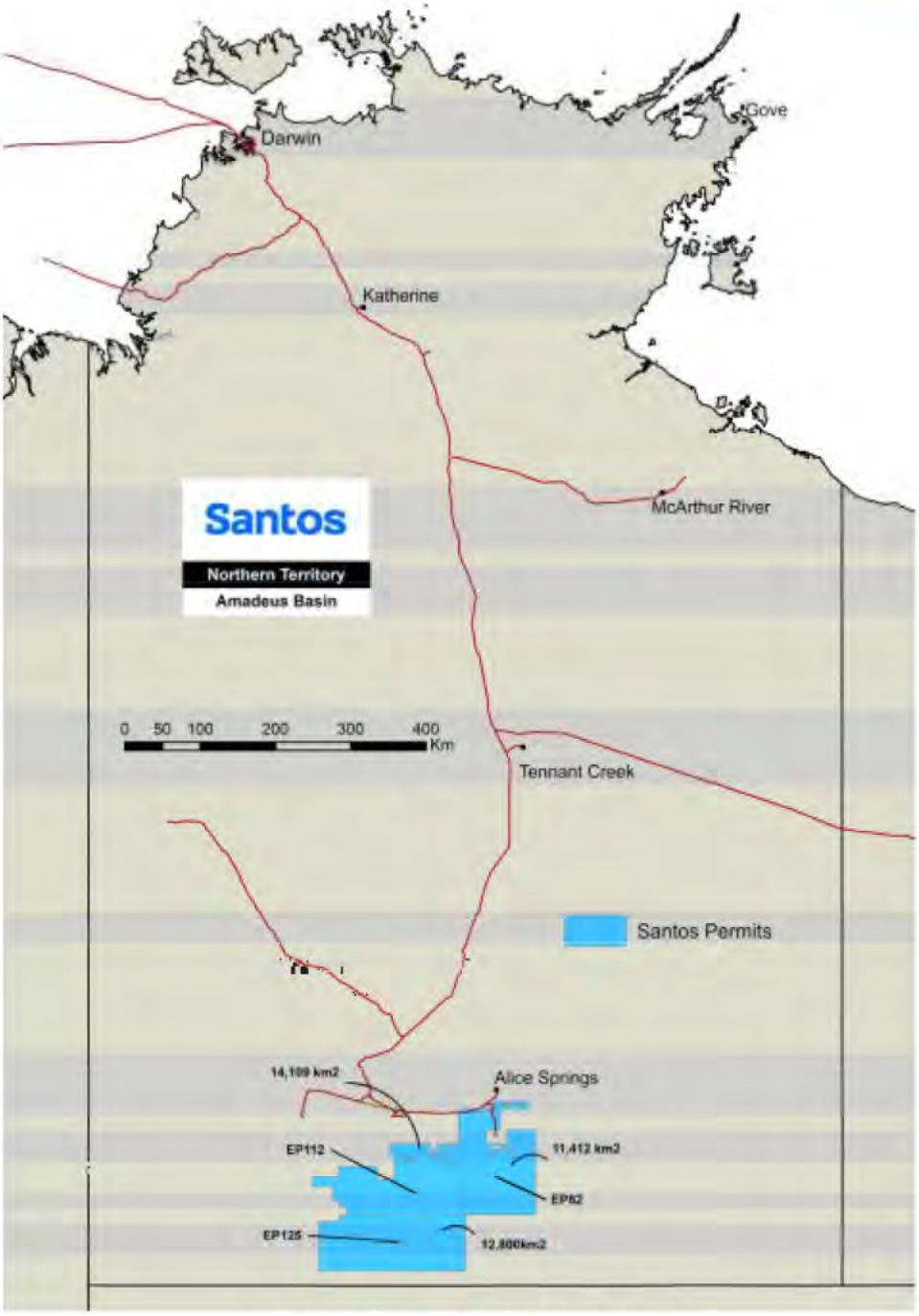

Figure 1: Location of related Santos Permit Area

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6 Acronyms and Abbreviations

Acronym	Meaning
AAPA	Aboriginal Areas Protection Authority
DEPWS	(Northern Territory Government) Department of Environment, Parks and Water Security
DITT	(Northern Territory Government) Department of Industry, Tourism and Trade
EMP	Environmental Management Plan
EP	Exploration Permit
LAA	Land Access Agreement
CLC	Central Land Council
NT	Northern Territory
NTG	Northern Territory Government

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Appendix A – Stakeholder Feedback Form

Stakeholder:					
Document Referenced:					
#	Ref	Comment	Date	Santos Feedback	Date

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Appendix B – General Wellsite Construction and Operations

Drilling Rig

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Water bore drilling

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Appendix C – General Petroleum Industry Activity Information

Protection of Groundwater Resources

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Aquifer Isolation

- Drilling stopped at regular intervals so that purpose-built steel pipes or casing can be installed.
- Multiple layers of cement and steel casing separating the producing well from surrounding formations and aquifers.
- Specially formulated cement mixtures used.
- Casing is tested above operating pressures to ensure well integrity
- Wellbore design, construction and operations closely monitored and regulated.
- Regulators are kept fully informed on well bore integrity.
- Integrity of each casing and cement stage is verified prior to moving to next operation.

Well De-commissioning

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Permanent isolation and protection of aquifers and groundwater

- Once well is no longer economic to produce it needs to de-commissioned
- Cement plugs placed to isolate and protect aquifers from depleted hydrocarbon zones
- Placement and verification of plugs is critical step
- Well head cut off below ground level, cement cap
- Well cellar is backfilled
- Area around well, the lease and roads into the lease are then rehabilitated
- Top soil is replaced and recovery of site is monitored until landholder agrees restoration is satisfactory
- End goal is that site is restored to natural state
- Each well abandonment must be approved by the Designated Authority and must comply with government regulations

4.2 CLC Work Program Submission 2022.07.08

4.2.1 Letter

Santos

Santos QNT Pty Ltd
ABN 33 083 077 196
Ground Floor Santos Centre
60 Flinders Street
Adelaide SA 5000
GPO Box 2455 Adelaide SA 5001
[redacted]

Our ref: **WP-2022-0004 / CHAR 22-4**

CONFIDENTIAL – Commercial in Confidence

[redacted]
PO Box 3321
Alice Springs NT 0870
mining.admin@clc.org.au

Dear [redacted]

Application and Work Program for EPs 82, 112 and 125

Santos (QNT) Pty Ltd (Santos), in accordance with Article 8 of the Indigenous Land Use Agreement Exploration Permit Numbers 82, 112, 118 and 125, provides this Work Program with respect to areas within EPs 82, 112 and 125 where it proposes to undertake activities. The areas identified in this submission are within areas that have been subject to work programs and sacred site clearance certifications associated with the following:

- 2D seismic activity undertaken in 2013;
  - CLC SSCC C2013-074 Idracowra additional lines (Part A)
  - CLC SSCC C2013-034 South Amadeus 2D – Part B
  - CLC SSCC C2013-035 South Amadeus 2D – Part C
  - CLC SSCC C2013-036 South Amadeus 2D – Part D
- Mt Kitty 1 exploration well
  - CLC SSCC C2013-047 Mt Kitty drill site, access road etc
  - CLC SSCC C2014-052 Mt Kitty seismic program
- 2D seismic activity undertaken 2016-18;

    - CLC SSCC Part A C2014-154 South Amadeus Seismic Work Program 2014 Western Portion – areas within EPs 112 and 125
    - CLC SSCC Part B C2014-142 South Amadeus Seismic Work Program 2014 Eastern Portion – areas within EPs 82 and 105
    - CLC SSCC C2016-009 South Amadeus Seismic Work Program 2016 – areas within EPs 112 and 125
    - CLC SSCC C2017-125 South Amadeus Seismic Work Program 2017 – areas within EPs 112 and 125
- Dukas 1 exploration well
    - CLC SSCC C2018-144 Dukas 1 Exploration Well

Scope

In summary, the key activities proposed for 2022-24 comprise three (3) exploration/appraisal wells as follows:

1) 1 x vertical well at the proposed Dukas 2 location (drill, evaluate and flow test) *or* 1 x vertical well at the existing Dukas 1 location (drill, evaluate and flow test)
2) 1 x vertical pilot hole with a deviated/horizontal sidetrack at the proposed Mt Kitty 2 location (drill, evaluate and flow test) *or* 1 x deviated/horizontal well at the existing Mt Kitty 1 location (drill, evaluate and flow test) *or* Mt Kitty 1 re-entry and deviated/horizontal sidetrack (drill, evaluate and flow test)
3) 1 x vertical pilot well plus a success case deviated/horizontal sidetrack at the proposed Mahler location (drill, evaluate and flow test)
4) Possible additional program for the Dukas 2 well only (2024+) would be informed by the drilling results and could include:
    a. Plug back and deviated/horizontal sidetrack; and/or
    b. Fracture stimulation and flow test

The following scope of work is required to complete these key activities:

- Scouting of water bore locations, well locations (including camp and laydown areas etc) and access tracks
- Environmental and heritage surveys
- Civil engineering activity:
    - upgrading existing tracks and creation of new access roads
    - construction of new well pads, and/or upgrade and maintenance of existing well pads
    - water bore drilling and water extraction as required (note that water extraction requires a Water Extraction Licence)
- Exploration drilling – vertical, deviated and possibly horizontal drilling (where horizontal wells will be contained entirely within the 2km radius subject area)
- Well evaluation – including wireline logging, formation testing, core acquisition, fluid sampling, open-hole formation integrity testing,, wellbore acquired seismic and other standard oilfield evaluation techniques as deemed appropriate
- Flow testing
- Well suspension and completion, or well decommissioning
- Ongoing site and well maintenance and monitoring, work-over and re-entry, and evaluation as required
- Collection of surface water (if present)

- Groundwater sampling from existing water bores (if present) and project water bores

Details of the proposed project work activities are included in the attached tables and annexures.

Purpose

The purpose of exploration and appraisal activity in 2022, 2023 and beyond is to increase our understanding of the prospectivity or potential of the three permits. Our objective whenever undertaking such activity is to minimise our impact on the environment along with ensuring Traditional Owners are engaged and informed for each phase of the activities.

Santos is targeting helium and natural hydrogen rich gas in reservoirs below a thick evaporite (anhydrite and halite) seal in the Amadeus permits. Location specific details are as follows:

- Mahler Lead, EP 82: The Mahler Lead is located updip from the 1992 Magee 1 well that flowed low rate, helium rich gas from a thin Heavitree Formation reservoir. The Mahler 1 well will test for the presence of a gas accumulation in naturally fractured basement rocks.
- Dukas Prospect, EP 112: The Dukas 2 well is a follow up to the Dukas 1ST1 well which was plugged and suspended before penetrating the target Heavitree Formation and potentially fractured basement reservoirs. Gas shows in the Dukas 1ST1 well included natural hydrogen and helium gases in addition to hydrocarbons.
- Mt Kitty accumulation, EP 125: The Mt Kitty 1 vertical well flowed low-rate hydrogen and helium rich gas from natural fractures in granitic basement rock. The Mt Kitty 2 well will be a vertical pilot well to evaluate the sub-vertical natural fracture system in the granite, followed by a deviated/horizontal sidetrack to increase high angle natural fracture intersections. Alternatively, the well may be drilled at the Mt Kitty 1 well location, or the plugged and suspended Mt Kitty 1 well may be re-entered and a deviated/horizontal sidetrack hole drilled. Again the well objectives will be evaluation of the sub-vertical natural fracture system in the granitic basement rock.

AAPA Authority Certificate

Santos will seek an Application for Authority Certificate from the Aboriginal Areas Protection Authority (AAPA) for the Proposed 2022-24 Work Program.

Work Program Meeting

Santos is available to attend work program meetings on country or, in the absence of a work program meeting, resource the CLC accordingly to meet any community requirements. Santos is willing to fund and resource interpreters or any other specific requirements to meet community needs.

Well Locations and Coordinates

Refer to the attached spatial data files for the coordinates of the proposed project works.

Attachments

Please refer to the attachments which contain descriptions of the activities proposed at each location:

Attachment 1: Summary table of proposed work activities

Attachment 2: Annexure describing industry work activities

Attachment 3: GIS data and supporting imagery

Santos is seeking your approval to proceed on this basis and looks forward to meeting at an agreed date to discuss in detail and progress this work program.

Santos also notes the importance of the community consultation requirements to ensure the host traditional owners are adequately consulted and informed of project activities. We look forward to working with the CLC to ensure the community consultations fully inform the host Traditional Owners.

Please contact Haydn Kreicbergs on the details below if you require any further information or clarification of the proposed works.

Kind regards,

Haydn Kreicbergs – Manager Cultural Heritage, Aboriginal Engagement and Land
haydn.kreicbergs@santos.com

4.2.2 Attachment 1

Attachment 1 – EPs 82, 112 and 125

1. Summary of proposed activities

All the activities included in Table 1 and annexures are subject to extensive regulatory approvals or review by the Department of Industry, Tourism and Trade (DITT), the Department of Environment, Parks and Water Security (DEPWS), the Environmental Protection Authority (EPA), and other regulatory agencies. Further details regarding these approvals and/or approval submissions can be provided on request.

Table 1. Summary of Proposed Work Program

Relevant Information	Description of Activities
(A) The nature, scope and objectives of proposed activities;	Please refer to Annexures for detailed descriptions of the exploration activities summarised in this table, which include drilling, flow testing, well monitoring and site maintenance, and associated civil works. The annexures detail the following activities that could potentially be proposed at the Dukas, Mt Kitty and Mahler locations: • 2D seismic acquisition (Annexure 1) Note: 2D seismic is not proposed in 2022, but this information is included for general reference • Wellsite civil works, access and camps (Annexure 2) • Exploration/appraisal drilling and evaluation (Annexure 3) • Diagnostic Fracture Injectivity Testing (DFIT) (Annexure 3) • Flow or production testing (Annexure 3) • Completion including suspension and/or well decommissioning (Annexure 3) • Ongoing well and site monitoring, maintenance, work-over and evaluation Refer to the provided maps and spatial data for proposed locations, access, and approximate areas of disturbance. The purpose of exploration and appraisal activity in 2022, 2023 and beyond is to increase our understanding of the prospectivity or potential of EPs 82, 112 and 125. Santos is targeting natural hydrogen and helium rich gas in reservoirs below a thick salt seal in these permits.
(B) The estimated time and period for the performance of proposed activities;	Project work in 2022 will include the preparation (several months for stakeholder consultation, ecological surveys etc) and approval (4+ months for Public Consultation and Northern Territory regulator review) of environmental management plans for

	proposed activities. Therefore, civil activities are unlikely to commence before Q1 2023 with drilling activities commencing in Q2 2023. The following summarises typical timeframes for discrete work packages or activities and reflects the planned 2022 - 2024 (pending approvals) work program plan. In future years, timings could vary and activity could reduce. Activity could be repeated in future years at these locations pending appropriate notification and discussion by Traditional Owners through On Country Work Program meetings. **4-16 weeks – Water bore drilling, Well Pad and Access Road Preparations:** Water supply bore drilling, access road preparation, well pad construction, and associated works will be undertaken in preparation for drilling operations. Where possible existing access tracks will be upgraded; however, new access roads will be created (within the surveyed areas only) if it achieves the objective of minimising the overall impact of operations. Temporary camps will be used to support these activities. **45-90 days (per well) – Drilling Phase:** Following completion of well pad and access track preparations, the drilling phase is anticipated to take approximately 45-90 days per well. **3-5 days (per well) – Completion Phase:** Wells may be completed with a tubing string that is run in the well to improve productivity. The tubing will be installed with the drilling rig or a workover rig and is anticipated to take approximately 3-5 days per well. **Flow Testing Phase and Well Suspension:** Subject to a successful reservoir outcome, the well will be put on extended flow test to allow key data to be gathered. A build-up test may be incorporated into the flow test to aid in the evaluation of the well results. Flaring will be used to ensure flammable gases are safely and efficiently handled. After flow testing the well will be suspended, or decommissioned.

	Further on-going well integrity monitoring, well-head maintenance, site maintenance, in-hole evaluation and work-over will be performed as required. If required, Santos will provide further details prior to the activity and as planning progresses.
(C) The techniques, infrastructure and major items of equipment to be used;	**Civils Surveying:** Surveying of proposed access tracks, well pads, gravel/borrow pits, camp sites and associated facilities will be carried out using 4WD vehicles and GPS units utilising existing roads and station tracks where possible. Where not possible, refer to section E below. **Road and Camp Site Construction:** Existing access tracks will be upgraded and widened (within approved subject land area only) to accommodate larger vehicles and the drilling rig mobilisation to well site. New access roads will be created where necessary to access the wellpad or minimise the overall environmental impact or impact on pastoral lease-holder infrastructure or activities. Junctions of access roads with sealed highways may be upgraded in line with regulatory requirements. Camps will be constructed within the approved subject lands to support activities. These camps may be capped with suitable clay material if required based on ground conditions. Preference will be given to utilising previously disturbed areas where practical. All camps will be covered by an approved Environmental Management Plan to minimise environmental impacts. The attached maps (Attachment 1, Section 2) and spatial data (Attachment 3) show the locations of the proposed access tracks. **Well Pad Construction:** Well pad construction will include clearing and stockpiling, grading and capping with clay/suitable material if required based on ground conditions. Construction of turkey nests, flare pits, cuttings pits and sumps, laydown areas and above ground storage tanks will occur as required. **Drilling Activities:** The wells will be drilled using either drilling mud or air as required to suit formation properties. Wells will be either vertical only (i.e. a vertical well), or initially vertical with a subsequent inclined section

	leading to a deviated or horizontal section (i.e. a deviated or horizontal well). Vertical well sections could vary between approximately 2000m and 4500m and deviated or horizontal sections could be approximately 500m to 2000m (where the absolute limit of any horizontal well would be the area surveyed and cleared for sacred sites (i.e. the clearance area)). Where possible, drill core and/or cutting samples will be obtained for geological assessment and analyses as per Santos and regulatory requirements. **Evaluation Activities:** Open-hole wireline, or logging while drilling (LWD), logs will be acquired over the open-hole sections as per Santos and Northern Territory Government requirements. In addition to wireline/LWD logging Santos may undertake formation testing including drill-stem testing, open-hole formation integrity testing and other standard oilfield evaluation techniques as deemed appropriate. Wellbore seismic may also be acquired. This activity combines surface seismic activities (Attachment 2, Annexure 1) with down-hole wireline tools (geophones). **Diagnostic Fracture Injection Test (DFIT):** A DFIT refers to the act of injecting small volumes of a clear fluid, typically water (usually with a small percentage of Potassium Chloride e.g. 2 to 3% KCl) at low pumping rates until a fracture forms, at which point the wellhead is shut-in and the pressure allowed to fall-off naturally. The fluid contains no proppant so that the fracture can relax and close naturally as pressure dissipates. The pressure changes are measured with high-accuracy gauges that are either placed deep in the wellbore or at surface on the wellhead. Pressure analysis during injection and after shut-in, provides information for designing hydraulic fracture stimulations. The DFIT process differs from fracture stimulation. It is of a much smaller scale, does not involve pumping proppant, and is not intended to induce hydrocarbon production. **Well Completion Activities:** The wells will have casing installed to meet well design objectives, the NT Well Operations Code of Practice (COP) and the Santos Drilling and Completions Management Standards. Casing will be set to isolate shallow aquifers (as per the NT COP) and any geohazards that may present such as significant loss zones, tight

	hole etc. Each casing string will be cemented in place to ensure aquifer isolation and overall wellbore integrity is maintained. Once each casing string is cemented in place, it is pressure tested to ensure the cement and casing meet and/or exceed design specifications. **Hydraulic Fracture Stimulation Activities:** Hydraulic fracture stimulation (HFS) is not planned in the current program but may be required in a future program depending on the flow capacity of any gas charged reservoirs encountered at the Dukas location only. HFS is not part of the drilling process but is a completion technique applied after the well is drilled. The intent of hydraulic stimulation is to place a highly conductive channel into the reservoir to increase the flow capacity of the reservoir and increase the well gas production. The technique is typically used in low permeability reservoirs that cannot sustain economic production, such as tight sand or a reservoir damaged by the drilling process. It is a process that has been used in the oil and gas industry since 1947, has been successfully used on wells in the Cooper Basin for more than 50 years and is currently performed in many basins around Australia, including the Amadeus Basin in the Northern Territory. The stimulation process involves pumping water, containing a minor volume of a specific blend of chemical additives and a propping agent such as sand or ceramic beads, down the well at sufficient pressure to create a fracture in the target formation. Proppant keeps the fractures open once the pump pressure is released which thereby improves the productive potential of the well. The following steps are required to inform, support or perform the HFS process: 1. Wireline logging to confirm the cement bond between the casing string and rock formation, ensuring isolation between the fracture stimulation target intervals and shallow aquifers. Valves are installed on the wellhead known as the “Christmas Tree” which are rated to above the maximum designed surface pressure and allow for the transfer of fluid and proppant/sand into the wellbore. The complete system is then pressure tested again to simulate hydraulic fracturing conditions. Cement bond logging occurs prior to the HFS (or frac) “spread” (the term used to describe the various trucks and equipment needed to frac) arriving on location.

	2. Perforation of casing over the target interval using a shaped charge to provide a conduit between the wellbore and the formation. 3. Diagnostic Fracture Injection Test (DFIT) as described previously. This stage is optional and typically only performed until subsurface conditions are better understood. 4. Main stimulation treatment consisting of injecting a pre-determined volume of stimulation fluid (pad volume), followed by injection of proppant at monitored concentrations and other additives to achieve fluid mobility (slurry stages). Finally, a flush stage displaces the last slurry stage through the casing perforations and into the fracture. 5. Isolation of the completed fracture stimulation stage using a mechanical plug installed at a pre-designed depth. 6. Perforation of the next stage to be hydraulically stimulated and repetition of the process in steps 4 and 5 above until the final fracture stimulation stage is completed. 7. Removal of the isolation plugs using Coiled Tubing with a motor and mill on the end. Once the plugs are milled out and a flow path to surface established, the well flowback commences to recover the frac fluids pumped into the well. The above method describes the "plug and perf" technique for fracture stimulation. Another technique uses coiled tubing assisted annular stimulation which is used to provide a conduit for "pin-point fracturing". Coiled tubing is run into the well to the deepest target. The bottom-hole assembly run on the end of the coiled tubing incorporates a jetting assembly that allows low concentration sand slurry to cut holes or slots into the casing and cement. The hydraulic stimulation treatment is then pumped into the coiled tubing / casing annulus to initiate and propagate the fracture. Summaries of the chemical composition of potential frac fluids and solids that could be included are included in Attachment 2, Annexure 4. These are typically used at low concentrations and the final fluid composition must be provided to the NT Government as part of the environmental approval process. Fracture Diagnostics are often used to determine the fracture effectiveness and allow for future optimisation. Chemicals Tracers may be pumped with the slurry at a known concentration. Their concentration during flowback can be measured to determine the relative contribution from each stage. Microseismic geophones

	may be used either at surface or in a neighbouring well, to listen for the very small seismic events that are created during fracture stimulation. Triangulation is used from the geophone array to determine the location of the event and hence gain a picture of fracture dimension (height and length) and direction. Tiltmeters may be used to gain an understanding of the micro deformation that takes place during a frac. These small changes can be used to determine the verticality of the frac and the direction in which the fracture has propagated. The installation of either surface geophones or tiltmeters is low-impact, and down-hole geophones have no impact on the environment. Further monitoring using high-resolution accelerometers to detect ground motion may also be implemented for real-time monitoring of the fracture stimulation process. **Well Testing Activities:** Some flow testing may be conducted with the drilling rig on location prior or post open hole logging activities. Subject to a successful reservoir outcome, the well will be put on extended flow test. Flaring will be used to ensure flammable gases are safely and efficiently handled and will be subject to rigorous environmental management plan approvals. **Well Status:** Exploration wells in the Amadeus Basin have a high uncertainty on reservoir outcome. The following activities may occur post logging evaluation: 1. Well suspension for future re-entry; or 2. Well suspension for future production; or 3. Decommissioning. As part of the well suspension process, wellbore barriers will be put in place as per Santos and Northern Territory regulatory requirements. A well integrity monitoring plan for monitoring of wellbore barriers will be put in place as part of the Well Operations Management Plan (WOMP) for any suspended well. As part of well decommissioning process, cement plugs will be permanently placed in the well as per Northern Territory regulatory requirements. The wellhead will be removed, well pads and roads restored and signed properly as per Northern Territory regulatory requirements.

	Site Restoration Activities: For any decommissioned well, the well pad and associated camp sites, etc. will be restored to promote site rehabilitation. For any suspended well, the wellhead area will be fenced off and the well pad site restored as much as practical to ensure access for well integrity monitoring and intervention activities can be maintained. Further technical details can be provided on request.
(D) The likely Environmental Impact of proposed activities and proposals to minimise the Environmental Impact, in particular, the disturbance to Native Title Parties;	Where possible, access roads, borrow/gravel pits, well pads, camp sites and associated works will be planned to use existing station tracks and/or access roads or resources to minimise any new disturbance. Where it is not possible to use existing tracks and access roads, new access roads will need to be constructed. New access roads will be contained within the subject area. When and where feasible, temporary local accommodation (eg. Erldunda Roadhouse) will be considered for short duration activities such as scouting to minimise environmental impact. Potential campsites will be constructed adjacent to access roads within the access road buffer, and capped with suitable clay material if deemed required based on ground conditions. Preference will be given to utilising previously disturbed areas. Roads/access tracks could extend up to 10m either side of a centre line (i.e. up to 20m in width). Where possible and practical new access roads will be oriented to minimise or avoid disturbance to land systems and native flora. Stock proof fencing will be erected around the well pad to minimise potential impacts on native fauna and livestock. Cleared vegetation and topsoil will be stockpiled for future respreading during site restoration. Chemicals will be stored in appropriately bunded and designated areas for the duration of the drilling operations. No surplus chemicals will be left on site after the well is decommissioned or suspended. Following completion of drilling activities, remnant fluids will be left in-situ (in sumps or ponds) to evaporate. Where the volume of remnant fluid poses a risk of overflow, fluids may be removed from site or stored (on-site) temporarily in purpose-built containers. Hydraulic fracture fluid generally comprises more than 90% water, and up to 9% sand or ceramic proppant. Chemicals generally account for less than 1% of the mixture and assist in carrying and dispersing the proppant in the low permeability rock. The chemical additives are not specific to the hydraulic fracture stimulation

	process, having many common household uses such as in swimming pools, toothpaste, baked goods, ice cream, food additives, detergents, cosmetics and soap. In accordance with regulatory requirements, the chemicals additives are subject to full disclosure. Refer to Annexure 4 for a list of chemicals used by Halliburton, Schlumberger and Condor in Fracture Stimulation operations. If chemicals other than those listed were proposed for use, these would be provided to the CLC. An above ground water storage tank provides temporary water storage for use in the hydraulic stimulation process. Source water can either be trucked from a nearby water source or piped along a temporary network. Small dosages of biocide are added to control algal growth particularly under warm and stagnant conditions. Following completion of works, temporary water storage infrastructure is removed from site. The equipment and machinery required to carry out a hydraulic stimulation operation is highly mobile and can be installed and removed relatively quickly (generally within a couple days). The equipment is compliant with state and federal regulations for road transport and is fitted with safeguards such as an in-vehicle monitoring system (IVMS) to ensure driver compliance. For any decommissioned well, the well pad and associated camp sites, etc. will be restored to promote rehabilitation. For any suspended well, the wellhead area will be fenced off and well pad site restored as much as practical to ensure that access for well integrity monitoring and intervention activities can be maintained. Further technical details can be provided on request.
(E) The proposed means of access and access routes for personnel and equipment, both into and within the Permit Area, including particulars of the amount of vehicular and airborne access and any proposals to construct or upgrade roads, landing strips, or other access facilities;	Please refer to Attachment 1, Section 2 for details of the proposed access routes for personnel and equipment and proposals to construct or upgrade roads. Please note that where alternate access routes are shown, the final access route will be selected after scouting. The amount of vehicular access will be variable during the scope of proposed activities, but Santos will aim to design proposed infrastructure such that it does not adversely impact Traditional Owners, pastoral lease holders, nearby industry, or the general public. **Initial Access Roads:**

	Planned earthworks are required to provide safe access to exploration wells, water bores, campsites, airstrips and for other operational needs. The access road for the Mt Kitty location already exists but may need some repair work and upgrading in some sections. The access road for the Dukas location utilises part of the existing access constructed for the Dukas 1 location; new construction will be required to gain access from Dukas 1 to the proposed Dukas 2 location. The access road for the Mahler location will utilise existing station tracks in part, with new road construction also required. The existing station track will likely need upgrading in some sections to meet Santos standards, which are designed to accommodate heavy vehicle usage. Regular watering may occur to reduce dust and additional capping may be added to the surface to reduce maintenance or road closure following periods of rain. **Landing Strips:** Airstrips and Helipads are commonly used to bring the workforce from a main centre closer to worksites with the aim of reducing fatigue and exposure to land transportation risks. Existing airstrips may be utilised and upgraded under agreement to a condition where charter operator (for crew change), or RFDS or Careflight Air Ambulance (emergency evacuation) aircraft can be accommodated. Helipads may be constructed at each wellsite to provide additional direct access to remote wellsites. **Initial Mobilisation and Final Demobilisation:** Initial rig mobilisation requires approximately 100-150 trucks mobilised to the nominated wellsite. A combination of standard loads and oversize loads (for which the required permits for transport will be in place with the NT government) will be used. Demobilisation will involve moving all equipment out from location via the proposed access routes. **During drilling activities:** A number of truck movements to the wellsite will be required, with some mobilisation of equipment to lay down areas via a combination of trailered loads (singles, doubles, road trains). A daily commute by 4WD vehicle may be required for crew changes between the campsite and rig site. Road maintenance will include the application of imported capping to repair washouts or holes, the addition of water to the road surface

	to restore compaction or reduce dust generation, and grading to restore drainage by reshaping the road profile or removing rutting. Rollers will be used where necessary to aid compaction. **Fracture stimulation:** The number of trucks required will depend on the size and number of frac stages planned. Initial mobilisation of the frac spread and associated services like coiled tubing and wireline may require up to 50 trucks mobilised to the nominated wellsite. There will also be up to 50 trucks required to mobilise frac materials like proppant to the location. Demobilisation will involve moving all equipment out from location via the proposed access routes. A daily 4WD commute to transfer crews between the camp and frac spread may be required. **Flow testing:** Minimal personnel, some trailered equipment haulage to site for initial set up of equipment and then 4WD transport as required for monitoring during flow testing activities. **Well Integrity Monitoring:** Scheduled visits for well integrity monitoring; one or two personnel as required.
(F) Any water, timber or other resources proposed to be obtained from within the Permit Area and surrounding areas;	**Water bores:** Drilling of new water bores and use of existing project water bores are the preferred water supply sources, followed by use of existing station water bores or water bores owned by other entities. Four water bores have been previously constructed by Santos along the Dukas 1 access track and at the Dukas 1 location. However, further water bores may be installed for Dukas 2 if needed and will always be located within the subject land. New water bores will be required for the Mt Kitty and Mahler locations. The water taken from water bores is limited by provisions of the NT Government Water Act and/or conditions of the relevant water extraction licences. In addition, earthen water holding pond(s) and loadout facilities may be constructed and fenced as required. Water will be used for civil works, drilling and for road maintenance. Hydraulic fracture stimulation and associated water use is not planned in this work program, by may be required at the Dukas location in future work programs. **Construction materials (soils and gravels):**

	Where in-situ materials are unsuitable, additional fill/clay/rubble for capping of roads, flood ways, land-holder pipeline crossings and well pads will be sourced from approved areas; wherever possible this will be done by extending existing quarries or borrow pits. **Borrow/gravel pits:** Borrow pits may be required as a source for extraction of construction materials. The presence of suitable borrow/gravel pits within the subject land approved areas will be confirmed through initial scouting. Management practices include separately stockpiling cleared vegetation and topsoil for respreading over progressively reclaimed areas. Maximum excavation depth will be based on the available soil types and volume. Where possible, materials stockpiled for construction will be stored within the cleared area and transferred to site as required. Mixing of water with materials to create a cohesive mix may be undertaken at the pit or at the construction site – e.g. well pad or roadway.
(G) The estimated costs of implementing proposed activities;	To be determined. Santos will provide further details as logistical and program requirements are finalised.
(H) If known, the identity of any proposed contractors and sub-contractors engaged or likely to be engaged and the minimum and maximum number of personnel likely to be on the Permit Area from time to time and their roles in undertaking such activities; Any proposals concerning employment, training and business opportunities;	To be determined. Santos will provide further details as logistical and program requirements are finalised. Santos will initiate preliminary discussions with contractors to ascertain availability and operational capacity. Further information can be provided once these arrangements are finalised.

(I) An estimate of the total area of the proposed activities;	Activity in conjunction with the 2022-24 Work Program is proposed at the Dukas location (new site or existing Dukas 1 well site), the Mt Kitty location (new site and/or existing Mt Kitty 1 well site), the Mahler location and associated access routes. Please refer to the maps in Section 2 and the spatial data provided.
(J) Any other aspect of proposed activities that is likely to have any Environmental Impact, or in particular, any impact upon Native Title Parties.	Santos has procedures for and extensive experience in operating in arid environments. Santos will ensure that any risk of long-term adverse impact is minimised and that there is no risk or impact to sacred sites and cultural heritage as a result of the work. Santos welcomes the involvement of local Traditional Owner groups to provide cultural awareness training, welcome to country, and to visit the operations during our activities.

8. Areas of proposed work activities

The proposed work activity falls within EPs 82, 112 and 125. The areas identified in this submission are within areas that have been subject to 2D seismic and drilling programs with sacred

site clearance certifications. Pending approvals Santos proposes to commence civil works and wellbore-associated activities in Q1 2023, depending on weather and surface conditions. Access track preparation, well pad construction and associated works will be undertaken in preparation for drilling operations. Where possible existing access tracks will be upgraded; however, new access tracks will be created (within the surveyed areas only) if it achieves the objective to minimise the overall impact of the operations. Temporary camps will be used to support these activities and will remain with the current cultural heritage authorised areas.

2.1 Mahler Wellsite Infrastructure and Access, EP 82

Civil works at Mahler is proposed to prepare an access road, well pad, waterbore location(s), laydown areas and campsites for the Mahler 1 exploration well. Approximate coordinates of the proposed Mahler 1 well are presented in Table 2.1. The well site will be accessed from the Chambers Pillar Road via existing station tracks in part, with new road construction also required. A bypass road around the Titjikala Community is also proposed.

Associated GIS files are attached to this application. The approximate well locations, and subject land areas are shown in figures 2.1 to 2.3. Subject land areas are as follows:

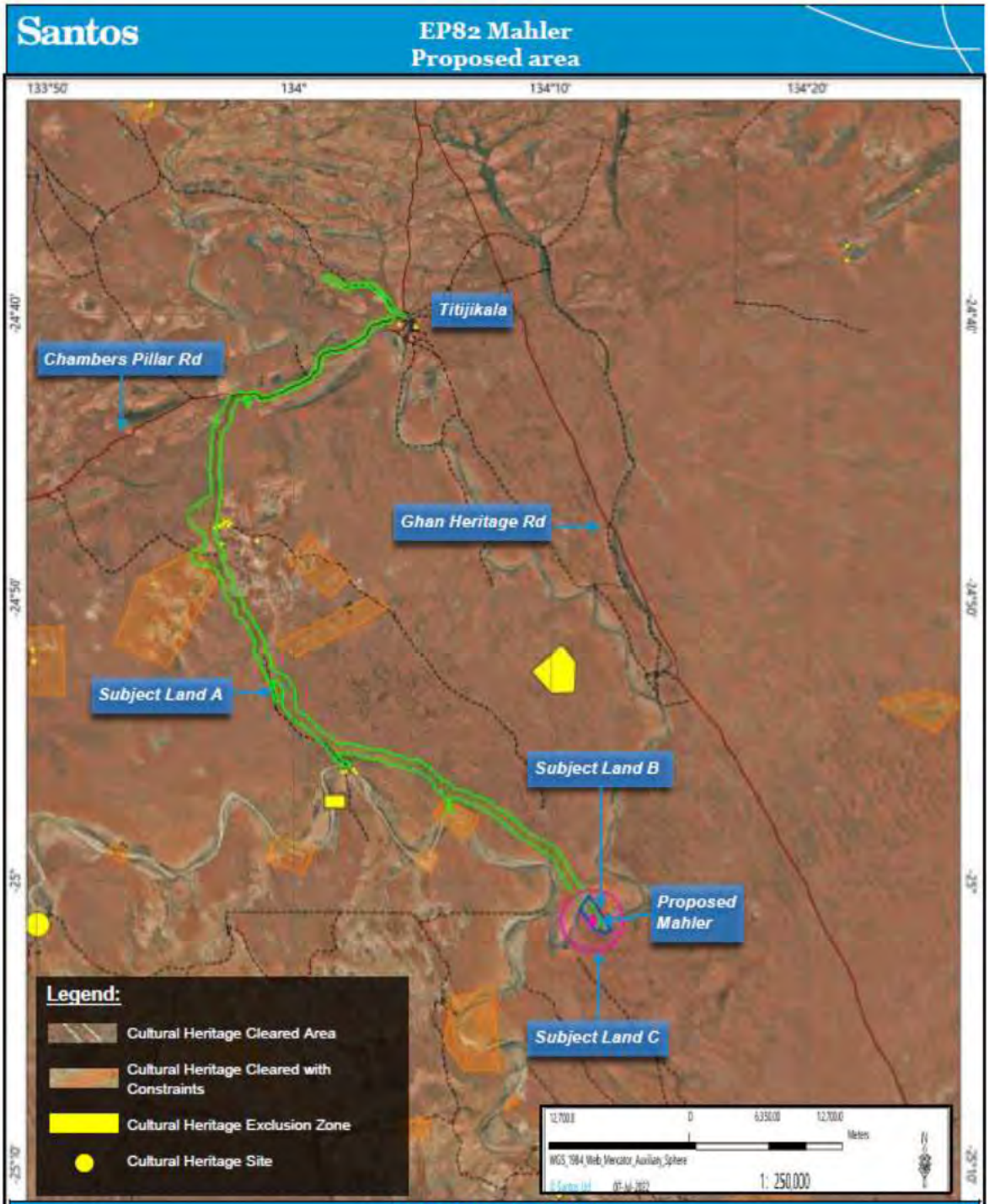
Subject Land A: Access to well location

Subject Land B: Well site within this area

Subject Land C: Possible subsurface footprint of deviated/horizontal well to a length up to 2000m.

	Projection	**MGA 94-53**
Exploration Well Location	**Easting**	**Northing**
Proposed Mahler well	[redacted]	[redacted]

Table 2.1: Approximate wellhead coordinates of proposed Mahler well



Work Request Map

Endorsed Parties	Central Land Council	Activity Location	Maryvale Station: EP82				
Nature of Activity							
Project Location	Mahler, Southern Amadeus	Vegetation			Doc#	Proposed	
Means of Access	Chambers Pillar Road	Drafted	AR	Date	7/07/22	Map	1

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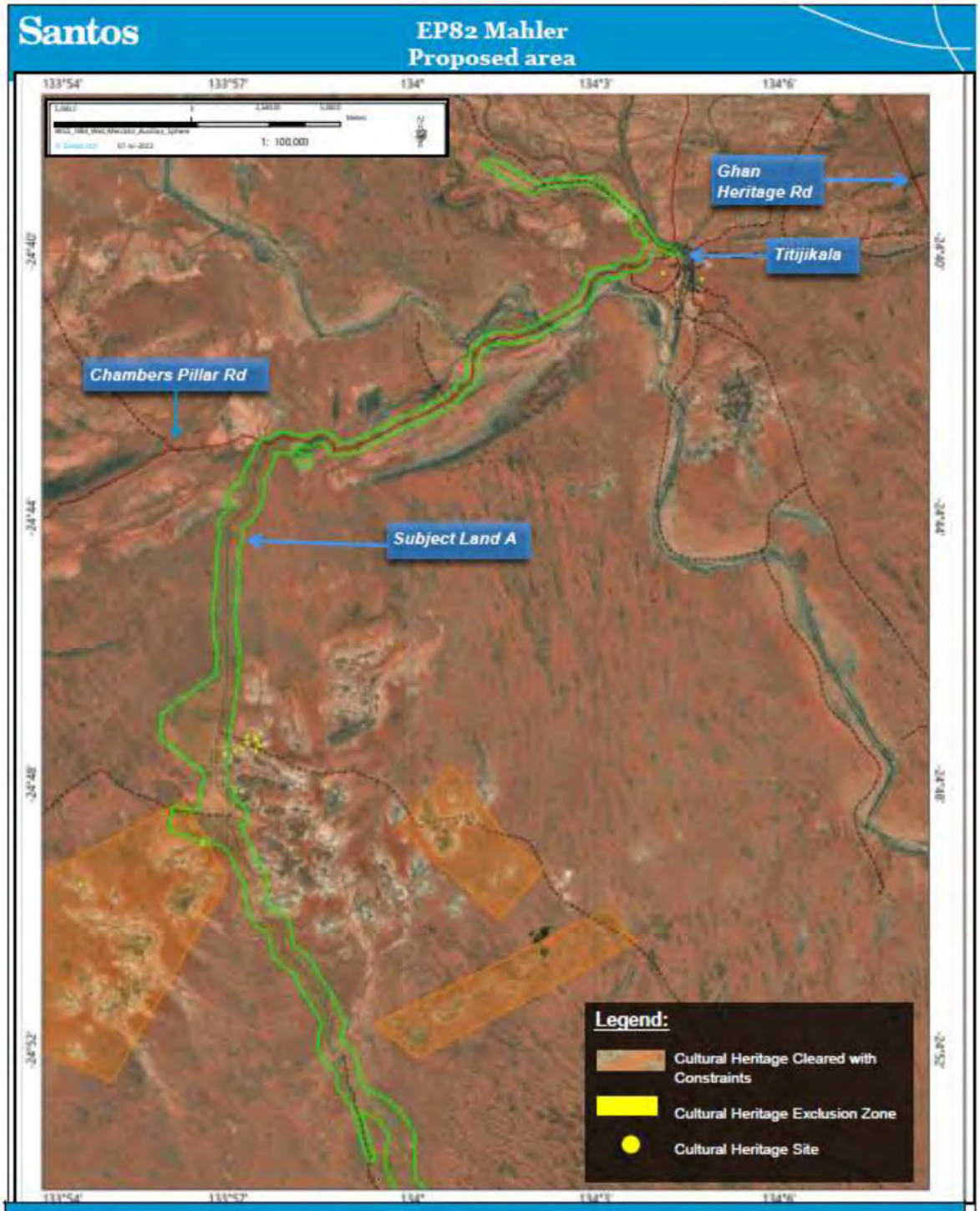
Figure 2.1: Mahler Project Area, Map 1



Work Request Map

Endorsed Parties	Central Land Council	[redacted]			Maryvale Station: EP82		
Nature of Activity							
Project Location	Mahler, Southern Amadeus	Vegetation			Doc#	Proposed	
Means of Access	Chambers Pillar Road	Drafted	AR	Date	7/07/22	Map	2

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Figure 2.2: Mahler Project Area, Map 2

Endorsed Parties	Central Land Council	Activity Location	Maryvale Station: EP82				
Nature of Activity							
Project Location	Mahler, Southern Amadeus	Vegetation			Doc#	Proposed	
Means of Access	Chambers Pillar Road	Drafted	AR	Date	7/07/22	Map	3

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Figure 2.3: Mahler Project Area, Map 3

2.2 Dukas Wellsite Infrastructure and Access, EP 112

Civil works at Dukas is proposed to prepare the well site access road, well pad, waterbore location(s), laydown areas and campsites for the Dukas 2 exploration well. Approximate coordinates of the proposed Dukas 2 well (new location option) are presented in Table 2.2, noting that a possible alternative to the new location is a re-drill at the Dukas 1 location. The well site will be accessed from the Lasseter Highway via the Dukas 1 access road, then via a newly constructed road from Dukas 1 to the new well location.

Associated GIS files are attached to this application. The approximate well locations, and subject land areas are shown in figures 2.4 and 2.5. Subject land areas are as follows:

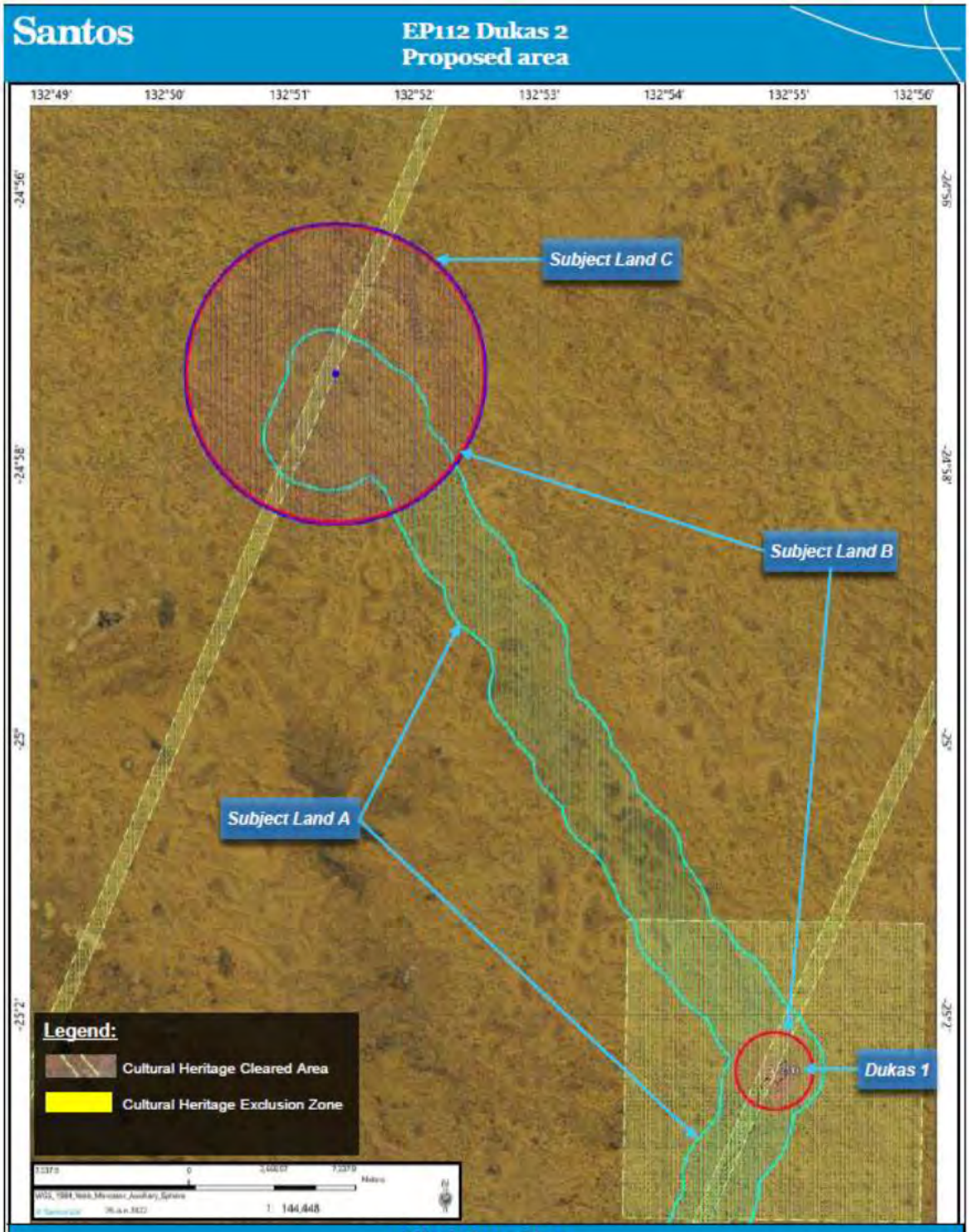
Subject Land A: Access to well locations

Subject Land B: Well sites within these areas

Subject Land C: Possible subsurface footprint of deviated/horizontal well (future work program) to a length up to 2000m.

	Projection	**MGA 94-53**
Exploration Well Location	**Easting**	**Northing**
Proposed Dukas 2 well – new location	[redacted]	[redacted]
Proposed alternate Dukas 2 well (Dukas 1 re-drill)	[redacted]	[redacted]

Table 2.2: Approximate wellhead coordinates of proposed Dukas well



Work Area Map

Endorsed Parties	Central Land Council		Activity Location	Mt Ebenezer; EP 112			
Nature of Activity	Access and Exploration						
Project Location	Dukas 2, Southern Amadeus	CHAR ID			Doc#	Proposed	
Means of Access	Lasseter Highway	Drafted	AR	Date	29/06/22	Map	1

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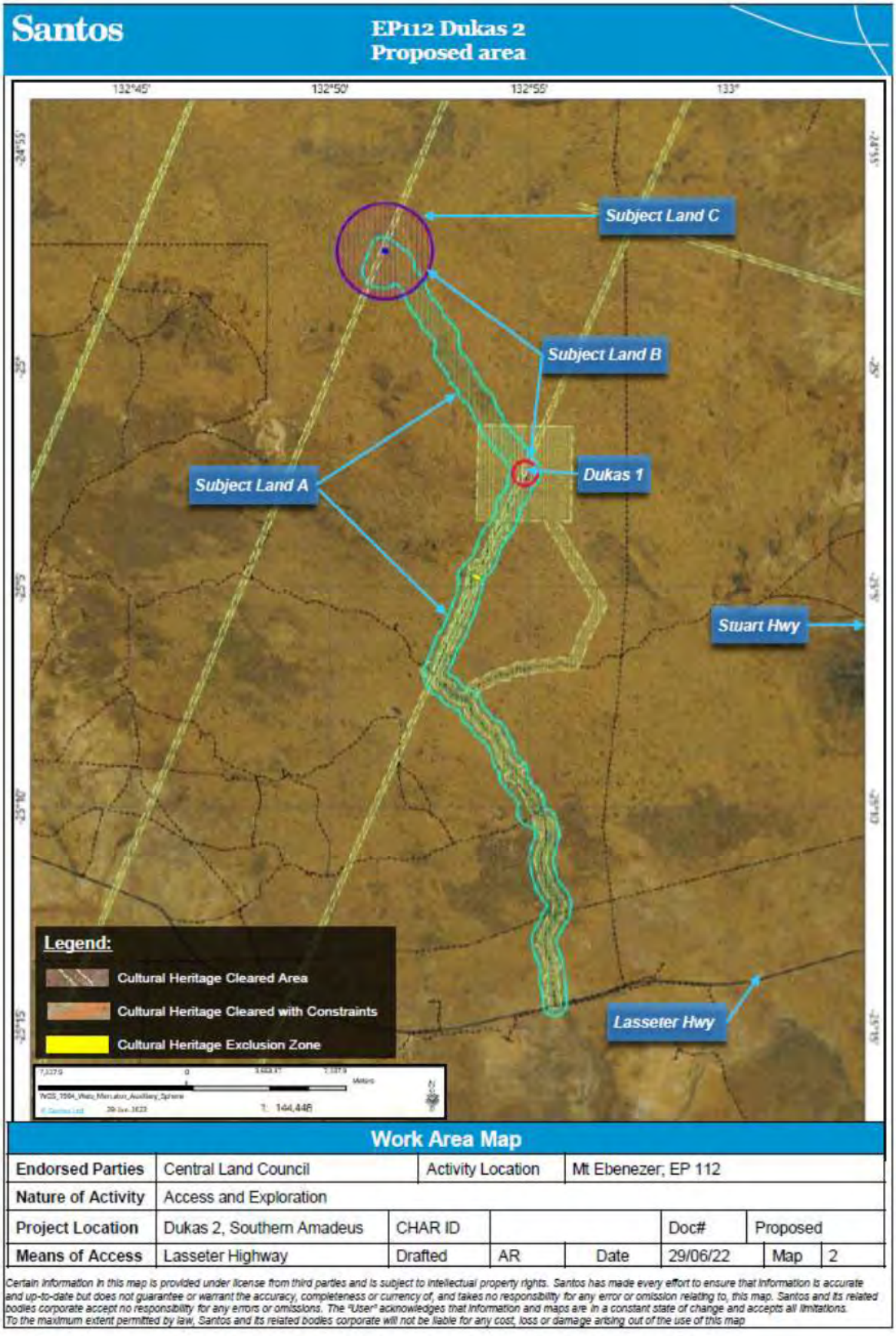
Figure 2.4: Dukas Project Area, Map 1



Work Area Map

Endorsed Parties	Central Land Council		Activity Location	Mt Ebenezer; EP 112			
Nature of Activity	Access and Exploration						
Project Location	Dukas 2, Southern Amadeus	CHAR ID			Doc#	Proposed	
Means of Access	Lasseter Highway	Drafted	AR	Date	29/06/22	Map	2

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Figure 2.5: Dukas Project Area, Map 2

2.2 Mt Kitty Wellsite Infrastructure and Access, EP 125

Civil works at Mt Kitty is proposed to repair and upgrade the existing Lyndavale Homestead/Mt Kitty 1 access track as necessary, and prepare a well pad, waterbore location(s), laydown areas and campsites for the Mt Kitty 2 exploration well. Approximate coordinates of the proposed Mt Kitty 2 well are presented in Table 2.3, noting that a possible alternative to the new location is a re-drill at the Mt Kitty 1 location, or re-entry of the Mt Kitty 1 well. The well site will be accessed from the Stuart Highway via the Lyndavale Homestead access road, then via the Mt Kitty 1 access road.

Associated GIS files are attached to this application (Attachment 3). The approximate well locations, and subject land areas are shown in figures 2.6 to 2.8. Subject land areas are as follows:

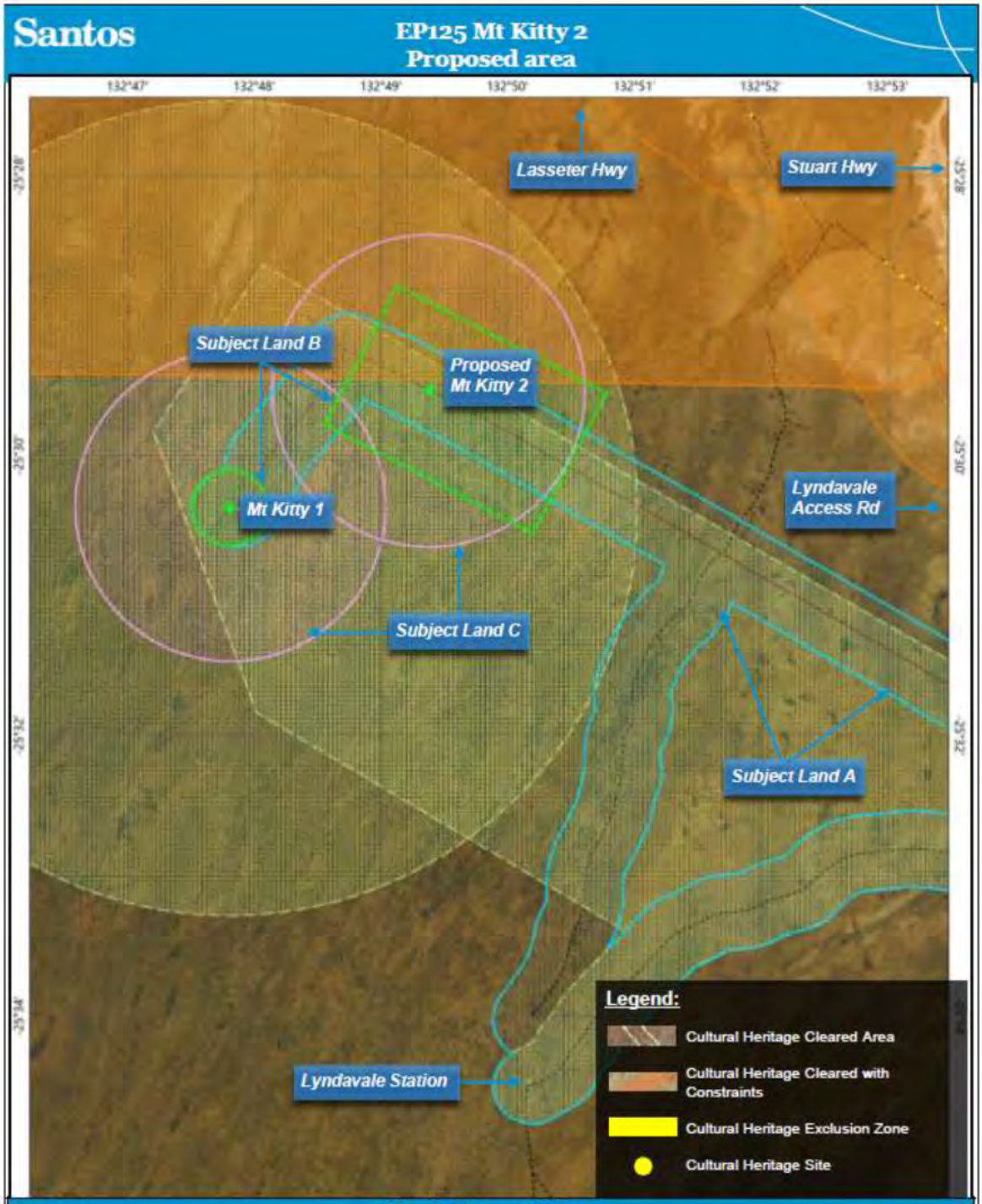
Subject Land A: Access to well locations

Subject Land B: Well sites within these areas

Subject Land C: Possible subsurface footprint of deviated/horizontal wells to a length up to 2000m.

	Projection	**MGA 94-53**
Exploration Well Location	**Easting**	**Northing**
Proposed Mt Kitty 2 well (new location)	[redacted]	[redacted]
Proposed alternate Mt Kitty well (Mt Kitty 1 location – re-entry or re-drill)	[redacted]	[redacted]

Table 2.3: Approximate wellhead coordinates of proposed Mt Kitty well



Work Request Map

Endorsed Parties	Central Land Council	**Activity Location**	Lyndavale Station: EP125					
Nature of Activity								
Project Location	Mt Kitty, Southern Amadeus	**Vegetation**				Doc#	Proposed	
Means of Access	Lyndavale Access Rd via Stuart Hwy	Drafted	AR		Date	4/07/22	Map	1

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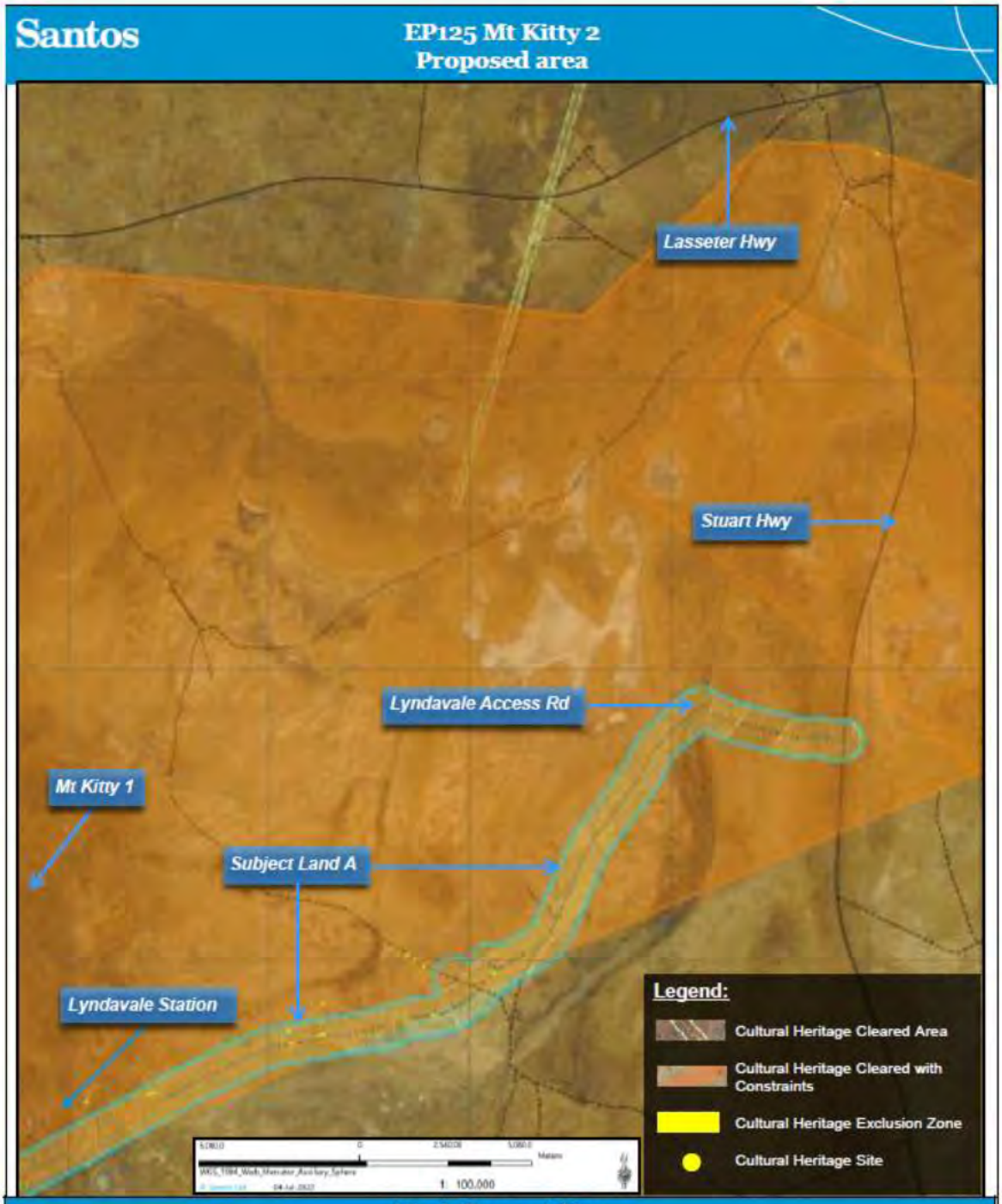
Figure 2.6: Mt Kitty Project Area, Map 1



Work Request Map

Endorsed Parties	Central Land Council	Activity Location	Lyndavale Station: EP125				
Nature of Activity							
Project Location	Mt Kitty, Southern Amadeus	Vegetation			Doc#	Proposed	
Means of Access	Lyndavale Access Rd via Stuart Hwy	Drafted	AR	Date	4/07/22	Map	3

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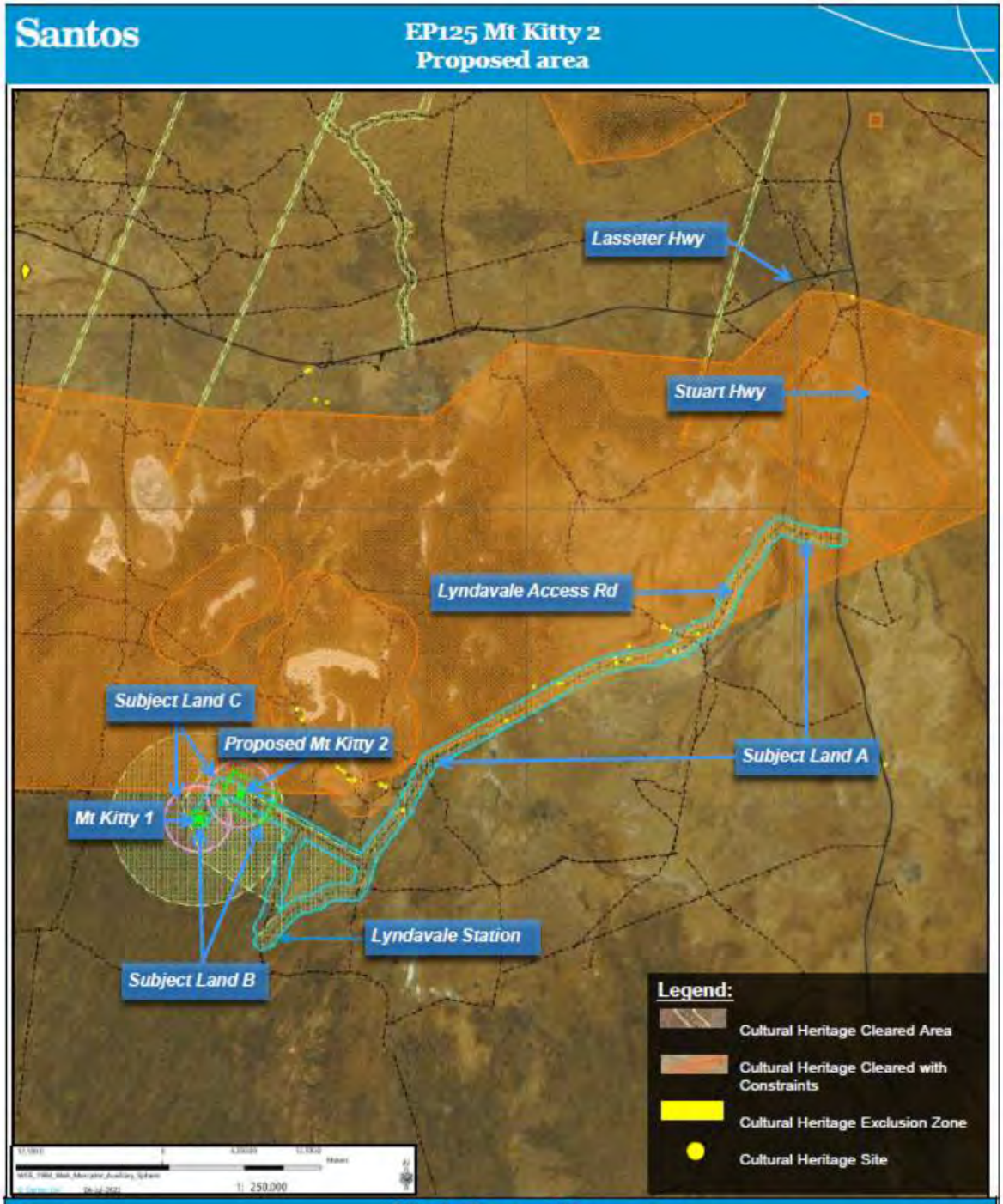
Figure 2.7: Mt Kitty Project Area, Map 3



Work Request Map

Endorsed Parties	Central Land Council	Activity Location			Lyndavale Station: EP125		
Nature of Activity							
Project Location	Mt Kitty, Southern Amadeus	Vegetation			Doc#	Proposed	
Means of Access	Lyndavale Access Rd via Stuart Hwy	Drafted	AR	Date	4/07/22	Map	4

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Figure 2.8: Mt Kitty Project Area, Map 4

4.2.3 Attachment 2

Attachment 2 – ANNEXURES

Annexure 1 – Description of 2D Seismic Operations

The seismic method

Seismic acquisition allows the explorer to 'image' below the surface and identifies areas where oil and gas may have accumulated. The seismic method uses energy sources such as vibrator trucks (or equivalent) to generate sound waves that travel into the earth and are then reflected from subsurface geological structures. The returning reflections are digitally recorded and sent to a seismic data processing centre to produce a 'cross-section' of the layers of the earth's crust. The following sections explain the field procedures for recording seismic data.

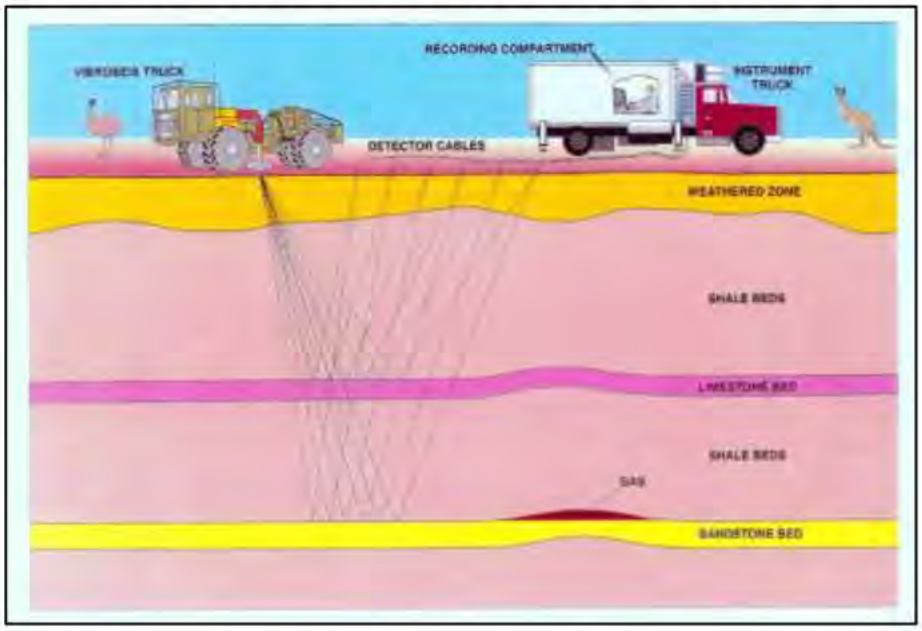


Figure: Schematic of typical seismic acquisition operation

Planning

Once the exploration team has proposed a seismic program, the line layout is plotted onto detailed topographic maps and aerial images to begin planning the survey.

Seismic surveys can be of a regional nature covering a very large area including the first look at an area, or an infill type survey that is infilling other seismic surveys. Typically infill surveys are a tighter density of lines covering a smaller area than a regional survey.

Regardless of their regional or infill nature, a seismic survey can be as small as a single line or up to dozens of lines totalling hundreds of linear kilometres. In the case of an infill type survey, the lines will usually be set out in a rough grid with line spacing ranging between 0.5 – 5km.

2D seismic lines are used to layout the seismic detectors that pick up the reflected sound waves and are also travelled by the vibrator trucks that provide the sound waves recorded on the seismic detectors.

Seismic lines are usually prepared tracks that are 4-5 m wide. The energy source for conventional 2D seismic typically moves along the seismic line as recording progresses. The seismic lines are carefully laid out to avoid sensitive environmental sites as well as cultural features such as buildings, dams, water wells and known cultural heritage sites. The key aspect of field acquisition is to get equipment (usually vehicular based) and personnel along the planned seismic lines and acquire sufficient data to adequately 'image' the subsurface.
The safety of field personnel is a key aspect of any seismic operation. This involves compromise between what is logistically, environmentally and economically possible.

Cultural heritage clearance
A cultural heritage clearance is usually the first field activity to occur on a 2D seismic survey. Clearance logistics vary from project to project. The appropriate method for the project is decided during early discussions between representatives of the explorer and the Native Title Claimants/Traditional Owners.

Depending on the method used, Santos may employ a field liaison officer who will be the link between the field clearance operation and Santos. They will work closely with Traditional Owners and will provide survey support to the group if required.

In the Amadeus Basin, all requests for Cultural Heritage Clearance are directed to the Central Land Council who then consult with Traditional Owners and their own specialists to facilitate approval to proceed with the survey. Typically this approval will come with a number of conditions that must be abided by for the survey to proceed.

No work will commence on the ground by Santos or any of its contractors until this approval is obtained.

Seismic Line and Access track preparation
Once the line positions for a project have been cleared by the cultural heritage group(s), the line preparation crew can commence work.

The line preparation crew usually operates simultaneously on different lines using D6 bulldozers (or equivalent) for the initial pass and then a grader may be utilised for tidy up work if required. Daily production of prepared line varies greatly and is primarily dependent on the terrain. It may vary from 5-20km per day per machine. In areas of low or sparse vegetation, the bulldozer will be utilised to simply walk with the blade up in easily traversable terrain, with the marks of the tracks being sufficient for the grader (if required) and the surveyors to follow. Where required for safety reasons, the blade may be used for minor clearing of topsoil or sand dune access. Blade work is minimised and generally restricted to skimming the top off rough ground to provide safe access for subsequent operations.

The grader that follows the dozer simply tidies up the resultant line. If any windrows are left behind the grader will knock them down to prevent any channelling of rainwater and thereby prevent future erosion. In many areas, the dozer will simply walk and there will be no work required by the grader.

All machine operators are given detailed project inductions at the start of each survey with project specific issues such as Cultural Heritage, Environmental, Safety and infrastructure requirements discussed in detail.

The line positions are pre-programmed into GPS units mounted in the dozers. These GPS units provide the dozer operators with real time position updates. These are plotted on a display that also indicates the Cultural Heritage cleared corridor for the dozer operators.
The dozers weave around vegetation stands and on open ground the machines weave every 75-100m to reduce the visual impact. Other items such as roads, infrastructure, detours plus any exclusion zones or restricted work areas are also displayed on the dozer GPS units so the operator has a detailed project map relating their real-time position.

Figure: Example seismic line (Mereenie) after line preparation

The line preparation personnel typically operate out of a small, mobile self-contained camp that regularly moves with operations. The project surveyors are also normally accommodated in the same camp along with a paramedic and Santos supervisor.

The line preparation phase may last anywhere from a couple of days to a couple of months depending on the size of the survey.

Seismic Line Surveying
Surveying commences within a day or two of the line preparation commencing.

A survey team is typically made up of a Senior Surveyor and GPS operators. The senior surveyor is typically responsible for all office work plus doubles as the dozer pointer to assist the dozer operators

if they are working in a highly constrained area. The GPS operators are responsible for surveying each seismic line and placing the required survey markers.

The GPS operators use real time kinematic GPS receivers to position receiver/source points. Surveyors generally insert numbered wooden pegs and plastic tipped "pin flags" to indicate the points; however, a seismic line can be "stakeless" in special circumstances such as when working on properties with a certified organic status. Markers protrude about 30cm above ground level and may be placed as deep as 100mm in soft sandy terrain. These markers are removed on completion of the recording phase. Line detours are often marked with biodegradable flagging, which is also removed. Each survey team (one surveyor in a light 4WD vehicle) generally makes only one pass over any given section of line.

Figure: Light 4WD vehicles used to pass along proposed seismic lines.

Back packing of the survey effort occurs in areas where line preparation and vehicle access routes have deviated from the true line position and markers are inserted on foot. This could be due to a variety of reasons, the more common being Cultural Heritage restrictions, environmental restrictions or infrastructure concerns. In these situations, the following recording crew will position cables and geophones by foot and no vehicles traverse the area.

Figure: Surveyor pegging on newly prepared seismic line

Surveying operations are normally run in conjunction with the line preparation operation and therefore have about the same duration.

Seismic Data Recording

Approximately 1-2 weeks after the line preparation and surveying are completed in an area, the recording operation will commence. This operation is the largest part of the seismic operation in terms of personnel and vehicles. Depending on the size of the program, a 2D recording crew would normally number up to 35 personnel and up to 15 light vehicles. The bulk of the on-ground equipment is transported to site in heavy vehicles, however heavy vehicles will only be used on existing tracks/roads and will not travel along the seismic lines.

Work commences with the deployment of small seismic detectors (geophones) that contain the geophone element, a GPS receiver, hard disk storage and a battery. These are deployed along the line at a pre-determined interval, dependent on geophysical target, which can be between 2.5m and 25m increments.

Figure: Seismic line crew deploying geophones

Recording would normally commence when a sufficient number of geophones have been deployed. This layout is termed "the spread" and it picks up the acoustic energy reflected from subsurface layers during the seismic surveying process, converts it to electrical energy and stores that information on a hard drive within the unit. Surveys may have up to 12km or more of spread "live" (recording) at any one time.

Recording consists of the vibrator trucks travelling along the line and stopping at regular increments, generally between 10m and 20m, to "vibrate" the ground. After vibrating in one spot for around 12-15 seconds, the trucks will move onto the next point along the line and vibrate again. During this, the trucks are centrally located in the line spread, resulting in around 6km of spread behind the trucks and 6km in front of the trucks. The seismic labourers (or "juggies") rotate the redundant spread from behind the vibrator trucks to in front of the vibrator trucks continuously throughout the day to ensure the vibrators can continue without delay.

Figure: Seismic line crew planting geophones

Figure: Geophone planted in the ground

Once the vibrators are finished on a line, the final spread behind the vibrators is picked up and the line is complete.

Figure: Seismic Recording Truck

All operational vehicles stay on the prepared line with the exception of parked vehicles that have to park off line to avoid causing noise on the spread and interference with line traffic. While parked off the prepared line, vehicles remain within the corridor cleared by the cultural heritage teams.
Along any single line the following vehicle passes can be expected to occur during normal operations.

Bulldozer: 1 pass
Grader: 1or2 passes
Light vehicles: Multiple passes during surveying and recording operations.

Seismic Line/Access Track and Campsite Restoration
Once a seismic line is completed, restoration work may commence if required. Most seismic lines and access tracks do not require restoration work, as one of the main objectives is to prepare and utilise them in a way that facilitates rapid natural recovery. However, instances that can give rise to restoration requirements are:

- It is a requirement of the project Environment Plan for all lines to be restored
- Wheel ruts have been created after wet periods or bulldust
- Windrows have not been fully removed by the grader
- Windrows need to be removed at intersection of lines and public tracks
- Public access tracks need to be reshouldered where necessary
- Access tracks have sustained damage due to extensive seismic traffic.

Normally a single grader is all that is required to carry out the restoration work. Methods used for rehabilitation include:

- Ripping of compacted areas with rear tyres
- Windrow material and vegetation pushed onto the line

- Public road windrows reinstated.
- Wheel rut material used to infill affected areas.
- Affected water course channels and creek banks reinstated to pre-survey profile.

Environmental Monitoring

During the above activities the maintenance of environmental standards is closely monitored by the Santos field representatives and Contractor section heads. All crew personnel are environmentally inducted prior to start up. Environmental monitoring photo points (PPs) are set up close to easy vehicle access and natural rehabilitation is monitored photographically over a period of years until rehabilitation is acceptable.

Various earthworks are required to provide a safe and practical work area and access to drill gas wells, drill water bores, prepare campsites, airstrips and for other operational needs. The construction designs will be determined by a framework that supports users, landholder(s) and regulatory needs.

All civil work activities will be fit for purpose and will be undertaken to minimise impacts on Traditional Owners, pastoral lease holders, nearby industry, or the general public. Design and construction will be appropriate for:

a. The types of vehicles that need to use the road.
b. The type of road planned and the surface material – e.g. high clay, dunefields or fine bulldust soils have different construction and maintenance requirements.
c. Expected weather conditions – i.e. all weather access and mobility can be improved by formation design, adequate drainage, plus capping with rock, rubble, or "Durabase Matting".
d. The conditions of the approved Environmental Management Plan, which requires a civil solution to manage erosion, wildlife impact, bushfire, and flood risks.

Optimally designed, planned and executed civil works are critical as summarised below:

1. **Wellsites** are constructed to create safe, fit for purpose work areas that include several distinct zones:
    i. Drill hardstand is level and compacted using selected fill that supports the loads and pressures of drilling rig equipment operations.
    ii. Drill pad work area is level and surrounds the drill hardstand – this area needs to be compacted and support ancillary equipment like generators, fluid treatment systems, pipe racks and forklifts.
    iii. Wellsite work areas that surround the drill hardstand and cuttings pits have a level tolerance of <2% and must be compacted to support the movement of trucks and forklifts, and for the storage of bits, casing and other consumables.
    iv. Cuttings pits are located proximal to the fluid treatment systems (Mud Tanks) or loaders (in the case of "sumpless drilling"). Pits can be unlined, lined with a bentonite and clay mix to create an impermeable layer, or lined with a synthetic membrane to retain drilling fluids during drilling and subsequent dehydration process prior to backfill.
    v. Flare pits are positioned down-wind from the prevailing wind direction and ideally >35m from hole centre or any other sensitive zones.
    vi. Mini camps, crib/first aid rooms and site management offices, are located outside the wellsite work/hardstand areas; offices are positioned to provide a clear view of the rig floor. This area will be level, compacted and accessible to supplies and emergency vehicles, and usually include emergency muster points and vehicle parking.

2. **Access Roads** are designed and constructed so that road trains can deliver equipment and supplies to the sites, and personnel can be safely moved around or delivered to site. Roads may be watered to reduce dust, and/or capped to reduce maintenance and/or closed following rain.
3. **Laydown yards** are constructed so that materials can be offloaded and stored for use as and when required. Materials include steel casing, tools and mud chemicals. Laydown yards must provide enough room for the safe movement of trucks and forklifts.
4. **Campsites** for workers' accommodation, and refuge during severe weather, illness or injury, are located in positions that provide isolation from fire and flood dangers. Campsites must be reliably resupplied and provide workers with good comfort and recreation facilities. The location of campsites should reduce travel and fatigue exposure to acceptable levels.

5. **Water Bores** for the supply of water to aid compaction and reduce dust; support drilling, completion and any hydraulic fracture stimulation operations; and supply water to the campsite for amenity needs. It is preferable to have a low salinity water supply close to site, reducing road maintenance costs and the quantity of imported potable water. However, saline aquifers are suitable for some operations. In ground turkey nests will be prepared for water storage if required.
6. **Water Storage Pads** are required if above ground water tanks are erected to provide sufficient water volume and delivery rate to support the works. Typically larger storage is required where water bore flow rates are low.
7. **Airstrips and Helipads** are used to transport the workforce from a main centre to the worksite. Air transport reduces fatigue and exposure to land transportation risks. Existing landowner airstrips will be utilised and upgraded under agreement to a condition where charter operators (for crew change), or RFDS or Careflight Air Ambulance (emergency evacuation) aircraft can be used. Helipads may be constructed at each wellsite to provide additional direct access to remote wellsites.

Annexure 3 – Description of drilling, evaluation, fracture stimulation, completion and flow testing activities

3.1 Drilling

Oil and gas wells are typically drilled by rotating a drill bit on the end of drill pipe while exerting downward force on the drill pipe. During drilling, fluid is pumped through the inside of the drill pipe or "string" to the drill bit and back up the outside of the drill string to lift drill cuttings out of the hole. The drilling fluid / drill cuttings are then channelled into tanks or pits and the drill cuttings are separated from the drilling fluid; drilling fluid is then recycled down hole in a continuous process. The well is drilled deeper by adding a length of drill pipe to the drill string; this is repeated until the well, or a section of well, reaches the target depth. Once the target depth is reached, casing composed of steel pipe is installed into the well and cemented in place to provide the structural integrity and well integrity barriers for the designed life of the well.

The figure below illustrates a typical drilling rig layout and well pad and access roads required for a Cooper Basin drilling operation. The drilling rig along with specialised wellsite support services and camp are mobilised to the well location, comprising 100-150 trucks. The drilling rig camp is either located adjacent to the wellsite or in a location central to multiple wellsites. It is designed to accommodate the crew working at the wellsite and will expand and contract as required to meet personnel requirements.

Figure: Drilling rig in the Cooper Basin. (Source: Santos 2016)

Wells are drilled to reach the target gas reservoirs via a series of hole sections. While drilling, rock cutting samples are captured from the drilling mud to characterise the formations that are being drilled through and to calibrate the geological model. Each hole section serves a specific purpose for well construction and well integrity as outlined below:

1. The Conductor Hole Section is drilled and cased to stabilise the surface sediments (i.e. it prevents loose soils from caving into the borehole), and is cemented into place to ensure an appropriately robust seal (up to ground level). The conductor casing also serves to isolate aquifers near surface, if present.

2. The Surface Hole Section is drilled and cased to isolate shallow aquifer systems and to stabilise the well for subsequent hole sections. This hole section will be drilled with drilling fluid that exerts a higher hydrostatic pressure on the rock face than is present naturally in the rock pore space, ensuring formation fluids do not enter the wellbore. Other techniques such as underbalanced or managed pressure drilling may be applied dependant on the downhole environment. The surface casing is cemented in place from bottom to top to ensure effective pressure isolation of shallow aquifers from deeper hydrocarbon bearing zones encountered in subsequent hole sections. Finally, the casing is pressure tested to simulate well life design specifications.

3. After the surface casing is installed, a Blowout Preventer (BOP) is installed onto the well at surface to provide a second barrier along with the drilling fluid. At the commencement of drilling the next hole section (i.e. only 2-3m of new hole drilled), a Leak Off Test (LOT) or Formation Integrity Test (FIT) is conducted to determine the rock strength. This will ensure the well is drilled without risk of the rock failing due to exerted pressure and will ensure the fluid used for drilling the well has the appropriate kick tolerance.

4. The Intermediate Hole Section(s) may be drilled and cased to isolate deeper aquifer systems (if present), to contain pressure that may occur during the subsequent hole section, or to isolate a geohazard, like a salt formation prior to drilling deeper. The hole section is drilled with drilling fluid that exerts a higher hydrostatic pressure on the rock face than is present naturally in the rock pore space, ensuring formation fluids do not enter the wellbore. Other techniques such as underbalanced or managed pressure drilling may be applied dependant on the downhole environment. Open hole wireline logging may be performed after the intermediate hole section is drilled and prior to casing being run. As with the surface casing, the intermediate casing is cemented in place to ensure appropriate well integrity. Finally, it is pressure tested to simulate well life design specifications.

5. The Production Hole Section is drilled to intersect formation targets containing oil and/or gas and is drilled to a depth below the lowest hydrocarbon bearing target. The hole section is typically drilled with drilling fluid that exerts a higher hydrostatic pressure on the rock face than is present naturally in the rock pore space, ensuring formation fluids do not enter the wellbore. Other techniques such as underbalanced or managed pressure drilling may be applied dependant on the downhole environment. Logging while Drilling (LWD) can be used to gather data in real time to gain an understanding of the petrophysical environment.

6. If well trajectory allows, open hole wireline logging is generally performed after the production hole section has been drilled and prior to the production casing being run. Wireline operations for Santos are undertaken by different industry recognised specialist service companies. Different tools are lowered into the well via wireline including density, neutron, acoustic and

electrical logging tools. Petrophysical characteristics of the various rock formations drilled, including porosity, permeability, rock type and hydrocarbon saturation are measured and recorded. This information is used to ascertain whether the well is economical to run production casing for future production. If the well is not currently economic, a decision not to run production casing may be made requiring the well to be plugged and decommissioned or plugged and suspended for future operations.

7. If a formation containing oil and/or gas is intersected, a Drill Stem Test (DST) can be conducted to evaluate the reservoir. This test allows fluids in the formation being evaluated to flow into the drill string and to the surface. Pressure-recording devices in the drill stem test tool measure and record pressure in the well while it is both flowing and not flowing (shut in). A DST can also obtain actual fluid samples from the formation. From detailed analysis of the pressure recordings and of the fluids, the operator can infer a great deal of information about the reservoir (Baker, 2004). Although a DST can be performed in uncased hole (open hole) or in cased hole (perforation tests), the open hole test is more common. The tool assembly which consists of a packer, a test valve, and an equalizing valve, is lowered on the drill pipe to a position opposite the formation to be tested. The packer expands against the hole to segregate the mud-filled annular section from the interval of interest, and the test valve allows formation fluids to enter the drill pipe during the test. The equalizing valve allows pressure equalization after the test so the packer can be retrieved. By closing the test valve, a build up in pressure is obtained; by opening the test valve, a decline in pressure is obtained. During the DST, both pressures and flow rates are measured as a function of time (Lyons, 2010).

8. The wireline logging evaluation program may include a vertical seismic profile (VSP) or checkshot survey, or a 'walk-away' VSP. These geophysical techniques are like surface seismic exploration, except the detectors (geophones) are located in the well bore, rather than at the surface, and the surface source is stationed at specific locations around the well. The geophone array comprises one to several geophones on wireline. The surface seismic energy source is either an airgun (in a water filled drum and pit) or a small vibrator truck located as close as is safe and practical to the well bore. The geophone array is run to the bottom of the hole on the wireline, and is then moved up the hole at regular intervals (e.g. 15m) and the stationary surface source is triggered. The geophones record the time it takes for the seismic energy from the surface source to arrive downhole at the geophone. The data recorded provides accurate velocity information and is processed to produce a seismic wavelet well-tie, such that the well can be "tied" to the 2D seismic line on which it is located.

   A walk-away VSP is a vertical seismic profile in which the energy source (small vibrator truck) is moved to progressively farther offset from the surface well location, effectively providing a mini 2D seismic line that can be of higher resolution than surface seismic data and provides more continuous coverage than an offset VSP. 3D walkaways, using a surface grid of source positions, provide 3D images in areas where the surface seismic data do not provide an adequate image due to near-surface effects or surface obstructions.

9. After the production hole is drilled and logged, production casing is installed to the total depth of the wellbore and cemented in place. It is pressure tested to simulate well life design specifications. The purpose of the production casing is to provide isolation between the hydrocarbon reservoirs and all other overlying formations, to contain the pressurised fluid if hydraulically fracture stimulation of reservoir is required, and to provide effective wellbore integrity for well production. High quality steel casing is designed specifically for each well. If the well does not require hydraulic fracture stimulation, a lower grade of steel casing may be used that meets the design requirements for the life of the well.

Casing design scenarios are modelled using well-established and reviewed techniques to simulate the design loads for collapse, burst and tensile failures that could conceivably be observed during the operational and production phases. The results of these analyses direct the selection of casing grade

and weight. All casing is tested by Santos and the contractor using specific Quality Assessment and Quality Control (QA / QC) procedures prior to installation to ensure compliance with Santos engineering and regulatory specifications.

After each hole section is drilled, the steel casing is cemented in place. The correct composition, volume and placement of cement is critical for well integrity. The cement serves two purposes – it provides protection and structural support to the casing while also providing zonal isolation between different formations, including groundwater and aquifers. The cement and required additives are high quality materials produced specifically for oil and gas operations with the materials selected designed to address the specific conditions of a particular well.

Santos and the cementing contractor ensure the cementing material and equipment is adequate to achieve the well design objectives and ensure effective isolation. Prior to pumping the cement, it will be laboratory tested against the engineering design and actual downhole conditions such as temperature. The cement is tested using specific QA / QC procedures and includes the following:

1. slurry density
2. thickening time
3. fluid loss control
4. free fluid
5. compressive strength development
6. fluid compatibility (cement, mix fluid, mud)
7. sedimentation control
8. expansion or shrinkage characteristics of the set cement
9. static gel strength development
10. mechanical properties (e.g. Young's Modulus, Poisson's Ratio, elastic / compressibility characteristics)

Cased hole logs can be run inside the cemented casing to validate the quality and integrity of the cement sheath bonding the casing to the formation. Typically, these logs include:

1. gamma ray - measures naturally occurring gamma radiation to characterise the rock or sediment in a borehole
2. casing collar locator - a magnetic device that detects the casing collars
3. cement bond log - an acoustic device used to measure the properties of the cement sheath and the quality of the cement bond between the casing and the formation

The cement bond log is an acoustic device that can detect cemented or non-cemented casing. It works by transmitting a sound or vibration signal into the casing, and then recording the amplitude of the arrival signal. Casing that has no or poor quality cement surrounding it (i.e. free pipe) will have large amplitude acoustic signal because the energy remains in the pipe and isn't transmitted to the formation. Casing that has a good cement sheath (fills the annular space between the casing and the formation and effectively couples the two) will have a much smaller acoustic amplitude signal as the energy is absorbed by the formation due to effective acoustic coupling. Santos uses experienced contractors to identify the key features of the cement quality to ensure the integrity of the cement seal for each casing pipe sheath.

3.2 DFIT

A Diagnostic Fracture Injection Test (DFIT) goes by many names: mini-frac, mini fall-off, datafrac, etc.; but all refer to the act of injecting small volumes of a clear fluid (usually with a small percentage of Potassium Chloride e.g. 2 to 3% KCl) at low pumping rates until a fracture forms, at which point the wellhead is shut-in and the pressure allowed to fall-off naturally. The fluid contains no proppant so that the fracture can relax and close naturally as pressure dissipates. The pressure changes are measured with high-accuracy gauges that are either placed deep in the wellbore or at surface on the wellhead. The analyses of fracturing pressure, during injection and after shut-in, provides information for understanding and improving fracture stimulation projects. The importance of DFIT analysis of fracture pressure was recognized in 1958 by Godbey, J.K. and Hodges, H.D. and pioneered by Nolte in 1979 who introduced the G-Function based on material balance and the Carter leak-off model. Barre et al. in 1996 recommended using the G-Function and its diagnostic derivatives to identify fracture closure and signatures of non-ideal leak-off behaviours such as tip extension, pressure dependant leak-off (PDL) and storage height recession signatures. These signatures help operators recognise fracture behaviours and design fracture stimulation programs accordingly to ensure that the targeted reservoirs are optimally stimulated. Below are examples of the signature behaviours that are commonly used in the industry to observe fracture injectivity responses:

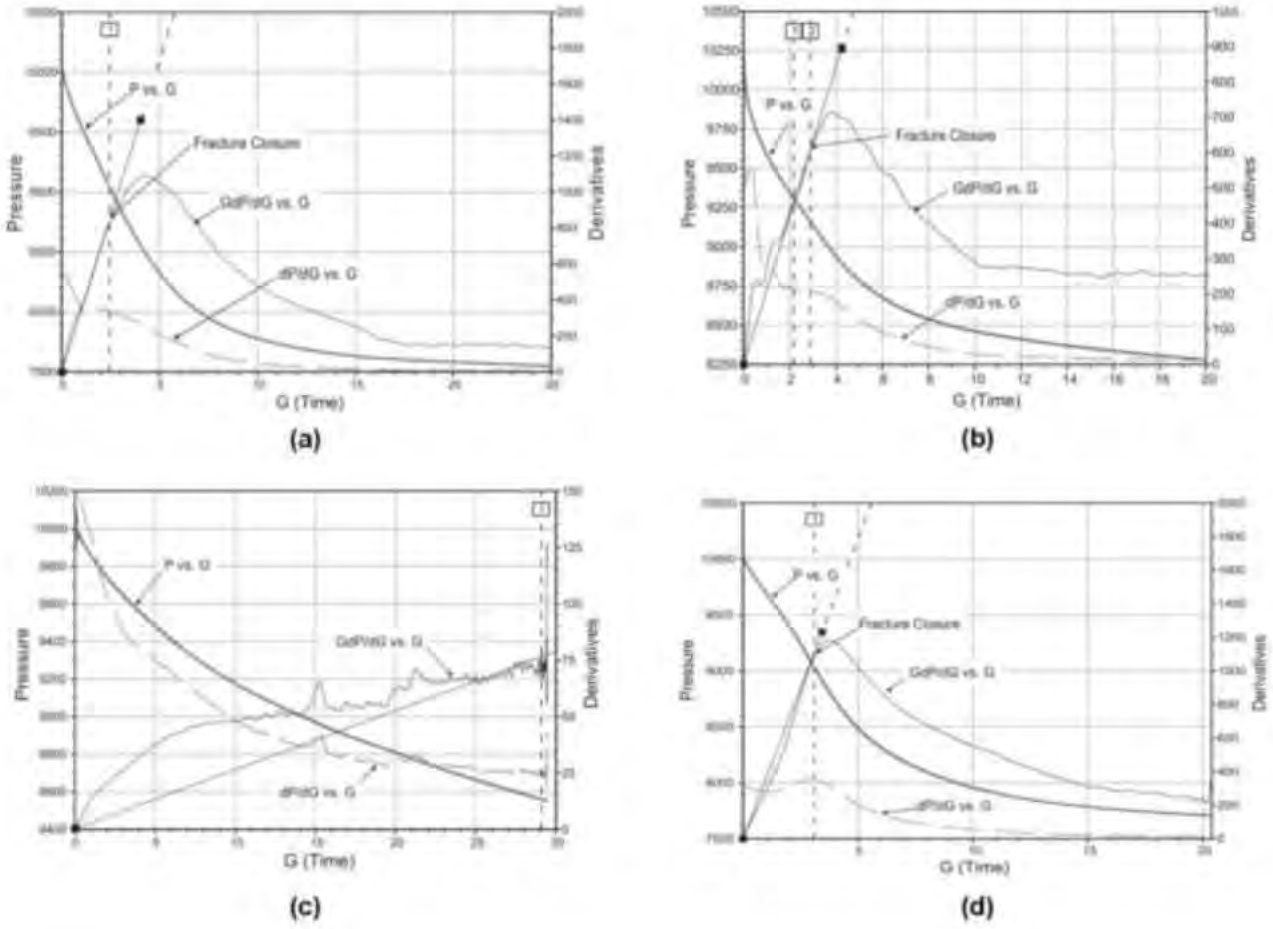


Figure: (a) Normal leak-off; (b) pressure dependant leak-off (PDL); (c) tip extension; (d) storage/height recession signatures on G-function plots (Barree et al. 2009).

Models have also been built to predict the fall-off pressure of an ideal normal leak-off DFIT using standard pressure transient analysis (PTA) log-log diagnostic plots. The figure below presents a log-log diagnostic plot of the basic fall-off response shape of a normal leak-off, which is interpreted as a 3/2 slope on the Bourdet-derivative (with respect to superposition time).

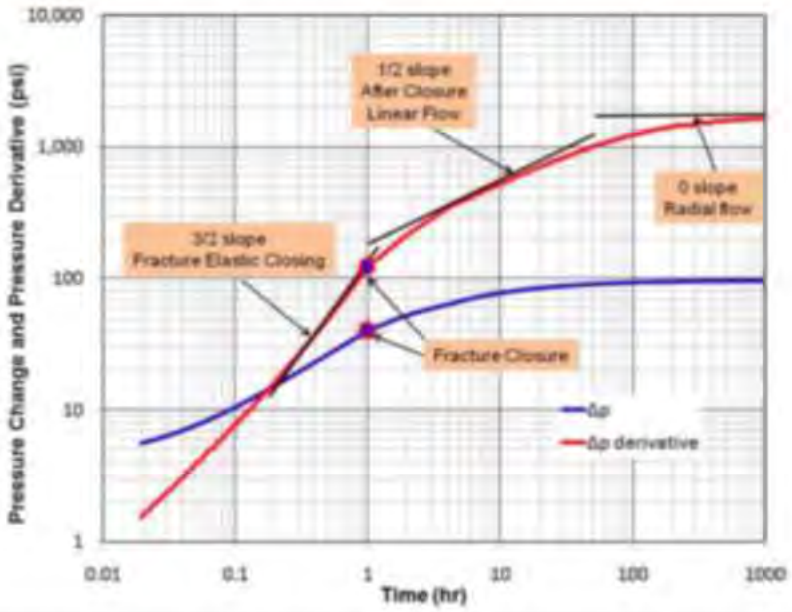


Figure: Log-log diagnostic plot of an idealised fracture-injection/fall-off test (Marongiu-Porcu et al. 2011).

3.3 Fracture Stimulation Evaluation

Pressure Monitoring

During a fracture stimulation treatment, computer assisted live monitoring allows for potential problems (surface or down-hole) to be identified and corrected quickly. An example of live monitoring applied to downhole conditions is if pressure communication between the annulus of the well and inside of the well is identified. Where communication is identified, it may be an indication that the first barrier control (as part of the well's integrity management) has been compromised and the treatment will be stopped immediately.

The figure below depicts information presented during real time stimulation operation monitoring. Key parameters such as surface, bottom-hole and annular treatment pressures, proppant concentrations, volume of injected fluid and fluid additives are monitored. The modelled pressures are compared with the actual pressures and can provide useful information in evaluating the overall fracture growth and fracture geometry achieved. This calibration process is used to refine and improve subsequent designs as part of the design optimisation process.

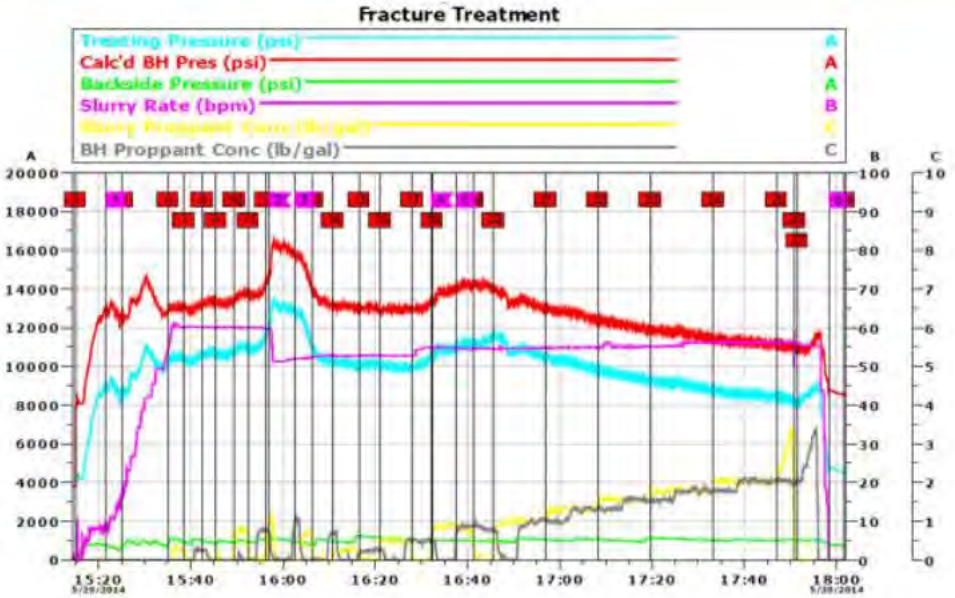


Figure: Real time monitoring of hydraulic fracture parameters (pressure, rate etc.) on a shale gas frac in the Cooper Basin (Santos 2014)

Tracers

Chemical tracers are used to determine the relative contribution from each fracture stimulation stage. These low dosage chemicals are designed to be unique in composition and able to be absorbed into the water or gas phase produced during flow back. This enables the operator to determine the performance of each frac stage and incorporate optimisation learnings into future campaigns.

Microseismic

Advanced stimulation monitoring techniques such as microseismic monitoring, may be used to evaluate fracture azimuth, fracture height and fracture half length. This information can be further used to calibrate the hydraulic stimulation model predictions. Microseismic monitoring involves the use of sensitive receivers ("geophones") at the surface or within one or more nearby wells to detect and locate in 3D space energy releases associated with fracture propagation. The figure below shows an example of a side-view of the locatable microseismic events that were detected during the multi-stage hydraulic stimulation of a Cooper Basin horizontal shale well, with the positions of the events colour-coded by stimulation stage. The modelling and field results show good agreement.

Figure: Microseismic events mapped during the 10 stage shale hydraulic fracture treatments pumped in the Cooper Basin. The different colours represent the different frac stages (Santos 2014).

The microseismic results are supported by detailed studies such as by Fisher and Warpinski (2012) which have reviewed height growth data from unconventional (shale) plays in the US including the Barnett, Marcellus and Woodford shales. These studies have indicated that maximum fracture height growth is typically far less than 300m when contained within a relatively homogeneous layer.

Tiltmeter installation

Tiltmeters are very sensitive surface tools for measuring very minor displacement or movement in the subsurface. They are used in hydraulic fracture stimulation operations to provide insight into the spatial extent and orientation of induced fractures.

Tiltmeters are typically installed into pre-drilled and cased holes drilled with an 8" or 10" diameter bit to a depth of around 12 metres.

Once the drilling is completed a 4" PVC pipe is then cemented in place within the hole. The cement secures the 4" PVC pipe to the ground around it to ensure good coupling for the tiltmeter. The cement ends around 1.2m below ground. To further minimize unwanted noise a larger 8 – 10" pipe around 1.8m in length is then placed around the smaller pipe to a depth of about 1.2m below the surface. The tiltmeter tools are then lowered into the inner 4" string of PVC. A small amount of sand is poured around the tools to give positive coupling to the surrounding ground. An end cap is then placed over the 8" PVC pipe to make the entire setup weatherproof.

Drilling of the tiltmeter holes will be performed by a small truck mounted rig as pictured below. There will also be an additional vehicle and trailer for transporting extra equipment and consumables such as concrete and sand. As the vehicles are light vehicles only minimal (if any) line preparation is needed

for access. Should access line preparation be required, the lines are prepared to the standard of seismic lines using a dozer and possibly a grader.

Drill cuttings will be stacked adjacent the hole to be re-used to backfill the holes upon completion of the project.

Installation would typically be completed in a 2 week period.

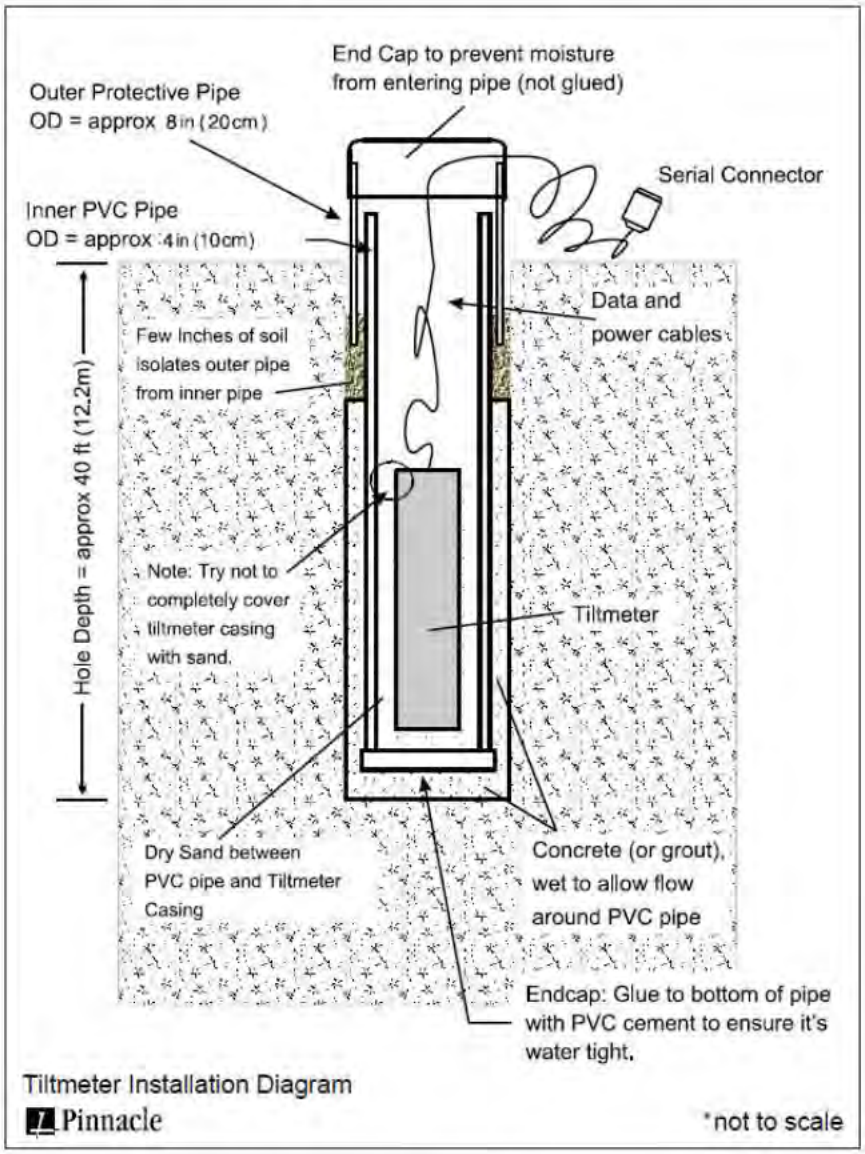


Figure: Schematic of typical tiltmeter installation

Figure: Truck mounted rig preparing shallow hole to install tiltmeter.

Tiltmeter recording

Once the tiltmeter installation is complete, the meters themselves are maintenance free and do not require any revisits until the project is complete and the meters are removed. The tiltmeters are expected to remain in-situ for 2 – 3 months.

Tiltmeter recovery and restoration

Once the tiltmeter survey is complete, the tiltmeters are removed and the location restored. To do this, each site is once again visited by a couple of light vehicles and the meter is manually removed. The outer 8" PVC casing is also removed. The remaining 4" PVC casing is then broken off around 1.2m below ground and the resultant hole is backfilled to ground level using the drill cuttings form the initial drilling if possible.

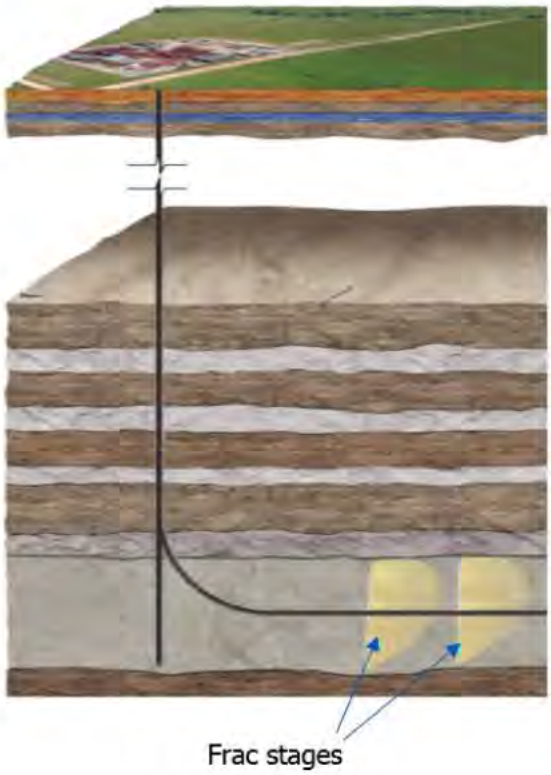
If any access tracks were prepared, they will be inspected at the time of tiltmeter removal and if required a grader will be brought in to restore the access tracks.

3.4 Fracture Stimulation

Objective

After determining that a well has the required design and well integrity to undergo stimulation and completions, the well is handed over to 'complete' the well and set it up for production. Hydraulic fracture stimulation is not part of the drilling process but is a completion technique applied after the well is drilled. The intent of hydraulic stimulation is to place a highly conductive channel (sand sized proppant) into the reservoir to increase the flow capacity of the well. Typically used in low permeability reservoirs that cannot sustain economic production such as tight sand or a reservoir damaged by the drilling process. It is a process that has been used in the oil and gas industry since 1947. The Society of Petroleum Engineers (SPE) estimates that over 2.5 million hydraulic stimulation treatments have been undertaken in oil and gas wells worldwide. It has been successfully used on wells in the Cooper Basin for nearly 50 years without a primary barrier breach and is currently performed in many basins around Australia, including the Amadeus Basin in the Northern Territory.

Figure: Fracture Stimulation spread rigged up on a 3-well pad in the Cooper Basin. (Source: Santos 2016)



Vertical depth to proppant placement in hydraulically opened fractures will likely range between 2000m and 4000m below surface.

Figure: Multi stage fracture stimulation operations in a horizontal well.

The stimulation process involves pumping water, a specific blend of chemical additives and a propping agent such as sand or ceramic beads down the well at sufficient pressure to create a fracture in the target formation. Proppant keeps the fractures open once the pump pressure is released which thereby improves the productive potential of the well. A fracture created in the target reservoir propagates laterally from the well in a vertical plane. Common dimensional terminology for the created fracture includes fracture half length (xf), fracture height (hf) and propped width (wf), as depicted in the figure below. Each frac stage typically takes 0.5 to 1 day to complete, with a fluid flowback period followed by gas flaring and production testing.

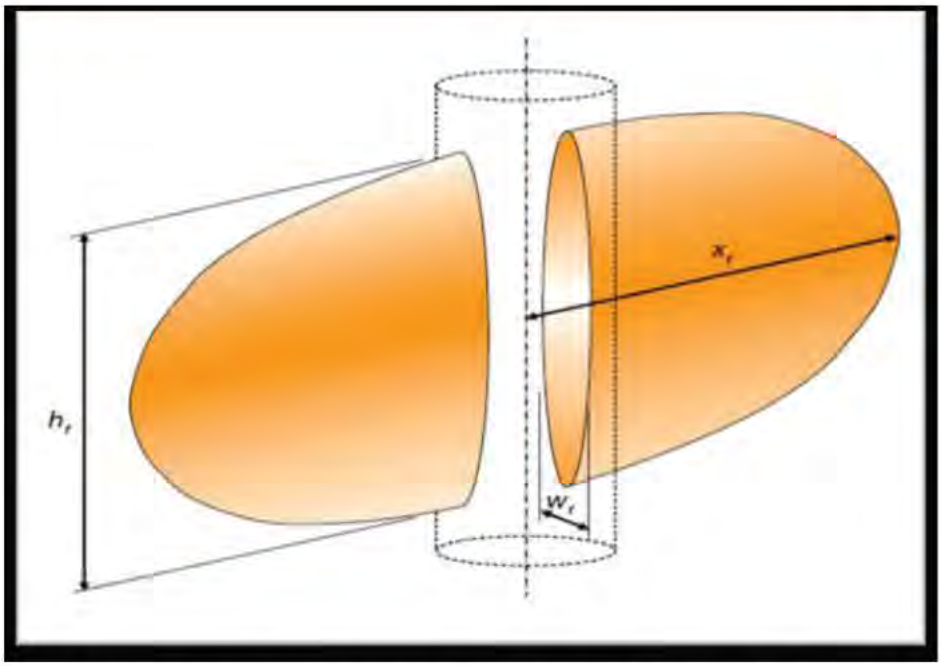


Figure: Conceptualised Shape of Hydraulic Stimulation Zone of Influence. (Source: Economides and Martin, 2007)

Santos has a long history of demonstrated well integrity during hydraulic fracturing operations. In nearly 50 years of hydraulic fracturing operations on over 1,150 wells, there has never been a loss of the primary barrier during the fracture treatment. The primary barrier during the stimulation phase is generally the production casing, with the secondary barrier being the surface well pressure control. Should the primary barrier fail, a pressure relief valve (PRV) installed to monitor pressure between the primary barrier and surface casing, is triggered to open at a pressure well below the failure point of the surface casing. This ensures that the surface casing is not exposed to pressure above its design specification, and as a result prevents the risk of failure. Also, programmable pressure triggers (kickouts) on each of the high pressure pumps will physically shutdown each pump (and associated pressure) if a certain trigger pressure is reached. This trigger is below the design limits of the well. If the primary barrier did fail during hydraulic fracturing operations, operations would cease and it would be repaired to meet the design requirements before proceeding with completing the well.

Engineering Design

Open hole and cased hole logging provides information required for the hydraulic stimulation design process, including rock stress and lithological parameters. This data is processed using industry-accredited stimulation software to develop an optimal design. The basis of well specific hydraulic fracture design is to create a fracture within the target formation that will produce hydrocarbon through the number of required fractures. This is achieved by modelling fracture length, fracture conductivity, and fracture height for each created fracture as depicted in the figure below. A number of considerations influence the final design for each treatment, including:

- depth and thickness of the formation target
- lithology of formation target and bounding layers
- minimum and maximum horizontal stress across all layers (target and bounding)
- thickness of the seals above and below the target reservoir formation
- porosity and permeability of the formation

- pore fluid saturations (percentage of formation pore volume occupied by oil, gas or water)
- pore fluid properties (e.g. density, water salinity)
- well performance data, including flow rates, formation pressure and produced fluid properties
- formation boundaries (as identified from offset wells, log data, cuttings data, and/or seismic data)
- bulk rock density, elastic properties and compressibility
- natural fracture networks
- stress field analysis to determine the maximum principle stress direction and the minimum principle stress direction

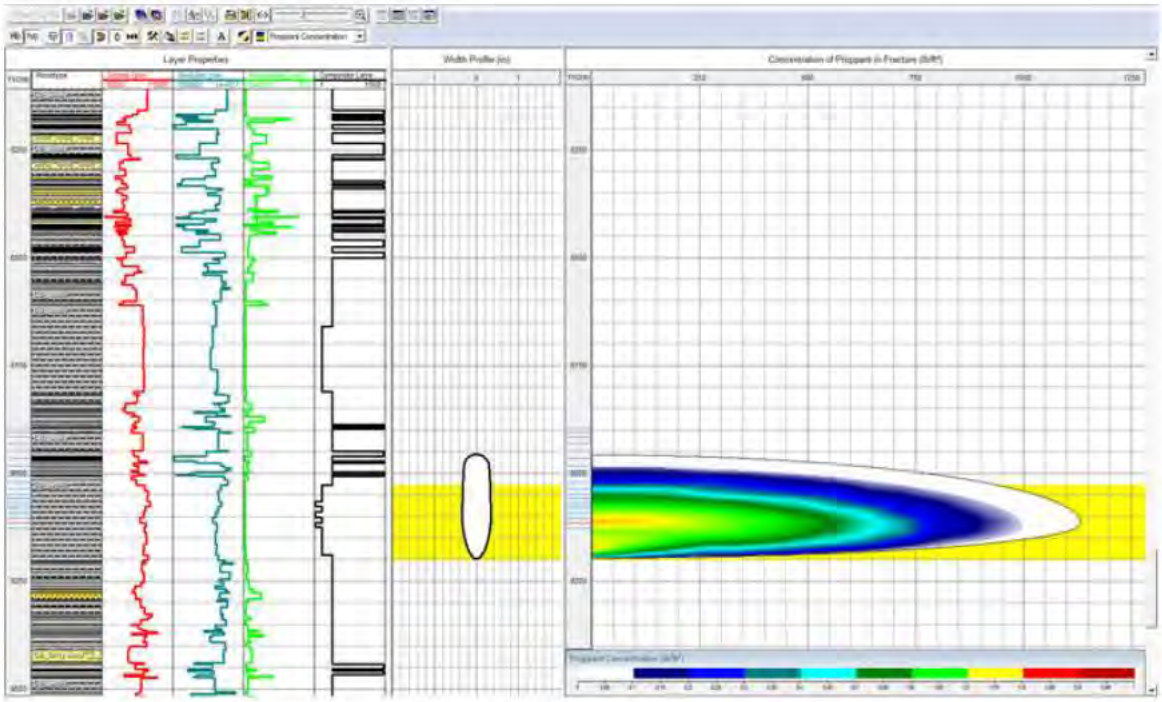


Figure: Modelled side view output from industry accredited stimulation software for a Cooper Basin horizontal well shale hydraulic fracture (Source: Santos 2014)

Proppant and Chemicals

Hydraulic fracture fluid water generally comprises more than 90% water, and up to 9% sand or ceramic proppant. Chemicals generally account for less than 1% of the mixture and assist in carrying and dispersing the proppant in the low permeability rock. In accordance with regulatory requirements, chemical additives are subject to full disclosure. The chemical additives are not specific to the hydraulic fracture stimulation process, having many common household uses such as in swimming pools, toothpaste, baked goods, ice cream, food additives, detergents, cosmetics and soap. The chemicals used provide the following functions:

- Viscosity – gelling agents (natural plant based) are added to the water to provide viscosity to enable the proppant material to be transported down the well and into the created fractures.
- Friction reduction – to reduce the force required to pump the fluid, making the fluid more slippery and easier to pump at high pressures and high rates required to create the fracture network.
- Biocide – added to ensure that there are no microbes or organisms present in the water that will affect the gelling agents and to ensure they will not enter and affect the reservoir.
- Scale and corrosion – scale and corrosion inhibitors are added to prevent deposition of mineral scales and to prevent corrosion of the primary wellbore barrier (i.e. the steel casing).

- Surface tension – surfactants or surface tension modifiers are added to assist the flowback of fluids from the formation.

The process is initiated by pumping a pre-designed volume of the stimulation fluid without proppant, referred to as the "pad volume". The purpose of the pad volume is to create the fracture geometry required to receive the designed proppant volume. Prior to and during pumping the pad into the well, the base gel is prepared and tested using specific QA/QC procedures. Programmed and automated control systems are used to maintain the fluid properties during the pumping of the treatment process. The viscosity of the fluid is typically in the region of 10 to 40 centipoise (cp), depending on the specific fluid design. This may require the use of a base gel or cross-linked gel, both made from guar.

Figure: Example of a typical slurry gum constituent, guar gum – illustrating its native form, seed form, splits and powder.

*** Note: Guar gum is a vegetable product which is ground into a powder and used to create a viscous liquid for hydraulic fracturing. (Source: Economides and Martin, 2007)*

Once the pad volume has been pumped, the injection of the "slurry stages" begins. Proppant is added to the blender and proportioned into the stimulation fluid. The concentration of proppant generally increases through the slurry stages as designed within the fracture treatment simulator. Previously mentioned chemical additives are incorporated to provide a suitable fluid for transporting proppant into the already created fracture.

In a cross-linked gel fluid system, breaker compounds are added at progressively increasing concentrations throughout the pad and slurry stages. The breaker comprises an oxidizing compound or enzyme that breaks the crosslink sites, as well as the long chain polymers. The end result is a fluid with significantly lower viscosity that can be easily flowed back from the formation to assist with fracture clean-up. The "break time" is designed to coincide with the known pump time at reservoir conditions plus some additional time to ensure the treatment is pumped to completion. This enables the fluid to be more easily recovered from the formation.

Proppant addition begins at low concentrations and is staged up to the final designed concentration which is specific to the formation being hydraulically stimulated. Typical proppant concentrations will range from 0.5 lb/gal (60 kg/m^3) to 8 lb/gal (1000 kg/m^3) for conventional sandstone reservoir stimulations. Proppant used in hydraulic stimulations range from graded quartz sand to higher strength ceramic proppants. The strength of this inert material varies, with ceramic proppant being much stronger than quartz sand. Ceramic proppant is used in formations with higher effective stresses, to prevent it from crushing and compromising the created fracture's conductive properties.

Figure: Typical sand - guar gum fluid mix. (Source Economides and Martin, 2007)

Once the final slurry stage is pumped on surface, the flush stage is pumped. The flush stage is a friction reduced fluid (non cross-linked) that is used simply to displace the last stage of slurry down to the perforations. This leaves the wellbore volume free of proppant and ensures that the proppant is placed within the fracture. Once this flush volume has been pumped, the high pressure pumps are shut down and the fracture treatment is considered complete.

Perforating

When the formations requiring hydraulic stimulation are identified, the casing needs to be perforated to provide communication between the wellbore and the formation target zone. The type of charge used depends on the type of hole, size and penetration depth required. The three primary types of perforating used are:

- Wireline Conveyed Perforating (WCP) – the most widely used perforating technique in the Cooper Basin. As the name suggests, WCP uses wireline to deploy the perforating charge.
- Tubing Conveyed Perforating (TCP) – uses the same technology as conventional wireline perforating but is run using a coiled tubing unit or jointed tubing (not wireline). TCP is the preferred perforating method when operating in underbalance or overbalanced conditions.
- Hydro-jetting – uses sand and water jetted through small holes in the bottom hole assembly to create holes in the casing across the target formation – there is no perforating charge. Hydro-jetting allows for targeted or pinpoint perforating, creating between 3 and 4 holes per event.

Process

A number of steps are involved in the hydraulic stimulation process to pump the designed fracture treatment:

1. Diagnostic Fracture Injection Test (DFIT) to validate and update the proposed stimulation design. This involves injecting a small volume of water, shutting down the surface pumps and monitoring pressure decline to evaluate near wellbore entry friction, fracture gradient, fluid leak off, and minimum horizontal stress. This stage is optional and typically only performed until subsurface conditions are better understood.
2. Main stimulation treatment consisting of pad volume, slurry stages with increasing proppant concentrations, and flush stage to displace last slurry stage through the perforations and into the fracture.
3. Isolation of the completed fracture stimulation stage using a mechanical plug installed at a pre-designed depth.
4. Perforation of the next stage to be hydraulically stimulated and repetition of the process in steps 2 to 4 above until the final fracture stimulation stage is completed.
5. Removal of all mechanical isolation devices by milling out the mechanical isolations.
6. Flowback well to clean up fracture stimulation fluids and monitor hydrocarbon production. This step may also be combined with an Extended Production Test (EPT) to help define the field reserves and expected production life. The flowback of stimulation fluid is conducted through a separator, which separates and captures liquids, and flares produced gas through a vertical 'flare stack'.

The above method describes the "plug and perf" technique for fracture stimulation. Another technique is to use coiled tubing assisted annular stimulation which is used to provide a conduit for "pin-point fracturing". Coiled tubing is run into the well to the deepest target. The bottom-hole assembly run on the end of the coiled tubing incorporates a jetting assembly that allows low concentration sand slurry to cut holes or slots into the casing and cement. The hydraulic stimulation treatment is then pumped into the coiled tubing / casing annulus to initiate and propagate the fracture.

Equipment

The equipment and machinery required to carry out a hydraulic stimulation operation is highly mobile and able to be installed and removed relatively quickly (generally within a couple days). The equipment is compliant with state and federal regulations for road transport and is fitted with safeguards such as an in-vehicle monitoring system (IVMS) to ensure driver compliance.

The Wellhead – is used to inject into and control the well, during hydraulic stimulation operations. The stimulation fluids, which are injected from the surface via the wellhead, are injected at high pressure through perforations in the well casing to physically fracture the reservoir rock. The wellhead provides the primary surface barriers for well control.

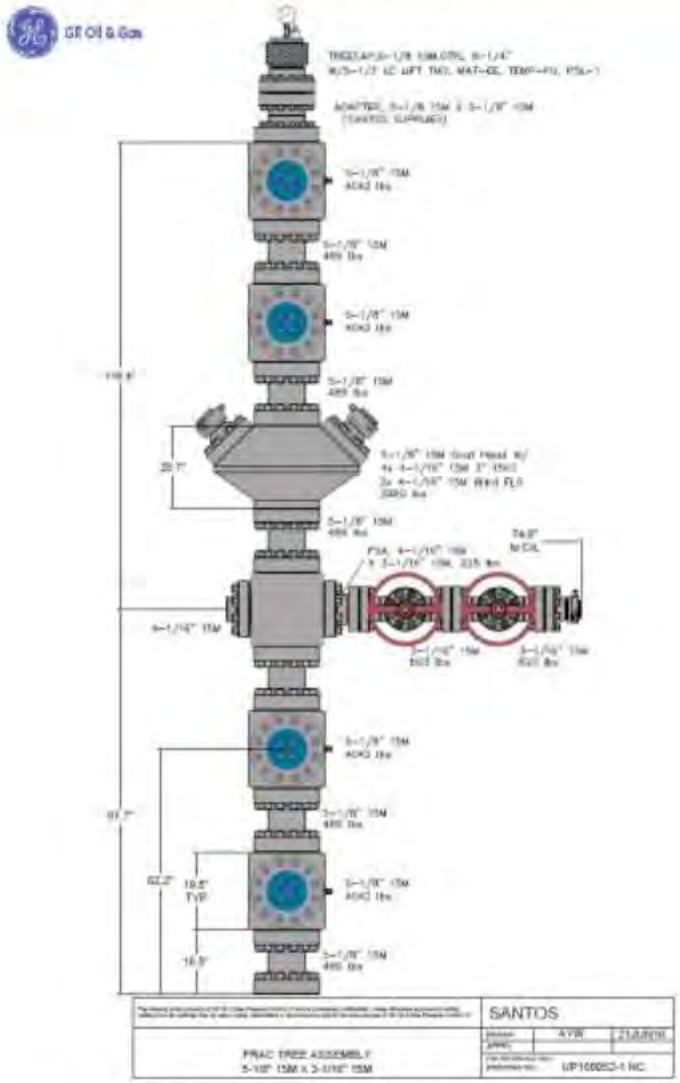


Figure: Example hydraulic stimulation wellhead

Above ground storage tanks – on site, above ground water storage tanks provide temporary water storage for use in the hydraulic stimulation process. Source water can either be trucked from a nearby water source or piped along a temporary network. Small dosages of biocide are added to control algal growth particularly under warm and stagnant conditions. Following completion of works, temporary water storage infrastructure is removed from site.

Figure: Above ground storage ponds used for frac make up water storage and frac flowback water storage in the Cooper Basin, (Santos 2013)

Sand Trailer Unit – a large, multi-compartment trailer that holds proppant (sand or ceramic material) required for the treatment. When proppant is required, a conveyor system distributes proppant from the compartments to the blender unit.

Figure: Sand trailer unit. (Halliburton 2012)

Blender Units – In general, two different blending units are used: A pre-gel blender; and a down-hole blender. The pre-gel blender combines the source water with additives required for the base stimulation fluid and proportions of required additives to provide the final hydraulic stimulation fluid. The down-hole blender unit then proportions proppant to the stimulation fluid to provide the proppant concentrations specified in the treatment design. The final hydraulic stimulation fluid, without proppant, is referred to as the "clean fluid". The final hydraulic stimulation fluid, with proppant added, is referred to as "slurry". Chemical additives are precisely measured, controlled and recorded by the blender throughout the stimulation treatment process.

Figure: Blender unit. (Halliburton 2012)

High Pressure Pumps – Reciprocating triplex or quintaplex pumps that receive low pressure hydraulic stimulation fluid from the down-hole blender and inject these fluids at the required higher pressure into the well during the hydraulic stimulation process. The pumps contain programmable pressure triggers (kick outs) to prevent pressure from exceeding the wellbore design limits. High pressure treating iron (pipes, manifolds, connectors, etc.) connecting the stimulation pumps and the wellhead also contain pressure safety valves (PSVs) that are set to open at a pre-set pressure to ensure the well components are protected.

Figure: High pressure pump. (Halliburton 2012)

Control or Data Acquisition Unit – telemetry from all units connects to a central control room during hydraulic stimulation treatments. Treatment parameter data, including surface and bottom-hole pressure, pumping rate, chemical rate and fluid density, are monitored, recorded and plotted. Treatment supervisors monitor and control the treatment to ensure that the treatment is pumped according to design. Satellite communication facilities allow further 'remote' oversight by technical experts.

Figure: Control unit. (Halliburton 2012)

Coiled Tubing Unit – a Coiled Tubing Unit (CTU) has many uses within oil and gas operations but is not always required as part of hydraulic stimulation operations. On some occasions the stimulation treatments are placed using coiled tubing assisted annular fracturing, as opposed to "perf and plug" completions (as described above). Coiled tubing can be used in place of wireline perforating by jetting holes through the casing and cement using abrasive jetting. Once perforations are jetted, the coiled tubing is left inside the well and the hydraulic stimulation treatment is pumped down the coiled tubing / casing annulus.

In Plug and Perf operations, the Coiled Tubing Unit is generally used at the completion of hydraulic fracturing operations and prior to flowing back into the well, to remove or "mill out" the bridge plugs set in the well to hydraulically isolate each stage.

Figure 3.19: Coiled tubing unit. (Halliburton 2012)

Flowback Ponds and/or Tanks – are used to receive fluids produced during stimulation operations and during the initial clean-up phase (following stimulation activities), and potentially during the early weeks and/or months of production testing operations. Typically the returning fluid decreases over time until it ceases and a hydrocarbon stream is solely produced. Ponds are typically double lined with UV stabilised synthetic liners to prevent leaks. After the initial clean-up phase, the produced fluids are allowed to evaporate or treated for disposal or re-use.

3.5 Completion

At the end of the clean-up phase, a workover rig may be used to install production tubing and associated completion equipment such as packers, nipple profiles, tubing hanger, and the production tree. Production tubing which has a smaller internal diameter than casing, is generally required to ensure the well can continue to 'clean up' and there is sufficient vertical lift performance to enable fluid to be removed from the well under natural lift from the well. After the well has been "completed" it is ready for longer term production via an inline production network. Where the well is not fracture stimulated, the production tubing and associated completion equipment may be installed by the drilling prior to rig release, or with a dedicated workover rig, prior to commencing flow testing.

3.6 Flow Testing – Post fracture stimulation

Once the injection process is complete, the internal pressure of the rock formation causes fluid to return or "flowback" to the surface through the well. This fluid, often referred to as flowback, contains the dissociation or breakdown products of the injected fluids plus naturally occurring geogenic compounds (i.e. material or substances that are mobilised through the process that must also be considered for any potential health or environmental impact).

A considerable volume of the injected fluid is recovered as flowback. Studies performed by the US EPA (US Environment Protection Agency (EPA), 2004) indicated that approximately 60% of the fluid is recovered in the first three weeks of flowback, and total recovery back to surface was estimated to be from 68–82%; however, this is variable across different fields and can be less than 20% in some instances. The flowback water is typically temporarily stored tanks or lined pits before treatment for reuse or disposal.

Initial flowback is typically performed with a mobile separator on location during exploration and appraisal when there are no or limited surface processing facilities. The separator is normally located on the well-pad and connected via relatively short flowlines that include debris catchers and choke manifolds to the wellhead to optimise the flowing conditions and frac clean-up. Separators are generally 3-phase to segregate gas, oil and water. The gas is sent through to a flare stack where it is flared on location (unless a gas network is already in place), while the liquid hydrocarbon (oil/condensate) is stored in onsite storage tanks, and the water or flowback is stored as described above.

Figure 3.20: Flow testing separator rig up on a pad location. (Farley Riggs 2014)

The recovered fluids produced during the initial clean-up phase (following stimulation activities), are stored in Flowback Ponds or Tanks, which are double lined with UV stabilised synthetic liners to prevent leaks. The fluid is allowed to evaporate or it is treated for disposal or reuse in the next hydraulic fracturing event. Waste treatment and management facilities are modular, factory fabricated and transported to site for assembly and connected to piping, electrical controls and instrumentation. By-products from wastewater treatment are contained in fully engineered, purpose-built structures for further treatment and disposal. Strategic opportunities for further treatment and beneficial use can be reassessed once composition and technology is assessed. The NT Government mandates conditions through a Code of Practice that Santos is required to comply with as a condition of its authorisation to undertake exploration activity.

Fluid samples are taken during the flowback period. The analysed samples are used to determine flow contribution from each of the fracture stimulation stages. Gas sampling is also performed to determine the composition of the gas (methane, ethane, butane, carbon dioxide, helium, hydrogen, nitrogen, hydrogen sulphide [if present], etc.). This will define the value of the product as well as optimising the casing and wellhead material specifications for future campaigns.

3.7 Flow Testing – no fracture stimulation

Flow testing when the well is not fracture stimulated is also typically performed during exploration and appraisal activities. A mobile separator is used on location when there are no or limited surface processing facilities. The separator is normally located on the well-pad and connected via relatively short flowlines that include a choke manifold to the wellhead to optimise the flowing conditions. Separators are generally 3-phase to segregate gas, oil and water. The gas is sent through to a flare stack where it is flared on location (unless a gas pipeline network is already in place), while the liquid hydrocarbon (oil/condensate) is stored in onsite storage tanks, and any produced formation water is stored in flowback tanks, lined earthen ponds or above ground ponds.

Gas sampling is performed to determine the composition of the gas (methane, ethane, butane, carbon dioxide, helium, hydrogen, nitrogen, hydrogen sulphide [if present], etc.). This will define the value of the product as well as optimising the casing and wellhead material specifications for future campaigns.

Annexure 4 – List of Chemicals Proposed for use in Hydraulic Fracturing of Potential Hydrocarbon Producing Formations

Below is a list of chemicals used by Halliburton, Schlumberger and Condor in Fracture Stimulation operations. If chemicals other than those listed are proposed for use, these will be provided to the CLC.

Chemical Name
1,6-Hexanediol
2-Ethoxy-naphthalene
2-hydroxy-N,N,N-trimethylethanaminium chloride
2-Mercaptoethyl Alcohol
2-methyl-2h-isothiazol-3-one
2-Propenamid (impurity)
2-Propenoic acid, homopolymer, ammonium salt
5-chloro-2-methyl-2h-isothiazolol-3-one
Acetic acid
Acrylamide acrylate copolymer
"Acrylamide, 2-acrylamido-2-methylpropanesulfonic acid, sodium
salt polymer"
Acrylamide, sodium acrylate polymer
Acrylonitrile
Alcohols, C10-16, ethoxylated propoxylated
Alcohols, C11-14-iso-, C13-rich, ethoxylated
Alcohols, C12-15, ethoxylated
Alcohols, C12-16, ethoxylated
Alcohols, C6-12, ethoxylated propoxylated
Alcohols, C9-11, ethoxylated
Alkyl Alcohol
Amides, tall-oil fatty, N,N-bis(hydroxyethyl)

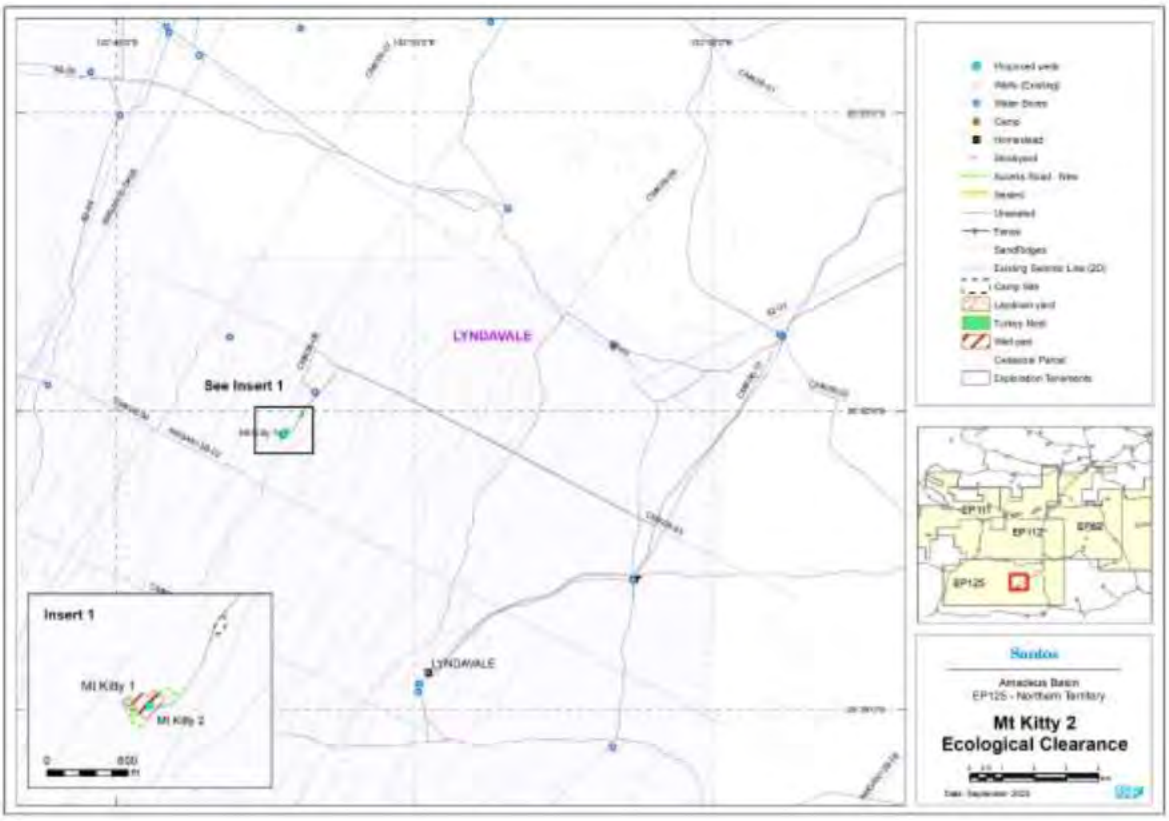
Amine oxides, cocoalkyldimethyl
Ammonium Chloride
Ammonium Persulphate
Ammonium Sulphate
Amylase, Alpha
Benzaldehyde
but-2-enedioic acid
Butyl alcohol
Calcium magnesium sodium phosphate frit
Carbolite (proppant)
Castor Oil
Ceramic (proppant)
Chlorous acid, sodium salt
Choline Chloride
Cinnamaldehyde
Citric acid
Copper(II) sulfate
Cristobalite
Crystalline silica, quartz
Decamethyl cyclopentasiloxane
D-Gluconic acid, monosodium salt
Diammonium peroxodisulphate
Diatomaceous earth, calcined
Dicoco dimethyl quaternary ammonium chloride
Diethanolamine
Diethylene glycol
Diethylene Glycol
Dimethyl siloxanes and silicones

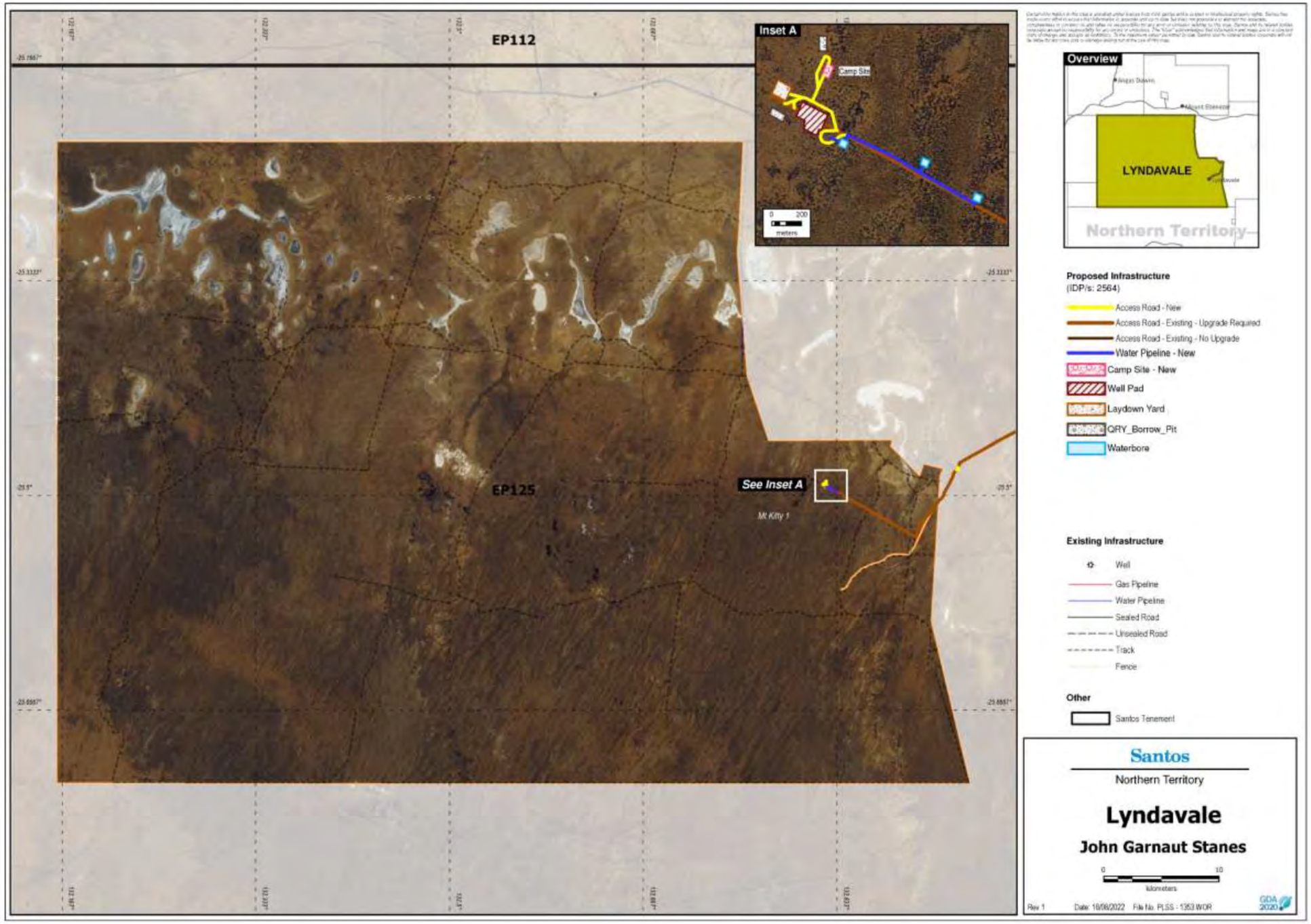
Disodium octaborate tetrahydrate
Distillates, Hydrotreated Light
Diutan
Diutan gum
Dodecamethylcyclohexasiloxane
EGMBE
Ethanol
Ethoxylated branched C13 alcohol
Ethoxylated C11 Alcohol
Ethylene Glycol
Fatty acids, tall-oil, ethoxylated
Formic Acid
Glutaraldehyde
Guar Gum
Hemicellulase
Hydrochloric acid
Hydrotreated light petroleum distillate
Inorganic Salt
Isopropanol
ISP (proppant)
Magnesium chloride
Magnesium nitrate
Magnesium silicate hydrate (talc)
Methanol
N-Benzyl-Alkylpyridinium Chloride
Non-crystalline silica (impurity)
Octamethylcyclotetrasiloxane
Partially neutralized polycarboxylic acid polymer

Pine Oil
Poly(oxy-1,2-ethanediyl), alphahexyl-omega-hydroxy-
poly(tetrafluoroethylene)
Polyacrylamide
Polyethylene glycol
"Polymer of 2-acrylamido-2-methylpropanesulfonic acid sodium
salt and methyl acrylate"
Polyoxyethylene nonylphenol ether
Polyoxyethylene-polyoxypropylene Block Copolymer
Potassium Chloride
Potassium Hydroxide
Potassium persulfate
Pottasium Sorbate
Propan-2-ol
Quartz, Crystalline silica
Quaternary ammonium compounds, bis(hydrogenated tallow alkyl) dimethyl, salts with bentonite
Sand (proppant)
Siloxanes and silicones, dimethyl, reaction products with silica
Sobitan, mono-9-octadecenoate, (Z)
Sodium acrylate, polymer with acrylamide and sodium AMPS
Sodium Benzoate
Sodium bisulfite
Sodium Bromate
Sodium calcium pentaborate octahydrate
Sodium Chloride
Sodium diacetate
Sodium erythorbate

Sodium hydroxide
Sodium iodide
Sodium perborate tetrahydrate
Sodium persulfate
Sodium polyacrylate
Sodium Sulfate
sodium sulphite
Sodium Tetraborate Decahydrate
sodium thiosulphate
Sorbitan monooleate polyoxyethylene derivative
Sorbitan, mono-(9Z)-9-octadecenoate
Sorbitan, monooleate, polyoxyethylene derivs.
Tar Bases, Quinoline Derivatives, Benzyl Chloride-Quat
Tetrasodium ethylenediaminetetraacetate
Tributyl tetradecyl phosphonium chloride
Triethanol amine
Ulexite
Urea

4.2.4 Attachment 3


LYNDAVALE
See Insert 1
Insert 1
Mt Kitty 1
Mt Kitty 2
LYNDAVALE
EP117
EP112
EP82
EP125
Santos
Amadeus Basin
EP125 - Northern Territory
Mt Kitty 2
Ecological Clearance


EP112
EP125
Inset A
Camp Site
0 200
meters
See Inset A
Mt Kitty 1
Overview
LYNDAVALE
Northern Territory
Proposed Infrastructure
(IDP/s: 2564)
Access Road - New
Access Road - Existing - Upgrade Required
Access Road - Existing - No Upgrade
Water Pipeline - New
Camp Site - New
Well Pad
Laydown Yard
QRY_Borrow_Pit
Waterbore
Existing Infrastructure
Well
Gas Pipeline
Water Pipeline
Sealed Road
Unsealed Road
Track
Fence
Other
Santos Tenement
Santos
Northern Territory
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Date: 18/08/2022
File No. PLSS - 1353.WOR
GDA 2020

4.3 Pastoralist Engagement Pack

Santos

EP125 (Mt Kitty) March 2023-July 2025 Work Program

Pastoralist Engagement Pack
(provided xx/xx/xxxx)

1 Purpose

Santos Ltd (**Santos**) is proposing to submit an Environmental Management Plan (**EMP**) in support of the proposed 2023/24 activities on Lyndavale Station in Exploration Permit (**EP**) 125. Santos presents this document to the operators and interest holders of Lyndavale Station to provide an understanding of:

- The regulated activity the interest holder proposes to carry out (Section 2),
- The locations where it is proposed to carry out the activity (Section 2),
- The timeline of the proposed activity (Section 3),
- The potential environment impacts, risks, controls, and environmental outcomes of the activity (Section 4),
- The possible consequences of carrying out the activity to the Pastoral Lessees rights or activities (Section 5), and
- A proposed plan for ongoing engagement (Section 5).

Importantly, scope beyond the end of the current Pastoral Land Access Agreement (**LAA**) period (end 2024) is subject of a new or revised LAA. Activity beyond 2024 will depend upon results of the described 2023/24 work program and is therefore hard to predict with certainty.

Santos proposes that any questions for feedback to the information provided in this pack is formalised via the form included in Appendix A within 60 days of receipt. Santos will ensure that all responses are reviewed, and feedback provided as appropriate. Santos also offers a face-to-face meeting with the stakeholder where subject matter experts can present the information in this pack and answer any questions. Face-to-face meetings must be arranged within 30 days of receipt of the pack. It should also be noted that Santos is committed to ongoing stakeholder engagement and discussion throughout the life of the activities.

1.1 Background

Santos QNT Pty Ltd, a subsidiary of Santos, is Operator of the EP 125 Joint Venture in the Amadeus Basin and is actively exploring the permit with co-venturer Frontier Oil and Gas Pty Ltd, a subsidiary of Central Petroleum Ltd (**Central**) (Figure 1). The acreage was originally granted by the NT Minister for Mines and Energy under the *Petroleum Act* on 21 July 2005. Both Santos and Central are in the process of entering agreements to allow Peak Helium (Amadeus Basin) Pty Ltd, a subsidiary of Peak Helium Pty Ltd (**Peak**), to join us the Joint Venture. These agreements are expected to be formalised by the NT Government imminently.

Since becoming Operator of EP 125 in 2013, Santos has acquired and processed 646 kilometres of seismic within the permit, followed by the drilling of Mt Kitty 1 in September 2013.

This Pastoralist Engagement Pack provides information to you in relation to the proposed activities on Lyndavale Station throughout 2023/24. This pack provides a detailed description of Santos' activities and how Santos proposes to manage the environmental impacts and risks associated with its activities, including how it will address its regulatory obligations and relevant Inquiry Recommendations that have underpinned the Code of Practice: Onshore Petroleum Activities in the Northern Territory (**the Code**). This pack aims to leverage off and simplify information within the EMP that will be submitted to DEPWS for assessment and approval.

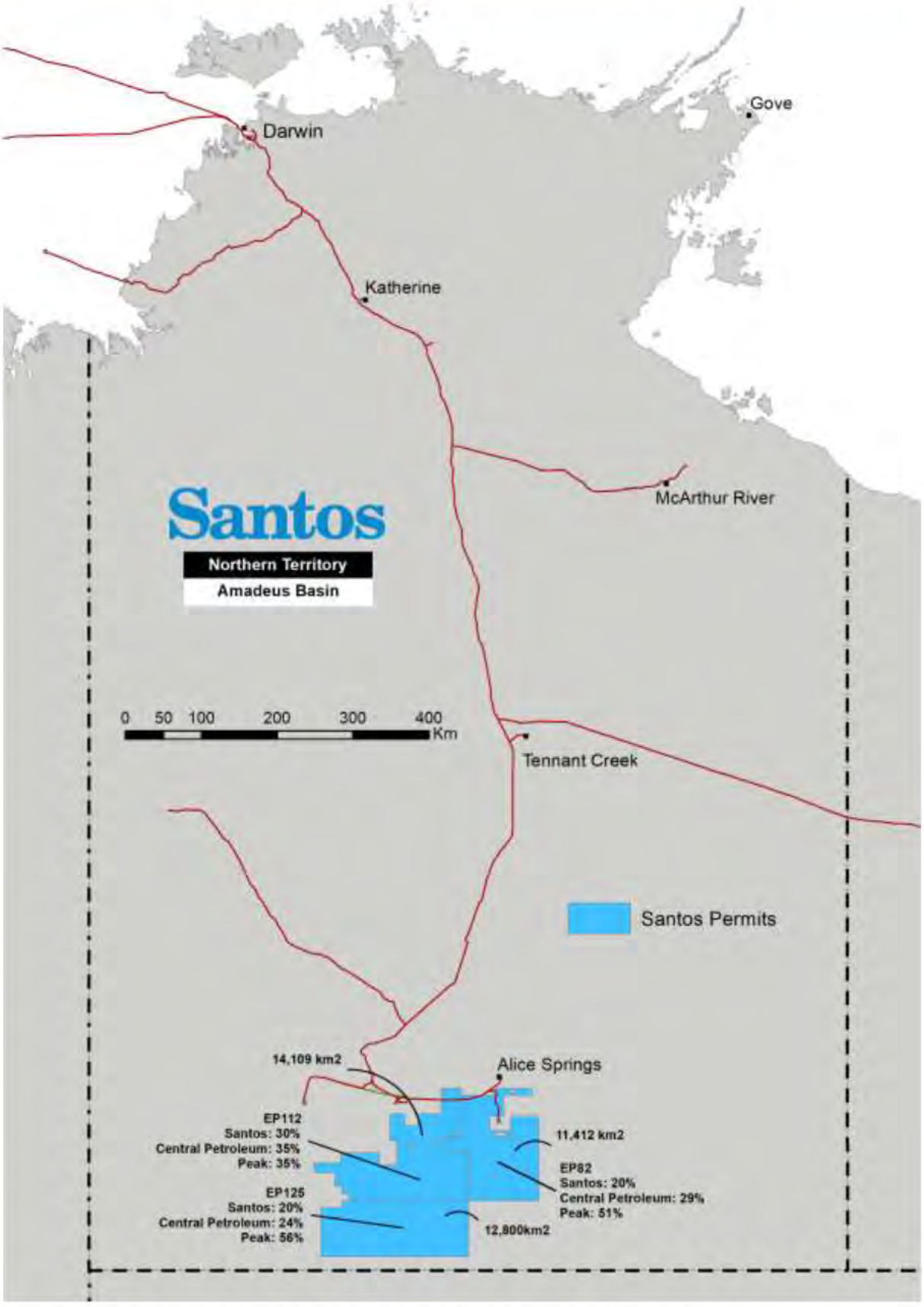

Figure 1: Location of related Santos Permit Area (% subject to Farm out agreement)

2 Description and Location of the Regulated Activities

2.1 Santos is proposing to submit an EMP to seek approval for:

a. Drilling of water bores,

Installation of water production monitoring equipment and water bore headworks,

Groundwater extraction in accordance with Water Extraction Licence conditions.

b. Re-entry of Mt Kitty 1 well, subject to risk assessment

(i). If risk assessment allows:

- Re-enter Mt Kitty 1 and drill deviated/horizontal sidetrack
- The scope of the well will include drilling, evaluating and a flow test for up to 365 days

(ii). If risk assessment does not allow re-entry, or re-entry of the existing wellbore fails:

- Drill 1 x deviated/horizontal well (Mt Kitty 2) ~20m from Mt Kitty 1 on the Mt Kitty 1 well pad
- The scope of the well will include drilling, evaluating and a flow test for up to 365 days

c. Associated road, civil works and water bores

2.2 The following scope of work is required to complete the key activities:

a. Civil engineering activity – upgrade of existing and creation of new access tracks, construction of an upgraded lease pad at Mt Kitty 1, and water extraction as required (note that water extraction requires a Water Extraction License to be in place and adhered to), identification and utilisation of borrow pits (new and existing)

b. Exploration drilling (and associated infrastructure, e.g. drilling sumps).

c. Well evaluation – including wireline logging, formation testing, core acquisition, fluid sampling, open-hole formation testing, and other standard oilfield evaluation techniques as deemed appropriate.

d. Flow-back and production testing

e. Well suspension and/or well decommissioning of each new well.

f. Ongoing site and well maintenance and monitoring, work-over and re-entry, and evaluation as required.

g. Water bore construction.

h. Groundwater sampling from existing nominal water bores (if present) and the installed bores subject to the proposed work program.

i. Operation of a camp during petroleum activities.

Ongoing low impact activities include:

- Well maintenance, integrity checks and monitoring,
- Bore maintenance and flow monitoring,
- Access track maintenance,
- Plugging and/or abandonment of the well(s),

- Decommissioning of the well(s), and
- Rehabilitation activities.

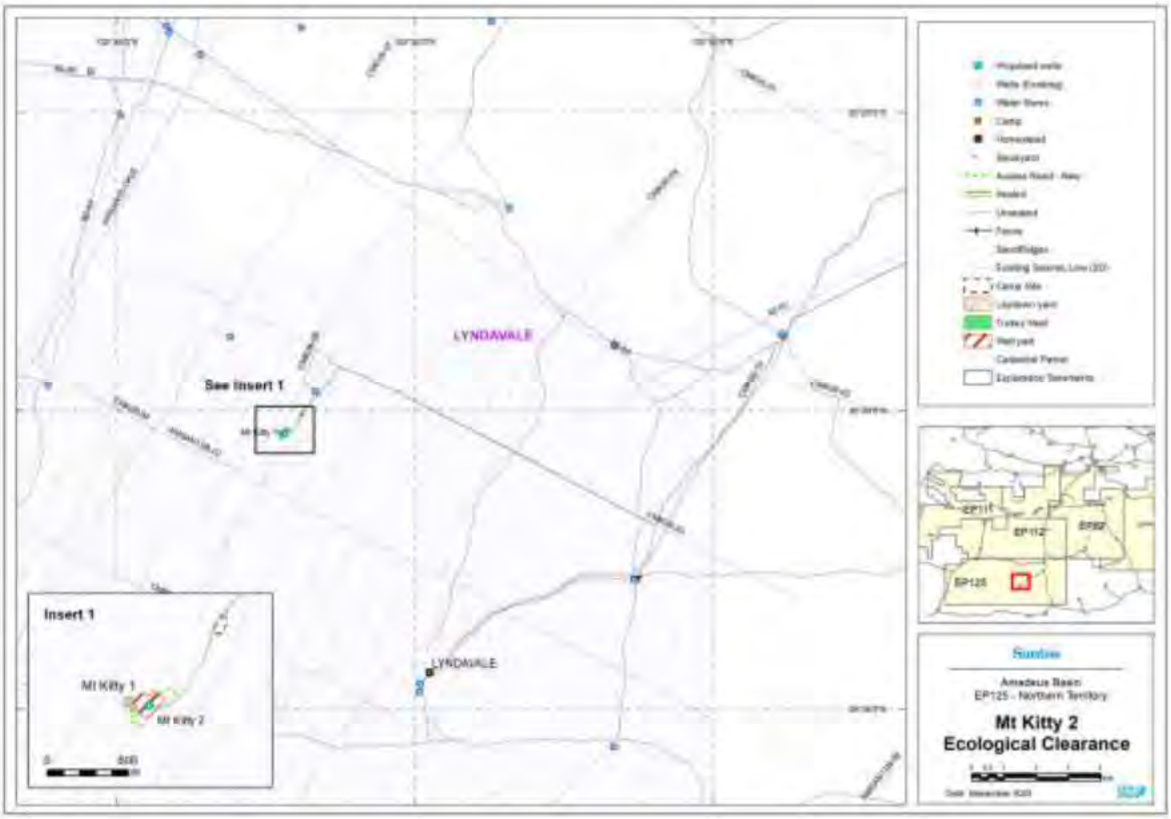

Figure 2: Mt Kitty 2 location relative to nearby infrastructure and proposed access route

2.3 Possible additional programs (likely 2024+) will be dependent upon risk assessment and preliminary results from this activity:

- Possible additional program for the Mt Kitty 1 well would be informed by the Mt Kitty 1 re-entry risk assessment, Mt Kitty 1 re-entry and/or Mt Kitty 2 drilling results and could include:
    - Plug and abandon Mt Kitty 1 and
    - Remediate well site

However, these will be subject to further approved EMPs, engagement and agreements.

The proposed location for infrastructure is within the Central Land Council (**CLC**) and Aboriginal Areas Protection Authority (**AAPA**) cleared subject land areas. It is noted that the nominated areas for infrastructure may change slightly to minimise environmental and heritage impacts, and to accommodate pastoral requirements. Such modifications will be made within the existing survey areas.

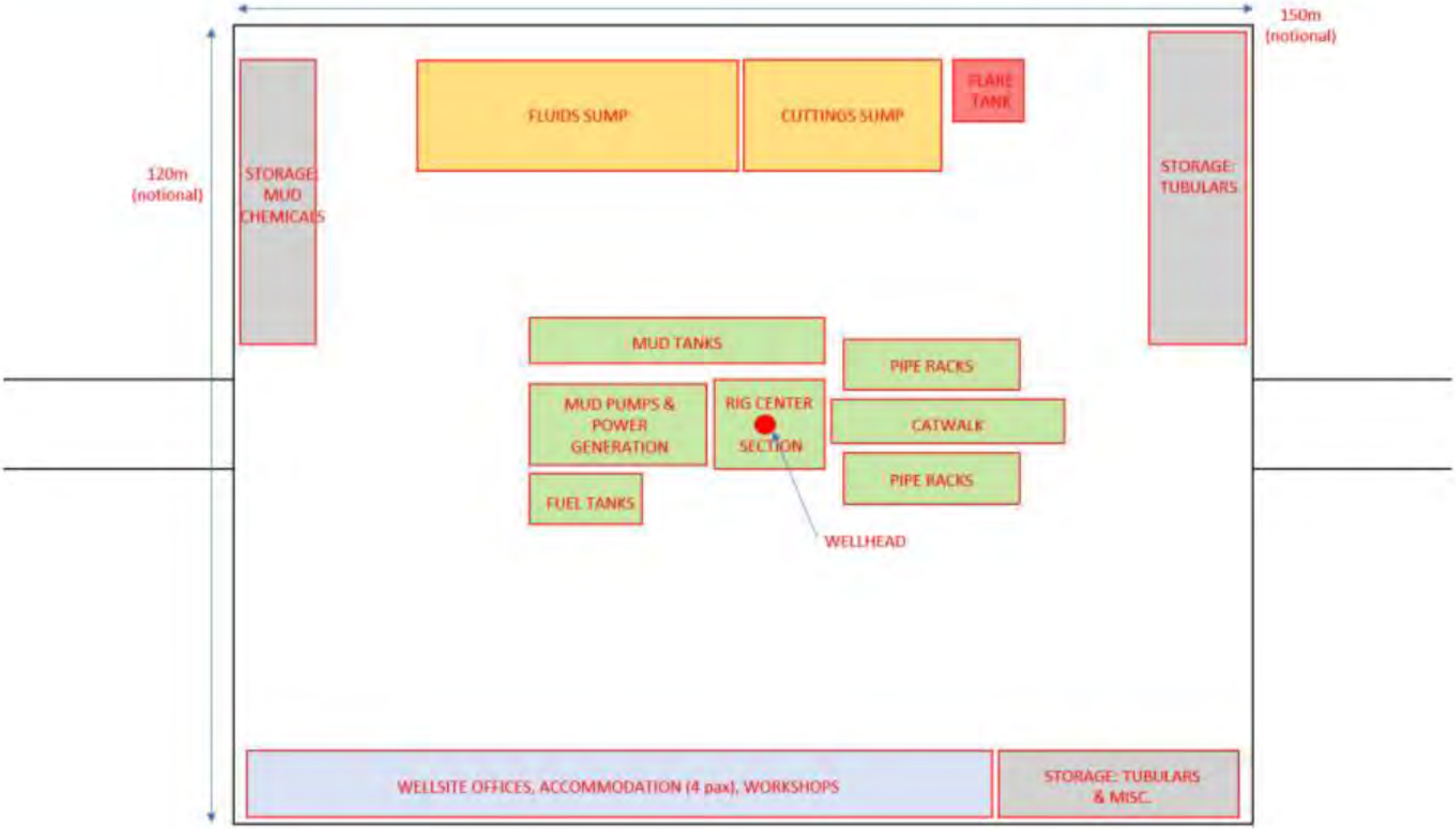

Figure 3 Conceptual lease schematic

Note: Figure 3 is a generic lease schematic which gives an indication of the potential lease layout on this well

3 Activity Timeline

Subject to gaining appropriate approvals (e.g. environmental), activity at the Mt Kitty 2 location is expected to commence in **Q2-2023** with the upgrade of the well lease pad, access tracks and water extraction bores.

The drilling of the Mt Kitty 2 well is expected to follow this from **Q3-2023.**

Ensuing activity is dependent on the evaluation results of the Mt Kitty 2 well, therefore two potential outcomes exist (1Q2024):

(i) Case and suspension of the Mt Kitty 2 well
Subsequent potential extended flow test

(ii) Plug and Abandon Mt Kitty 2 well
Remediate well site

The scenarios defined above represent the most likely outcome for activity in 2023-2025; Section 2 outlines further activity which would potentially occur in subsequent years. Importantly, a current LAA will be in place prior to execution of all proposed activities. As aforementioned, scope beyond the end of the LAA period (end 2025) is subject of a new or revised LAA. Activity beyond 2025 will depend upon results of the described 2023-2025 work program and is therefore difficult to predict with certainty.

4 Environmental Risk Summary

The risks and potential impacts associated with the drilling, testing and maintenance of Mt Kitty 2 are covered in the EMP that will be submitted to DEPWS for assessment and approval. The risks and controls have been summarised in Table 4 – 1. The proposed scope and associated risks and controls will be submitted to DEPWS for formal assessment and approval prior to commencing any regulated activity.

Table 4 – 1 Environmental risks and controls of proposed activity

Aspect	Environmental Outcomes	Potential Impact / Risk	Controls
Waste	No adverse impacts on soil, surface water, groundwater, sensitive habitat and air quality. Minimise creation of food sources or habitat for pest species. Minimise waste generation through reduce, reuse, recycle programs.	Additional wastewater to be stored onsite. Additional drill mud cuttings to be stored and disposed of onsite.	Evaporation to be used to minimise offsite transportation of any flowed liquids. Site to be bunded for liquid storage. Drill cuttings will be excavated from sump and dried within a lined containment area to enable additional cutting and mud volumes. Once completed, cuttings and muds will be mixed, buried and covered onsite in accordance with the Code.
Traffic	Minimise the impact of traffic on pastoralist amenity and tourism.	Access to the site will most likely be concentrated during the May 2023 – March 2025 period. Interference with pastoral business.	Site is located away from pastoralist homestead.
Groundwater quality and use	To manage exploration activities to prevent unsustainable depletion of groundwater resources. Preserve groundwater quantity and quality for livestock supplies (the surrounding water use).	Depletion of localised aquifers. Crossflow between subsurface zones.	Monitoring water use to ensure total extraction within Licence limits. All wells designed to protect aquifers with engineered and verified well barriers in place in accordance with the Code.

Aspect	Environmental Outcomes	Potential Impact / Risk	Controls
Emissions	Avoid environmental nuisance at sensitive receptors. Minimise greenhouse gas emissions.	No additional risks/impacts predicted	Site located away from sensitive receptors. Maintain vegetation free safety zone around flare
Noise	Minimise impacts to pastoralists and sensitive receptors from noise.	No additional risks/impacts predicted given distance to receptors.	Activities are located away from sensitive receptors.
Dust	Minimise impacts to pastoralists and surrounding ecological communities from dust.	No additional risks/impacts predicted.	Dust suppression to be used on access tracks and adjacent sites to minimise dust emissions.
Soils	Avoid, minimise and control soil erosion and discharge of sediment or soil into waterways or established drainage systems. Minimise disturbance of soil, vegetation and drainage during site activities. Prevent the contamination of soil to maintain the viability of soil resources.	Localised contamination of soil	Secondary containment in place. Spill management plan in place. Lined wastewater tanks in use. Site maintained to minimise sediment releases, with erosion and sediment control plan in place.

Aspect	Environmental Outcomes	Potential Impact / Risk	Controls
Bushfire	No bushfire as a result of the regulated activity. Avoid impacts on pastoral infrastructure, environmental habitat and fauna, impacts on culturally significant sites, public infrastructure and community lands.	Regulated activities ignite a bushfire.	Existing bushfire management plan Maintain vegetation free safety zone around flare. Vehicles drive on formed tracks and roads.
Weeds	Avoid the introduction of weeds. Avoid the spread of existing weeds.	Weeds introduced to the property.	All equipment and vehicles to be inspected, a weed hygiene certificate will be issued before entering the property. Weed Management Plan. Annual weed survey.
Surface water	Avoid and minimise the potential contamination caused by the discharge of sediment or contaminated storm water to waterways or established drainage systems. No releases of contaminants (wastes, wastewater, chemicals, hydrocarbons or drilling fluids) resulting in long-term contamination of the waters.	Decreased surface water quality.	No offsite releases of wastewater. Site fully bunded during wastewater storage. Site maintained to minimise sediment releases, with erosion and sediment control plan in place.

Aspect	Environmental Outcomes	Potential Impact / Risk	Controls
Flora and fauna	Minimise disturbance to flora and fauna.	No additional risks/impacts predicted.	Activity contained within approved areas. Vegetation community surrounding the activity is regionally extensive and not threatened. Significant impacts to endangered flora and fauna are not anticipated.

5 Consequences for Stakeholder Rights and Activities

5.1 Stakeholder Rights

Pastoral Lessees within the Northern Territory (**NT**) have non-exclusive rights to conduct their pastoral activities on the land granted under the *Northern Territory Pastoral Act (2016)*. Santos respects these legal rights and seeks a sustainable relationship with Pastoral Lessees so that both parties can co-exist on the land. Santos proposes to achieve this via the following key principles:

- Formal engagement aligned with the requirements of Regulation 7.2 (a) of the *NT Petroleum (Environment) Regulations*
- Structured and timely process for the execution of an access agreement and associated compensation
- Mutually agreed ongoing, regular engagement and communications

5.2 Stakeholder Activities

The proposed activities detailed in this document are in areas both previously identified in the LAA supporting Mt Kitty 1 drilling activities and additional areas to be subject to a new LAA.

Figure 2 displays the location of Mt Kitty 2 relative to nearby infrastructure.

Table 4 – 2 summarises the environmental impacts, risks associated with the proposed Regulated activities, highlighting the potential impacts / risks and controls. Detailed information will be contained in the EMP to be submitted for assessment and approval by DEPWS.

Key considerations when understanding the consequences to Pastoral operations:

- To ensure sustainable co-existence, Santos compensates the Pastoral Lessee for the impact of Regulated activities on pastoral operations (as identified and agreed in the LAA),
- The proposed regulated activities are part of the exploration phase and are therefore temporary in nature. At the completion of the activities, Santos will rehabilitate or as agreed with the Pastoral Lessee,
- Pastoral Lessees receive beneficial use of the infrastructure that Santos installs upon completion of the activity (or otherwise agreed to by both parties); this includes roads, laydowns, water bores and onsite medical personnel.

A summary of the potential consequences of the activity and mitigation controls are summarised in Table 4 – 3.

Table 4 – 2 Potential Consequences and Control Measures

Activity	Potential Consequences to Activities	Mitigations for Consequence
Land and Stock		
Well pad and new access road	Reduction in grazing area Restricted access to well lease pads during activity duration	Industry-proven coexistence of cattle and petroleum industry. Disturbance area optimised to conduct Regulated activity, to minimise a fenced area restricted for operations. Short term use. End of life rehabilitation to return land back to pre-existing state or as agreed with pastoralist. Full fencing of well pad.
Existing Access Tracks	Traffic along access tracks. Temporary access restrictions during rig mobilisations and heavy transport operations. Interference with stock.	Ongoing maintenance of access tracks (existing and new as utilised by Santos operations). Santos Pastoral lease notification ahead of large movements. Road remains shared use asset of Pastoral lessee.
Air Traffic	Helicopters causing disturbance to stock.	Minimisation of use of helicopters. Communication with landholders to ensure routes minimise impact on mustered stock.
Organic Certification	Mount Ebenezer Station organic certification is impacted by Mt Kitty 2 operations on the property.	All activities will comply with relevant Santos processes and procedures to potential impacts to Mount Ebenezer Stations organic certification.
Lease pads	Contamination of soils from activities.	All activities must comply with the Code, including spill management, wastewater management and waste management. Site to be rehabilitated back to pre-disturbance level with no harmful contamination permitted. Activity restricted to a small area, with no contaminates released to surrounding areas.
Water		

Activity	Potential Consequences to Activities	Mitigations for Consequence
Ground water	Pastoral water bore rates and/or quality.	Monitoring water use to ensure total extraction within Licence limits No material reduction in water quality or quantity predicted to surrounding groundwater extraction bores. Aquifer protected through use of cement and steel casing barriers in accordance with the Code.
Weeds		
Weed control	Noxious weeds	Baseline weeds survey completed. annual weed monitoring. Vehicle and equipment to be clean and have valid weed hygiene certificates prior to access. Weed identification in inductions. Weed management plan.
Air Quality		
Dust	Dust	Short period of high-volume traffic movements. Equipment movements to consider time of day to reduce impacts on traffic. Dust suppression utilised during high volume traffic movements and around sensitive features (homesteads, cattle yards, etc.).
Emissions	Increased emissions from flares and wells	Flares are used to reduce the risk associated with vented hydrocarbons. Leak detection monitoring in accordance with the Code.
Light, Noise and Visual Amenity		
Light and noise	Interaction with stock	Site location chosen to minimise impacts on pastoralist operations, including appropriate separation distances between sensitive receptors and activities. Short duration of drilling activities.

Activity	Potential Consequences to Activities	Mitigations for Consequence
Visual amenity	Pastoral visual amenity	Site location chosen to minimise impacts on pastoralist operations, including appropriate separation distances between sensitive receptors and activities. Short duration of activities Site not located in a major thoroughfare, located away from the majority of pastoralist activities.

5.3 Stakeholder Engagement Plan Feedback

Santos proposes frequent discussions with nominated representatives of the Pastoral lease to ensure a clear understanding of the activities and ongoing program. Santos would also like to ensure that the Pastoral lessees have the ability to attend exploration activities to seek further comfort in their understanding and to highlight the nature in which operations are conducted.

Santos seeks a frequency suitable to the nominated representatives for a phone call or meeting to discuss these activities and progress as well as during field operations committing to formal reporting with updates on field activities.

All feedback on the proposed activities and their potential impacts, risks and proposed controls should be provided to Santos via the feedback form in Appendix A within 60 days of receipt.

All lessee comments and associated Santos responses will be documented within the final EMP submitted to DEPWS for assessment.

6 Acronyms and Abbreviations

Acronym	Meaning
AAPA	Aboriginal Areas Protection Authority
DEPWS	(Northern Territory Government) Department of Environment, Parks and Water Security
DITT	(Northern Territory Government) Department of Industry, Tourism and Trade
EMP	Environmental Management Plan
EP	Exploration Permit
LAA	Land Access Agreement
CLC	Central Land Council
NT	Northern Territory
NTG	Northern Territory Government

Appendix A – Stakeholder Feedback Form

Stakeholder:					
Document Referenced:					
#	Ref	Comment	Date	Santos Feedback	Date

Appendix B – General Wellsite Construction and Operations

Drilling Rig

Water bore drilling

Appendix C – General Petroleum Industry Activity Information

Protection of Groundwater Resources

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Aquifer Isolation

- Drilling stopped at regular intervals so that purpose-built steel pipes or casing can be installed.
- Multiple layers of cement and steel casing separating the producing well from surrounding formations and aquifers.
- Specially formulated cement mixtures used.
- Casing is tested above operating pressures to ensure well integrity
- Wellbore design, construction and operations closely monitored and regulated.
- Regulators are kept fully informed on well bore integrity.
- Integrity of each casing and cement stage is verified prior to moving to next operation.

Well De-commissioning

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Permanent isolation and protection of aquifers and groundwater

- Once well is no longer economic to produce it needs to de-commissioned
- Cement plugs placed to isolate and protect aquifers from depleted hydrocarbon zones
- Placement and verification of plugs is critical step
- Well head cut off below ground level, cement cap
- Well cellar is backfilled
- Area around well, the lease and roads into the lease are then rehabilitated
- Top soil is replaced and recovery of site is monitored until landholder agrees restoration is satisfactory
- End goal is that site is restored to natural state
- Each well abandonment must be approved by the Designated Authority and must comply with government regulations

Schematic well design and plug placement

4.4 Traditional Owners (& CLC) Engagement Pack

Southern Amadeus Basin: Proposed 2023 -24 Activity

27 September 2022: Imanpa

Santos

Dukas 1 drilling activity - 2019

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The process of exploring

Santos

2012 — **Tenure**

- Permit Award process
- Applications/Discussions/Approvals

2013-24+ — **Exploration**

- Seismic surveys
- Exploration wells evaluating formations

We are here

2023-24+ — **Appraisal**

- Testing the gas-bearing formations
- Appraisal of discovery

2025+? — **Development**

- Further seismic surveys
- Wells drilled to develop gas fields

Production

- Pipelines
- Gas facilities to collect gas

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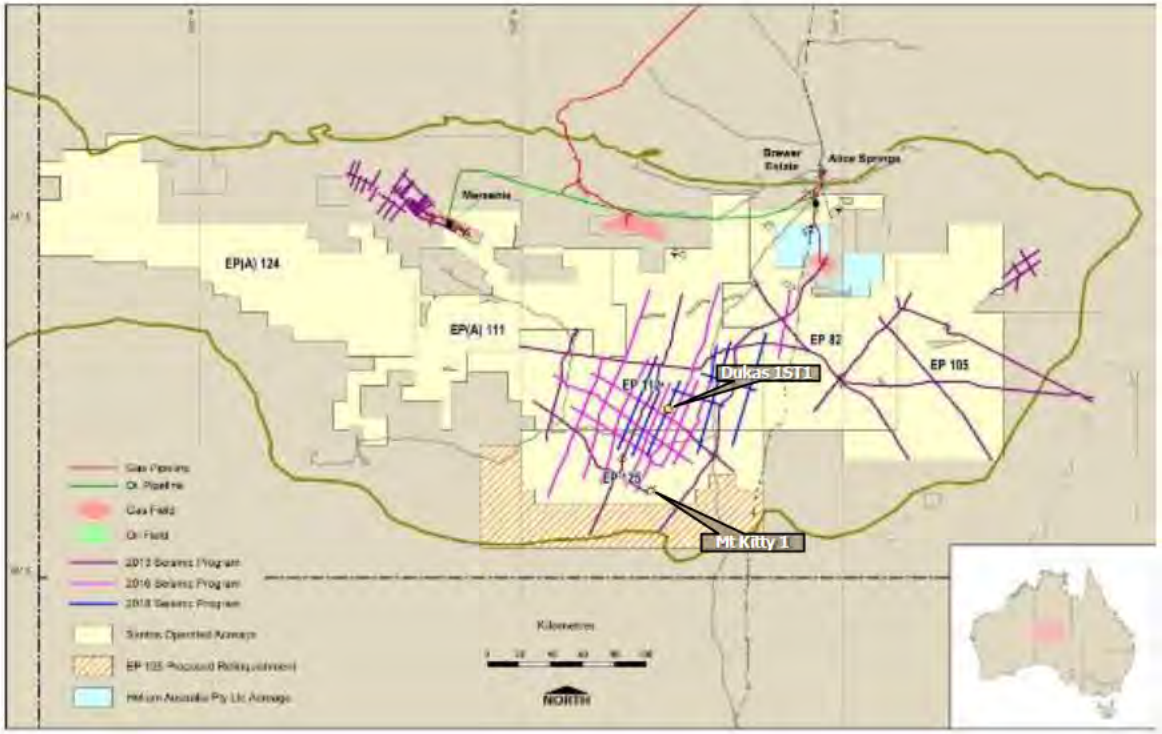
Santos Amadeus Basin Exploration Summary

Santos

2012 – 2021: 2923 line km 2D seismic and two exploration wells; A$100M gross exploration expenditure



- **2013** – 1,586 km of regional 2D seismic data acquired – FIRST REGIONAL SEISMIC
- **2014** – Mt Kitty 1 (P&S) – *low rate gas (including He+H) from fractured basement*
- **2016-18** – 1,337 km of 2D seismic data acquired
- **2019** – Dukas 1ST1 (P&S)

3

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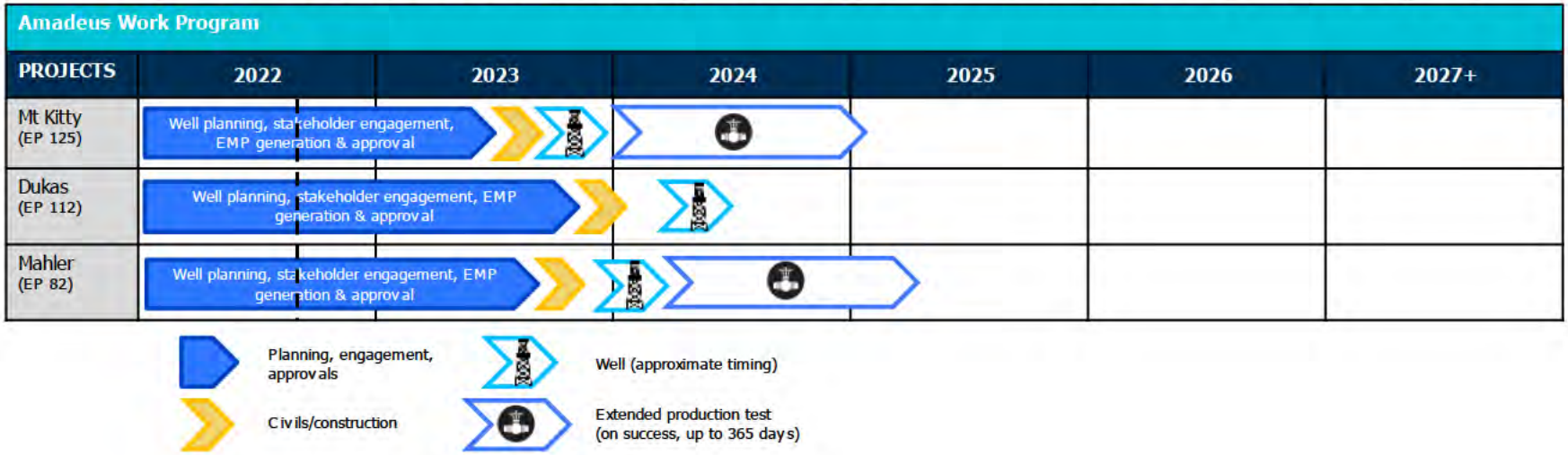
Proposed 2023-24 Campaign: Timeline of Activity

Santos

Detailed well and logistics planning, stakeholder engagement, Environmental Management Plans in progress to underpin proposed three well Campaign

- Significant regulatory requirements
  - In particular the generation, submission, acceptance and approval of Environmental Management Plans (EMPs)



Seismic Acquisition

Santos has completed multiple 2D seismic surveys during its Amadeus Basin exploration program. Further seismic acquisition could be proposed, depending on well results. Future seismic surveys would be subject to stakeholder engagement and relevant approvals.

Acquiring seismic data is usually a minimum disturbance activity, with only light clearing required and a rehabilitation program planned to ensure the areas recover to their original state.

Seismic assists geoscientists in understanding the subsurface geology and in planning wells to the correct depths and avoiding any hazards that may already exist.

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Seismic Operations & Rehabilitation

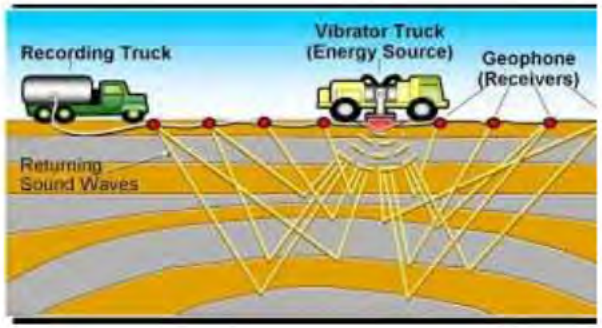
Santos

Before activity

After activity

Example of seismic operations in Northern Territory (McArthur Basin)

Installation of geophones



Vibroseis truck creates vibration

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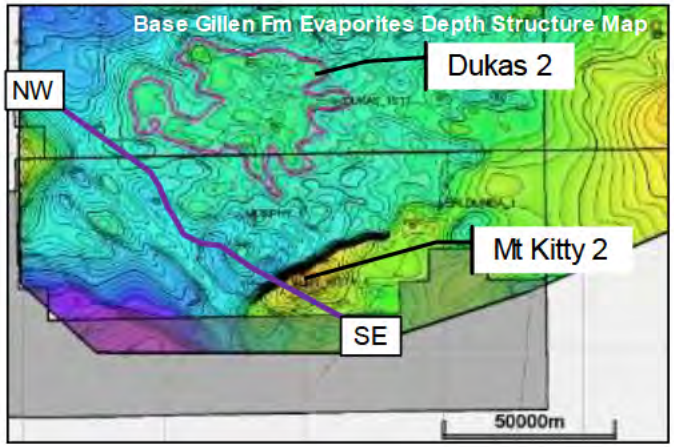
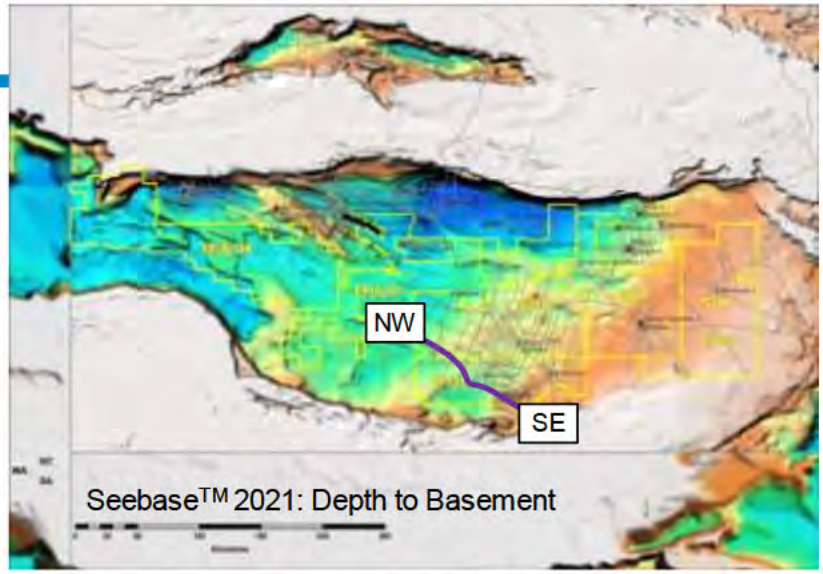
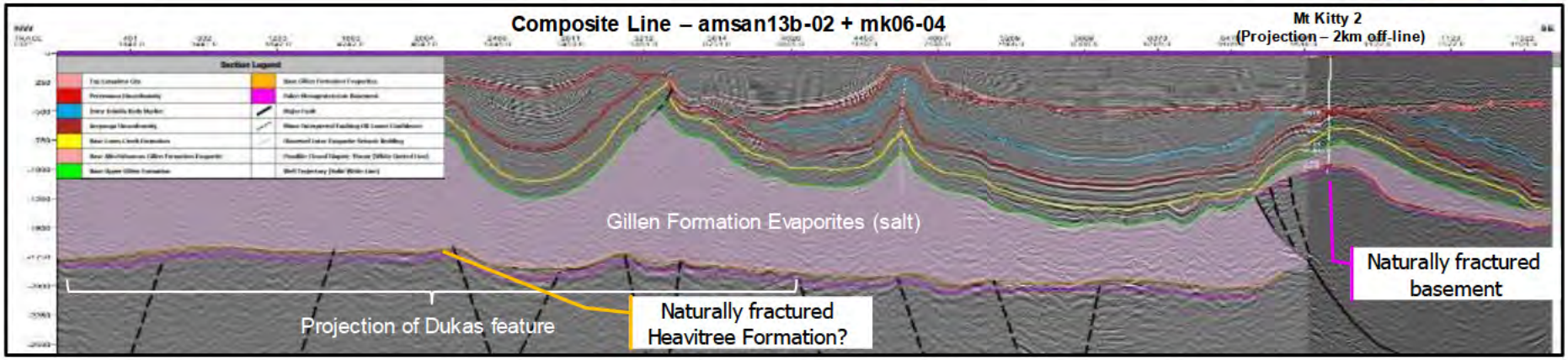
Southern Amadeus Basin: Target







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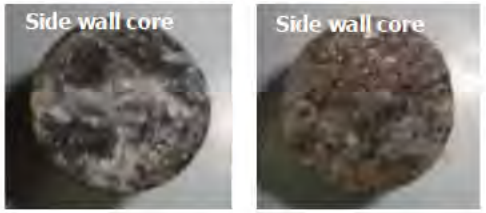
Target Reservoirs and Fluids

Multiple reservoirs: naturally fractured basement and Heavitree
Multiple products: natural gas, helium and natural hydrogen

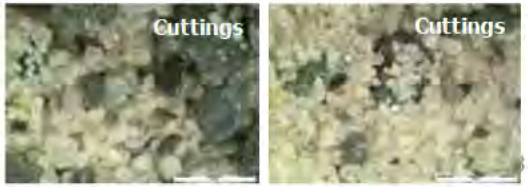
- Mt Kitty 1:
  - Reservoir: basement (granodiorite)
    - Igneous, crystalline. Naturally fractured
  - Fluid: 18% of the gas is hydrocarbon. (methane comprises 73% of the hydrocarbon content)
    - 9% helium content
    - 11.5% hydrogen content
- Magee 1:
  - Reservoir: Heavitree Formation
    - Sedimentary, clastics. Naturally fractured?
  - Fluid: 48.9% of the gas is hydrocarbon (methane comprises 80.3% of the hydrocarbon component)
    - 6% helium content
    - Trace hydrogen content

WELL	MAGEE-1	MT KITTY-1
DATE	1992	2014
RESULT		P & S
ANALYSIS TYPE	Flow test	Flow Test 2
DEPTH	2345-2349m	2156m
MOL %		
HYDROGEN SULPHIDE	Nil	Nil
HELIUM	6.20	8.96
HYDROGEN	0.03	11.46
OXYGEN	Nil	0.54
CARBON DIOXIDE	0.82	0.09
NITROGEN	43.61	61.04
METHANE	39.26	13.14
ETHANE	6.10	3.53
PROPANE	1.91	0.82
ISO-BUTANE	0.36	0.19
N-BUTANE	0.57	0.13
ISO-PENTANE	0.20	0.07
N-PENTANE	0.18	0.02
HEXANES	0.17	0.01
HEPTANES	0.09	Nil
OCTANES	0.04	Nil
NOANES	Nil	Nil
DECANES	Nil	Nil
UNDECANES	Nil	Nil
DODECANES PLUS	Nil	Nil
OTHER	0.46 (Argon)	Nil
TOTAL	100.00	100
COMMENT		

Mt Kitty 1



Magee1



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Santos

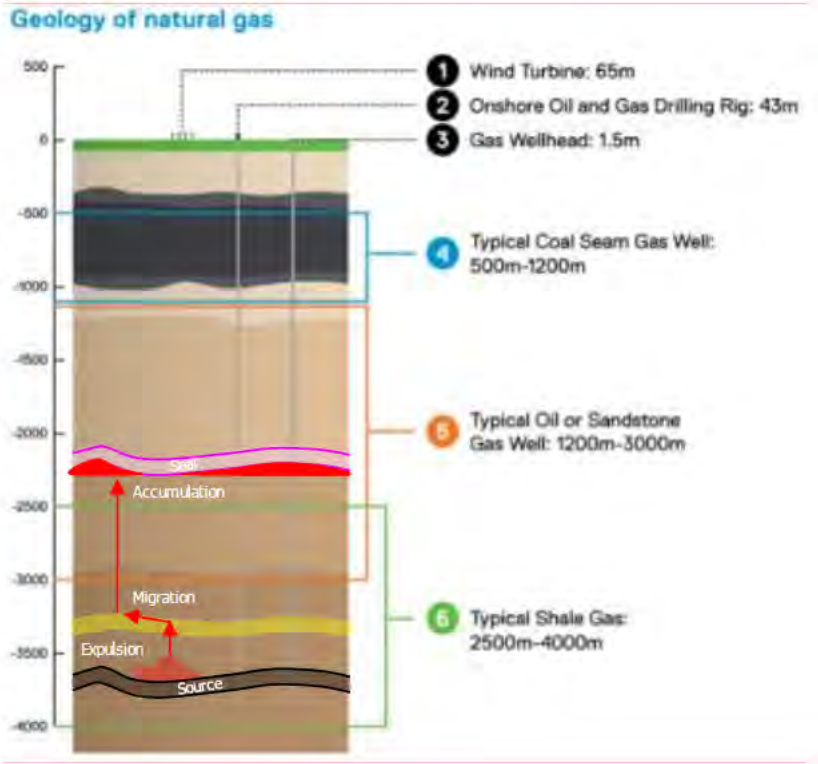
Natural Gas – What is it?

Where is natural gas found?

+ Natural gas was formed over tens of millions of years from the compressed remains of organic rich material such as plants and algae (source rock).
+ Over time, increases in heat and pressure expel natural gas molecules from the source rock and it migrates into porous and permeable carrier beds (expulsion and migration).
+ Eventually, the gas molecules are trapped in a reservoir underlying an impermeable seal (accumulation).

How do you produce natural gas?

+ To produce natural gas, we drill wells deep underground into the reservoir. These wells are surrounded by steel and concrete to ensure they are separate from other underground layers, such as water aquifers.



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Helium & Hydrogen – What are they?

Santos

Helium is an inert gas used across multiple industries including medical, automotive and electronics
Hydrogen is an emerging clean energy source

+ Global demand for helium is rising, supply is very tight and is limited to few countries

+ Australian domestic supply of helium is reducing

+ Global demand for hydrogen as a clean energy source is expected to increase significantly

+ Santos and our Joint Venture partners are targeting both natural gas and helium/hydrogen in our proposed 2023-24 Campaign

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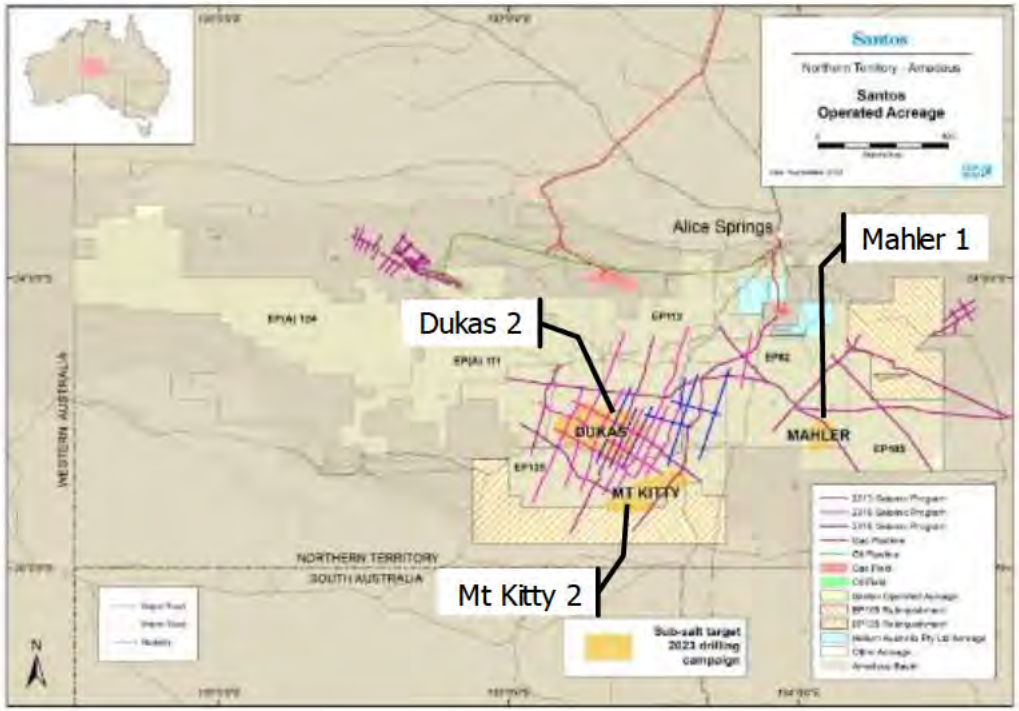
Southern Amadeus Basin: Proposed 2023-24 Campaign Santos

Proposed three well Campaign to appraise an existing natural gas discovery and explore for new natural gas resources

- Mt Kitty 2 appraisal well
  - Re-entry/twin of Mt Kitty 1 wellbore
  - Lateral/horizontal well to intersect up to 500m of fractured basement
  - Extended production test (<365 days, on success of lateral/horizontal)
- Dukas 2 exploration well
  - Vertical. No production test
- Mahler 1 exploration well
  - Vertical pilot well
  - Lateral/horizontal well to intersect up to 500m of fractured basement (on success of vertical pilot)
  - Extended production test (<365 days, on success of lateral/horizontal)



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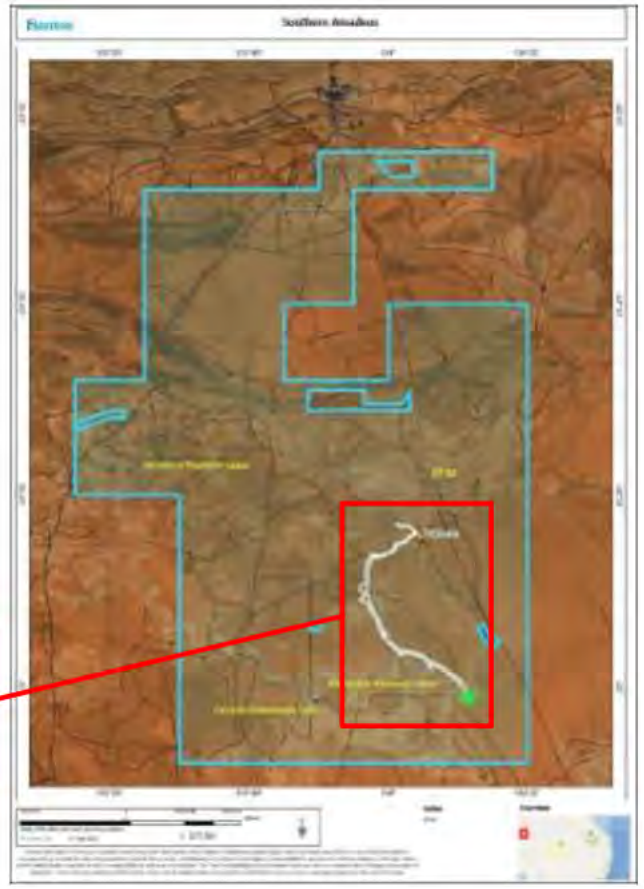
Proposed 2023-24 Campaign: Locations of Activity

Santos

+ Dukas 2 exploration well and associated civils

+ Mt Kitty 2 appraisal well and associated civils

+ Mahler 1 exploration well and associated civils



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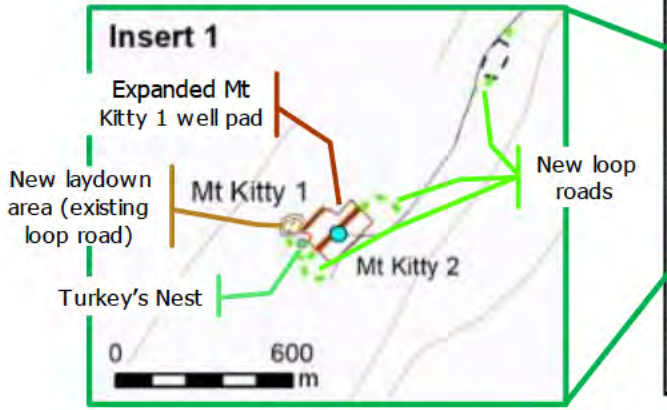
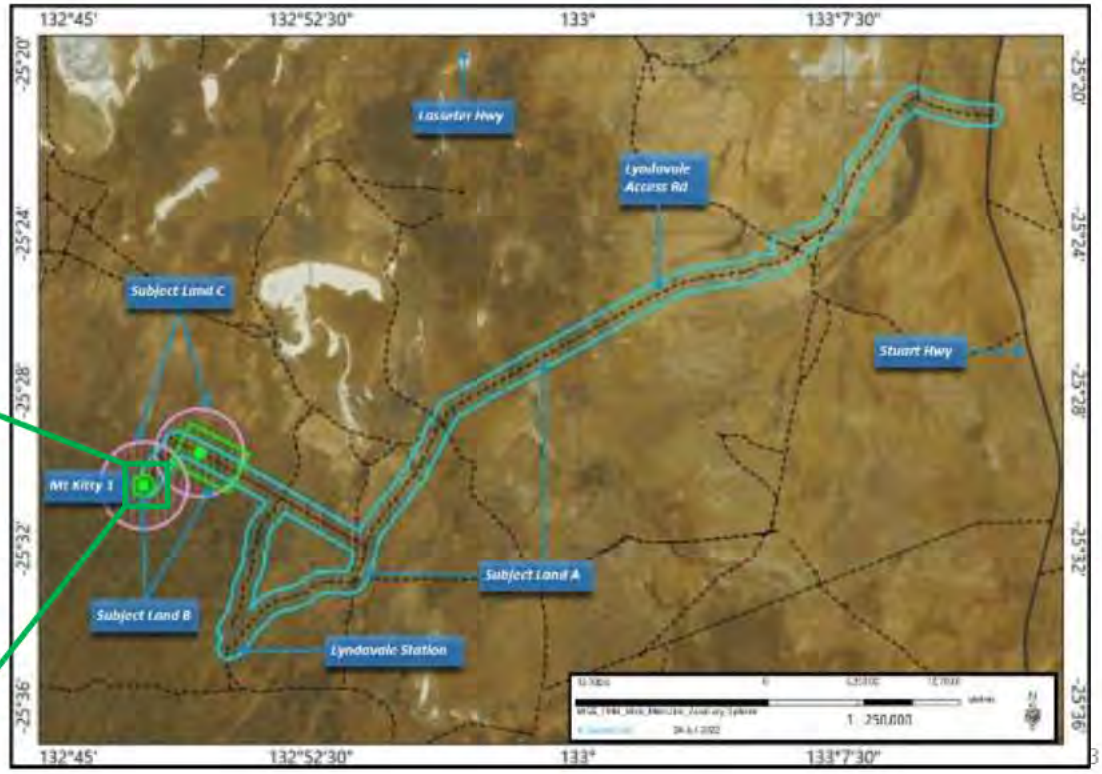
Mt Kitty 2: 2023-24 Work Program

Santos

Minimising the impact of our activity by utilising existing infrastructure (access and well pad)
Any new disturbance is limited to being within areas with Sacred Site clearance

- Access via Stuart Highway
- Upgrade of existing Lyndavale Homestead/Mt Kitty 1 access track, as necessary
- Expansion of existing Mt Kitty 1 well pad
- Preparation for and drilling of new waterbore(s)





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Mt Kitty 2: Sacred Site Clearance Requests

Santos

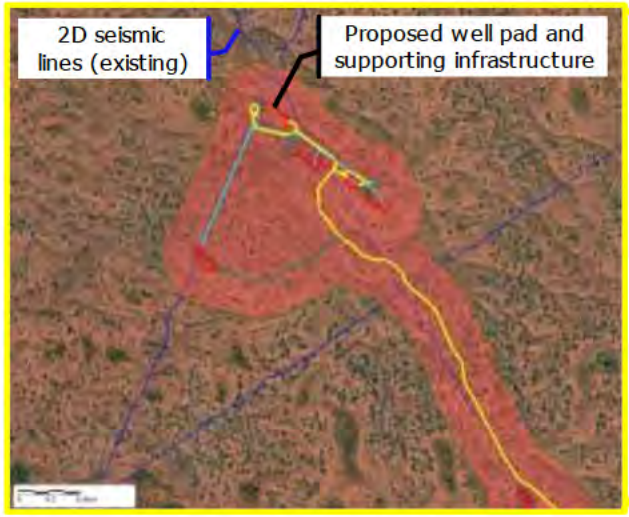
Commercial in confidence

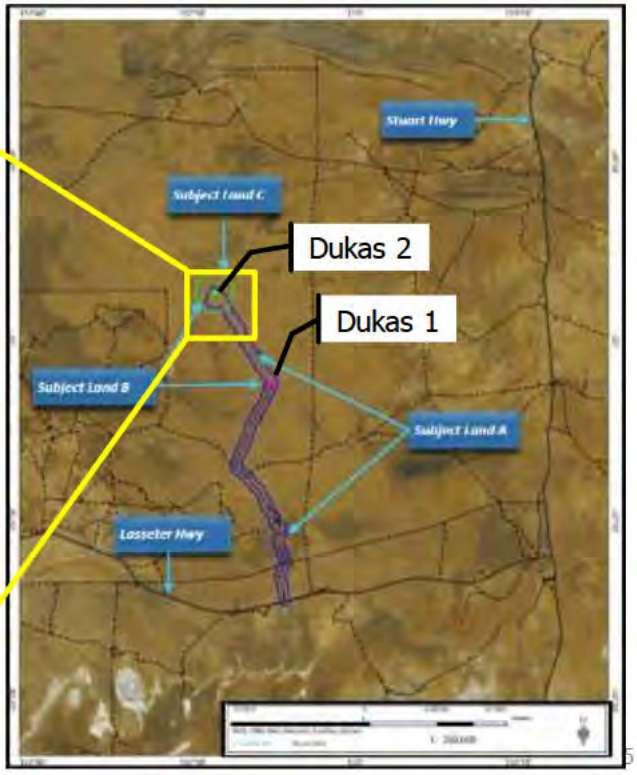
Dukas 2: 2023-24 Work Program

Santos

Minimising the impact of our activity by utilising existing infrastructure (access & water, partial)
Any new disturbance is limited to being within areas with Sacred Site clearance

- Access via Lasseter Highway
- Upgrade of existing Dukas 1 access track, as necessary
- Preparation of 12km of new access track
- Preparation of a new well pad and for drilling of new waterbore(s)





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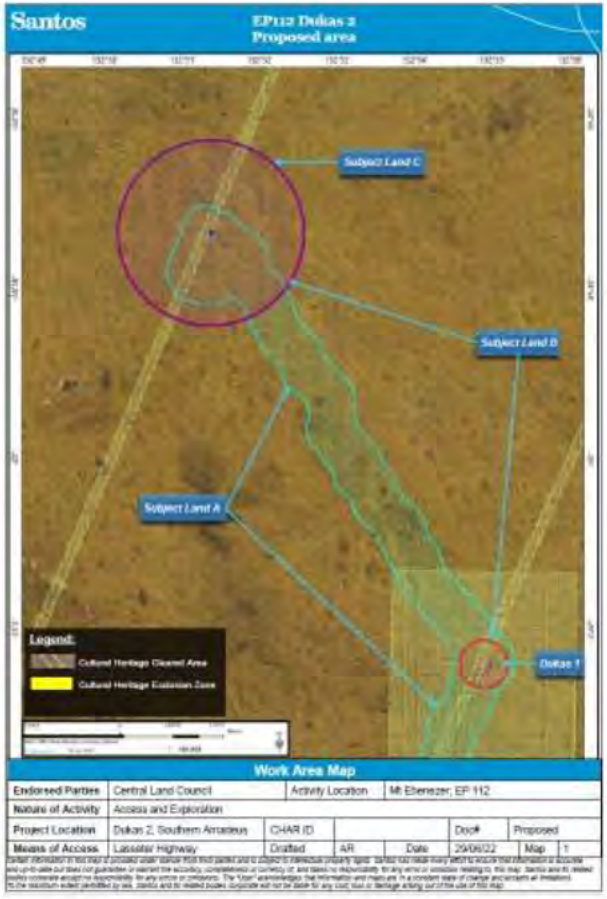
Dukas 2: Sacred Site Clearance Requests

Santos



16

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Water

Santos

Waterbore drilling and groundwater extraction is a critical requirement for Operations

st this

Map of aquifer in the Amadeus

sed 202324 y is in **ured rock** r domain.

rs are most **associated structural** **ts** rather than raphic units.

rs may not be sistent raphic intervals relatively short ces

Commercial in confidence

Water

Santos

Water access will be relatively small and sustainable

- Our water access rights are the same as any other potential water user – require a licence
- Water used for drilling/testing is relatively small, and a once off, e.g. <80 ML per well
- Government determines sustainability of water access/licence requests
- Licencing decisions made in accordance with water management plans developed for each area

Risk of water contamination from natural gas development is small

- Reservoirs are very deep, >1,000m below the aquifers, and not naturally connected to aquifers
- Well design ensures that there is no pathway for contaminants/gas linking gas reservoirs to aquifers
  - This is regulated by the government

Frac water

- We typically only frac a well once, soon after it has been drilled. This uses the majority of water
- It is not continuous process throughout the life of a gas field
- The frac fluid remains in the target formation, or else it comes back out from the well up the production casing/tubing
- Flowback water is stored/managed within lined tanks
- Treatment involves simple evaporation until it is concentrated enough to be trucked away for off -site disposal at a licenced facility

18

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Operational Wellsite Overview: Tanumbirini (NT)

Santos

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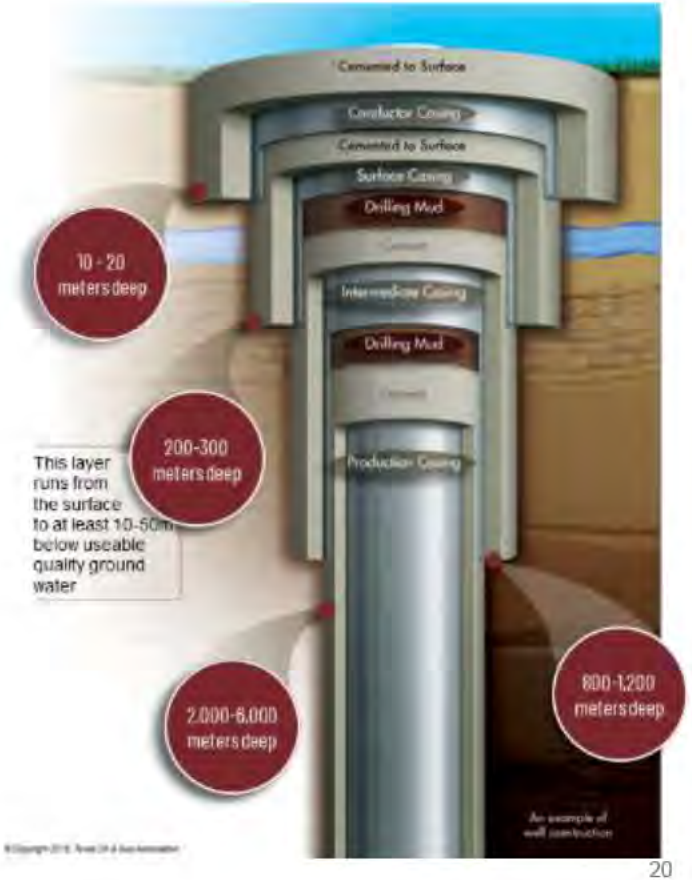
Protection of Groundwater Resources

Santos

Aquifer Isolation

+ Drilling stopped at regular intervals so that purpose -built steel pipes or casing can be installed.
+ Multiple layers of cement and steel casing separating the producing well from surrounding formations and aquifers.
+ Specially formulated cement mixtures used.
+ Casing is tested above operating pressures to ensure well integrity
+ Wellbore design, construction and operations closely monitored and regulated.
+ Regulators are kept fully informed on well bore integrity.
+ Integrity of each casing and cement stage is verified prior to moving to next operation.



20

Fracture Stimulation – What is it?

YouTube video - Santos CSG

YouTube video - Shell frac

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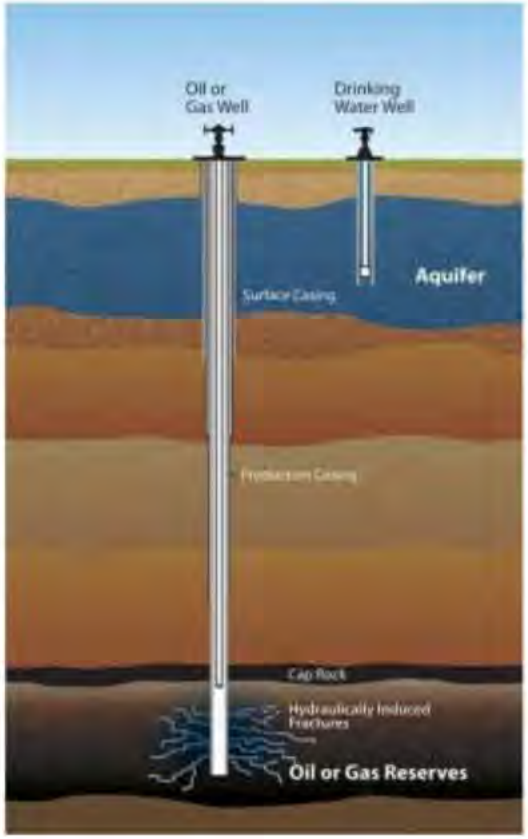
Santos

What is it?

Process used to enhance the productivity of a well

+ Accelerates the release of hydrocarbons from the reservoir rock
+ A fluid mixture of 99% water and sand plus a very small amount of chemicals is pumped down the well bore at controlled pressure to open passageways into the rock
+ The fluid carries the fine sand into the cracks, and the sand props the cracks open, allowing hydrocarbons to flow back into the well bore
+ Has previously been used extensively around Australia and the world for decades
+ All fracture stimulation activities will comply with all Government regulations



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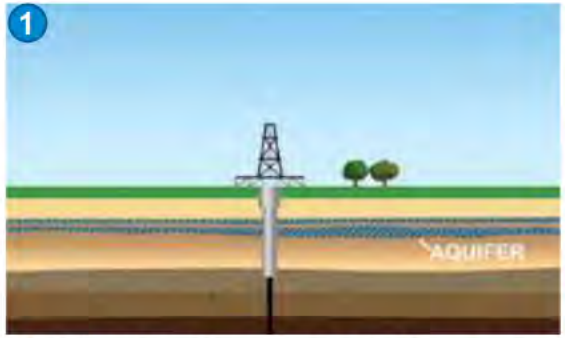
Commercial in confidence

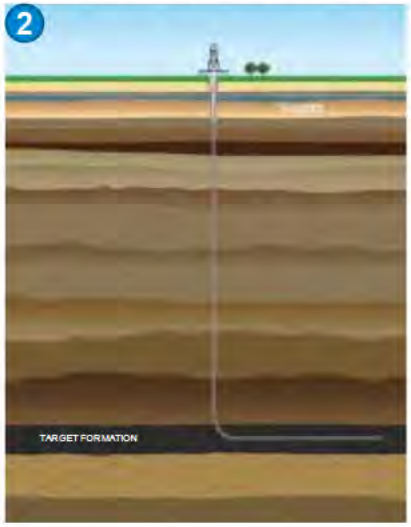
Santos

Fracture Stimulation

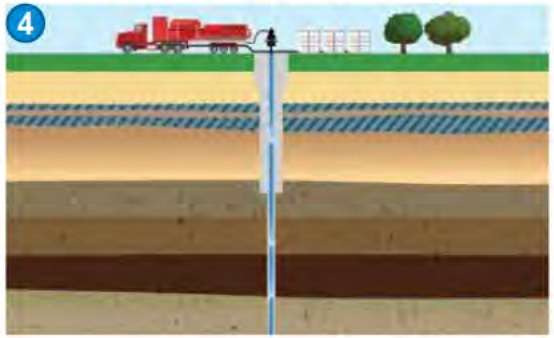


1. Drilling through upper geological layers using cement and steel casing as barrier to aquifer.

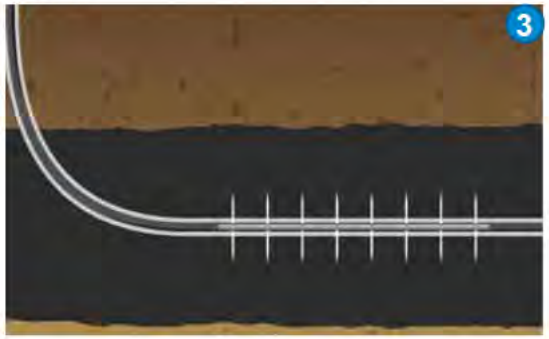
2. Vertical drilling up to 4km to target formation and horizontal drilling through to gas-bearing zone



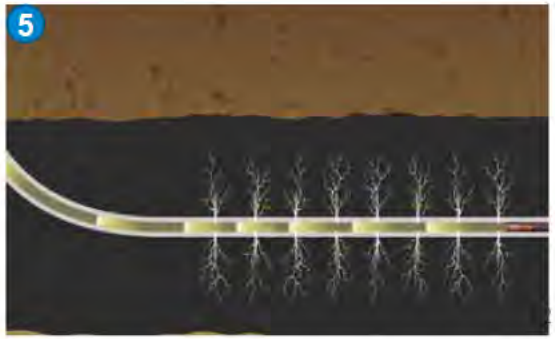
4. Pump water, sand and chemical additives into the well to fracture the gas-bearing rock



3. Perforate the well to access gas bearing rocks



5. Gas flows through the fissures into the well bore to surface



Commercial in confidence

Fracture Stimulation – Chemical management

Santos

- Water accounts for about 90% of the fracturing mixture and sand accounts for about 9.5%.
- Chemicals used to augment
  - Viscosity
  - Friction reduction
  - Biocide
  - Scale and corrosion
  - Surface tension
- Used in low concentrations
- Majority have common household use
- No BTEX chemicals (benzene, toluene, ethylbenzene and xylene) are used in fracture stimulation operations
- The industry is committed to open and transparent disclosure of the chemicals used in exploration and production

Typical Chemical Additives Used in Hydraulic Fracturing Water

Compound	Purpose	Common application
Acids	Helps dissolve minerals, initiate fissure in rock (pre-fracture) and manage pH Levels	Swimming pool cleaner
Sodium Chloride	Allows a delayed breakdown of the gel polymer chains	Table salt
Polyacrylamide	Minimises the friction between fluid and pipe	Water treatment, soil conditioner
Ethylene Glycol	Prevents scale deposits in the pipe	Automotive anti-freeze, de-icing agent, household cleaners
Borate Salts	Maintains fluid viscosity as temperature increases	Laundry detergent, hand soap, cosmetics
Sodium/Potassium Carbonate	Maintains effectiveness of other components, such as crosslinkers	Washing soda, detergent, soap, water softener, glass, ceramics
Glutaraldehyde	Eliminates bacteria in the water	Disinfectant, sterilisation of medical and dental equipment
Guar Gum	Thickens the water to suspend the sand	Thickener in cosmetics, baked goods, icecream, toothpaste, sauces
Citric Acid	Prevents precipitation of metal oxides	Food additive; food and beverages; lemon juice
Isopropanol	Used to increase the viscosity of the fracture fluid	Glass cleaner, antiperspirant, hair coloring

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Water Management

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Water used in well construction – drilling and fracture stimulation

Water Use

+ Approx. 0.1 - >1 ML of water is used per stimulation stage
+ Number of stages varies depending on the well:
  - Vertical wells up to 10 stages
  - Horizontal wells 30 -50 stages

Water Sources

+ Water does not need to be potable
+ Water is sourced from existing local bores, captured rainfall and recycled where practical.

Water Storage

+ Water is stored on -site in lined pits or above ground tanks
+ Flowback fluid is captured in lined pits or above ground tanks
+ Fluids disposed and managed in at approved facilities.

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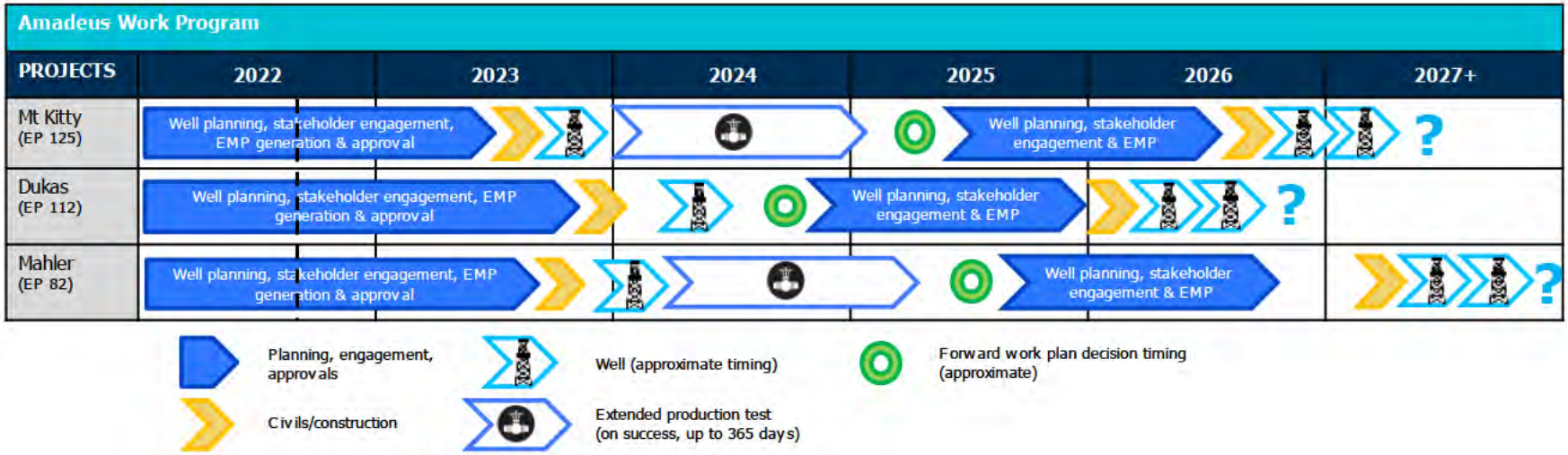
Timeline of Activity: Future

Data acquired throughout 2023-24 will inform optimised future work program



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Well De-commissioning

Permanent isolation and protection of aquifers and groundwater

- Once well is no longer economic to produce it needs to de -commissioned
- Cement plugs placed to isolate and protect aquifers from depleted hydrocarbon zones
- Placement and verification of plugs is critical step
- Well head cut off below ground level, cement cap
- Well cellar is backfilled
- Area around well, the lease and roads into the lease are then rehabilitated
- Top soil is replaced and recovery of site is monitored until landholder agrees restoration is satisfactory
- End goal is that site is restored to natural state
- Each well abandonment must be approved by the Designated Authority and must comply with government regulations

Schematic well design and plug placement

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Well Sites

Operational and rehabilitated leases

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Pipeline Easements

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Rehabilitation Management Plan

Appendix 12

Amadeus Basin: Jacko Bore 1DW1 Drill and Test Program

EP125

Santos QNT Pty Ltd

Date	Rev	Description	Initiated	Reviewed	Approved
13/02/2023	1	Approved for Use	KR, TS, NF, VC	TS, NF, LD, RM	MD
16/06/2023	2	Approved for Use	VC	VF, PS, TS	MD
15/12/2023	3	Approved for Use	NF	PS, TS	RD
03/05/2024	4	Approved for Use	NF	TS	DG
28/06/2024	5	Approved for Use for STO5-5	NF	TS	DG

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1. Introduction

This Rehabilitation Management Plan (RMP) aims to outline the program for the rehabilitation of sites no longer required for ongoing or future works as per the requirements set out in the *Code of Practice: Onshore Petroleum Activities in the Northern Territory* (*the Code*) [DEPWS et al., 2019]. This RMP has been developed using the *Rehabilitation Plan Guide for Surface Disturbance: Onshore Petroleum Disturbance* [DEPWS, 2020].

2. Scope

The Rehabilitation Management Plan applies to the land disturbance associated with new and previously constructed, access tracks, well pad and well pad expansion, the re-establishment of gravel/borrow pit/s and campsite required for the Activity associated with this **EMP**, including Activity conducted by Santos Pty Ltd (the Interest Holder) prior to this **EMP**. It does not include infrastructure that has been put in place by the landowner. This RMP covers the rehabilitation strategy for final land use, objectives, works, monitoring, and maintenance of disturbed land.

3. Environmental Description and Risks

The topography of the Project Area (Shown in **Figure i** of the **EMP**) comprises undulating sand ridges oriented southwest-northeast that spread south and west of the EP. The main features of the Project Area are dune fields, sandstone and limestone plains and rises, drainage lines, salt and clay pans, alluvial plains, and drainage and depression lines. The Ecological Assessment (**Appendix 01**) has a complete description of the land types, relevant bioregions, and environmental features within the Project Area. **Table 3—1** presents potential environmental risks and proposed controls.

Table 3—1 Environmental Risks and Proposed Controls

Site-specific Environmental Risks	Proposed Controls
Management of Removed Topsoil	• Removed topsoil is to be located away from water flow paths. • Topsoil stockpiled in berms <1.5m in height to maintain seed bank.
Presence of Weeds of Concern (E.g., Athel Pine)	• Weed survey conducted before clearing for the identification and management of weeds. • All personnel and contractors will be made aware of any identified infestations and to avoid infestation areas. • Inductions to areas to cover vehicle weed hygiene requirements. • Vehicles will be cleaned down and inspected prior to mobilisation. • Vehicles will stay on cleared/formed access tracks. • Review records from annual weed surveys and monitoring. • Follow the site-specific Weed Management Plan (**Appendix 09**). • Identified weeds controlled in line with the *Northern Territory Weed Management Handbook* [NORTHERN TERRITORY GOVERNMENT, 2021].
Cattle Grazing (Post reinstatement of topsoil and disbursement of seed)	• The well pad area will be fenced until vegetation is established.
Topsoil Compaction (From vehicle and machinery movements on access tracks and well pads)	• Use of council roads and pre-existing tracks lines to access well pad where available. • Topsoil will be removed from cleared areas and stockpiled for rehabilitation. • Areas of compaction will be alleviated by mechanical means (ripping, scarifying, harrowing) to assist in vegetation regrowth.
Erosion Risk (New construction and maintenance)	• Utilisation of existing access tracks, to avoid new disturbance/clearing. New construction will be selected and designed to minimise erosion, e.g., outside of natural flow paths or outside of the 1-100 flood zone where possible. • Site selection of new tracks placed to avoid riparian zones. • The creation and implementation of a site-specific Erosion and Sediment Control Plan in line with **Appendix 05** (ESC Plan) that includes controls to divert water flow around the well pad and control stormwater on the well pad. • Monitoring and maintenance of ESC measures until final rehabilitation is complete. • As per the conditions of the AAPA Certificate, no works shall occur that could impede surface water flows in natural creek channels
Contamination Risk	• Controls will be in place as per the Spill Management Plan (**Appendix 07**) to minimise risk of spills or contamination to the environment. • If contamination occurs, remediation will commence immediately.
Fire Risk	• Controls in place as per the Fire Management Plan (**Appendix 08**). • Site-specific Emergency/Contingency Plan (**Appendix 13**) has been developed and will be implemented in the event of a fire.

4. Strategy for Final Land Use

All significantly disturbed land, put in place by the Interest Holder, that is not required for ongoing or future petroleum works will be rehabilitated to as close as possible to its pre-disturbed condition, consistent with surrounding land uses and ecological values as compared to an analogue site.

To verify rehabilitation is on track analogue sites will be chosen to reflect the landforms being disturbed by the construction of access tracks, the expansion of the well pad, the re-establishment of the campsite and use of the gravel/borrow pit/s. The analogue sites will be surveyed, assessed, and photographed before construction works commence to aid in the rehabilitation assessments.

5. Rehabilitation Success Criteria

The rehabilitation approach will be a combination of assisted regeneration in areas that have been cleared and compacted, along with natural regeneration in areas with less compaction.

Rehabilitation site success is identified through the information obtained in the pre-disturbance land condition assessment and adjacent vegetation communities. To aid in the evaluation, the analogue sites (selected pre-works) will be surveyed to determine levels of species composition and richness.

After the Activity, the Interest Holder will work toward rehabilitation success based on the below tabled objectives:

Table 5—1 Rehabilitation Success Measures

Objectives	Measurement Criteria
• Stable and self-sustaining landform with no erosion requiring ongoing maintenance	• Negligible erosion present on access tracks and well pads or sensitive areas, e.g., water ways. (Qualitative – photo evidence of scarring, rill/sheet erosion).
• Safe for land users and wildlife.	• No waste or rubbish associated with the Activity left in the Project Area. • No subsidence associated with re-instated drilling pits.
• Returned to an agreed and close to the pre-disturbance level that requires little or no ongoing management. • Re-instated to reflect the natural ecosystem/s or establish an alternative outcome commiserate with the surrounding land use.	The rehabilitated area: • Ground and perennial cover equivalent to 70% of the analogue site. • Organic litter and coarse woody debris equivalent to 50% of the analogue site. • Evidence that native fauna is utilising habitat within the rehabilitation area, i.e. tracks, scats, burrows etc., or functioning as per previous land use.
• No declared weed infestations in the rehabilitated area that require management.	• Declared weeds identified during monitoring events controlled.

6. Rehabilitation Works

6.1 Pre-planning and Designing

To minimise the disturbance of the Activity:

- Access to the well pad will primarily be along pre-existing access tracks.
- Gravel/fill requirements will be limited by using existing access tracks and positioning new infrastructure on locations with <2% slope (where practicable).
- The site selection and civil construction of the well pad expansion will consider a 1 in 100-year return period flood event to limit/control run-on and run-off.
    - Worst-case modelling indicates that the southern part of the well pad may experience isolated and minor flooding during a 1 in 100-year event. The well pad expansion and upgrades will be designed and constructed to reduce this potential flood risk, with site-

specific erosion and sediment controls put in place. Specifically, a bund will be constructed on the perimeter of the work area to divert water run on and off.

- An Erosion and Sediment Control Plan ESC plan (**Appendix 05**) developed by a suitably qualified person will be in place for new clearing and the maintenance of existing infrastructure.
- Water for construction and drilling make-up water will be preferentially sourced from a water bore on the well pad to limit clearing.
- The Activity will be conducted within a construction corridor, assessed by an ecologist and archaeologist, to enable adjustment of the well pad expansion and access tracks to avoid environmental and cultural heritage areas during construction works.

Prioritising reuse of existing infrastructure, preferencing the clearance of semi-rehabilitated areas, as opposed to disturbing mature native vegetation assists in the reducing the impacts on existing landscape amenity to a level that is as low as reasonably practicable (ALARP) and acceptable.

Refer to **Table 6—1** for an overview of potentially disturbed areas and their site characteristics. The table below is informed by **Figure 5—5** (Soil Types), and **Figure 5—14** (Vegetation Types) in the **EMP**.

6.2 Site Stabilisation and Maintenance

To facilitate rehabilitation success the Interest Holder will:

- Where clearing is required, topsoil will be stockpiled away from natural or constructed drainage lines no higher than 1.5m to ensure that topsoil and the existing seed bank are maintained for rehabilitation.
- Where vegetation is cleared, it will be stockpiled and stored separately to topsoil stockpiles or mulched and used as an ESC measure.
- Topsoil is to be stripped in slightly damp condition to reduce dust generation and deterioration in topsoil quality as far as practical.
- Topsoil with suitable seed bank, if available, should be spread over the exhausted pit areas, to encourage natural regeneration.
- Topsoil is only to be stockpiled when disturbed areas are not available for immediate rehabilitation.
- Where areas are no longer in use topsoil can be respread across disturbed surface at 50-100mm depth. Note: Handle topsoil in damp condition and avoid an over-compacted or smooth surface (rough is preferred).
- Topsoil identified for removal is to be stripped (nominal depth of 100 mm) immediately prior to commencement of earthwork activities; and preserved for reuse.
- Avoid mixing topsoil with subsoil material.

- Excavated subsoils are to be stockpiled separately from topsoil material; or removed from site.
- Where revegetation is to occur, subsoils are to be scarified to a depth of at least 50mm prior to topsoil placement.
- To maintain a stable landform, ESC measures will be installed as per the ESC Plan (**Appendix 05**).
- Spills will be addressed as per **Appendix 07** (Spill Management Plan).
- Residual drilling by-products will be sampled and tested in accordance with *the Code* to determine suitable measures for management on site or off-site disposal.
- Visual inspections for maintenance/weed control will occur annual at the end of the wet season.

Table 6—1 Estimated Disturbed Areas

Infrastructure	Est. Disturbance Area New (ha)	Est. Disturbance Area Historic (ha)	Vegetation	Soil Type
Well Pad (re-establishment of original well pad and expansion)	4.5	0.8*	• Spinifex.	• Red earths (mainly sandy, locally lateritic) and red clayey sands.
Well Pad Buffer Area**	0.8	-	• Spinifex.	• Red earths (mainly sandy, locally lateritic) and red clayey sands.
Campsite	-	1.3	• Spinifex	• Red earths (mainly sandy, locally lateritic) and red clayey sands.
Access Tracks	2.0	34.7	• Spinifex. • Spinifex; open or sparse shrubs over short grass of southern blue bush. • Open or sparse shrubs with Bassia spp. or southern bluebush.	• Red earths (mainly sandy, locally lateritic) and red clayey sands. • Red clayey sands and sandy calcareous earths. • Red clayey sands, mainly stony soils. • Mainly red clayey sands.
Gravel/Borrow Pits	-	9.9	• Spinifex. • Spinifex; open or sparse shrubs over short grass of southern blue bush. • Open or sparse shrubs with Bassia spp. or southern bluebush.	• Red earths (mainly sandy, locally lateritic) and red clayey sands. • Red clayey sands and sandy calcareous earths. • Red clayey sands; mainly stony soils. • Mainly red clayey sands.
Sand Dune Crossings	-	6.8	• Spinifex. • Spinifex; open or sparse shrubs over short grass of southern blue bush. • Open or sparse shrubs with Bassia spp. or southern bluebush.	• Red earths (mainly sandy, locally lateritic) and red clayey sands. • Red clayey sands and sandy calcareous earths. • Red clayey sands, mainly stony soils. • Mainly red clayey sands.
Water Bores	1.5	-	• Spinifex. • Spinifex; open or sparse shrubs over short grass of southern blue bush. • Open or sparse shrubs with Bassia spp. or southern bluebush.	• Red earths (mainly sandy, locally lateritic) and red clayey sands. • Red clayey sands and sandy calcareous earths. • Red clayey sands; mainly stony soils. • Mainly red clayey sands.

*0.8ha is the area remaining of the original well pad that has not been re-habilitated.

** 0.8ha is included as a contingency buffer to account for any necessary deviations that may be identified during ground-truthing.

7. Monitoring and Maintenance Program

The Interest Holder will inspect and maintain areas being progressively rehabilitated in line with **Table 7—1** (Inspection, Maintenance, and Reporting). All rehabilitation monitoring works are scheduled around the defined wet season; re-entry to the Project Area will be subject to weather/road conditions. Inspections and maintenance during dry periods before wet season where possible

Following the guidance of the *Rehabilitation Plan Guide for Surface Disturbance: Petroleum Exploration*, a suitably qualified third party will conduct the final rehabilitation assessment and endorsement [DEPWS, 2020].

Table 7—1 Inspection, Maintenance, and Reporting

Rehabilitation Phases	Rehabilitation Surveys	Methods	Measurable Attributes	Corrective Actions	Maintenance	Reporting
Planning and Design: No more than 12 months prior to construction	• Identify, establish, and survey analogue sites. • Survey vegetation and soil pre-disturbance. • GPS dune crossings for monitoring reports.	• Ground truth geospatial data. • Survey, assess and document existing erosion issues.	• Baseline ground cover (%). • Baseline canopy cover (%). • Erosion (qualitative – photo evidence of scarring, rill/sheet erosion).	N/A	N/A	• Overview reports for analogue sites, well pad, new access tracks and campsite and gravel pits to be utilized.
Stabilisation and Maintenance: Ongoing	• Inspect, monitor, and test.	• Visual inspection of ESC measures and weed growth on the well pad, campsite, gravel pit/s and access tracks. • Test drilling waste as per *the Code*.	• No visible erosion. • No declared weeds. • Drilling pit ready for closure.	• Erosion and Sediment measures remediated. • Weed management conducted. • Initiate removal of unevaporated fluids from pits.	• Remove the sediment from fences/traps and re-contour banks. • Repair and reinstate ESC measures. • Remove weeds.	• Inspection reports during construction and drilling operations. • Incident reports during construction and drilling operations, e.g., spills. • Drilling by-product management report.
Progressive Rehabilitation: Ongoing Annual/Post Local Wet Season Inspections Until Success Criteria are Met	• Annually at the end of the defined wet season.	• Inspect ESC measures and weed growth. • Inspect for subsidence of closed drilling pits. • Inspect re-growth in comparison to analogue sites.	• Erosion - no visible scaring, drill/sheet erosion. • No declared weeds. • Ground cover (%). • Canopy cover (%).	• Dependent upon a third-party report or landowner feedback. • Erosion and sediment remediated. • Weed & pest management conducted. • Additional seeding. • Soil amelioration.	• Remove the sediment from fences/traps and re-contour banks. • Repair and reinstate ESC measures. • Remove weeds.	• Annual inspection report. • Drilling by-product management report as per WWMP (**Appendix 06**).
Annual Inspections: Up to and including when the areas used for the Activity, or future activity are no longer required.	• Inspections by a suitably qualified person (SQP) or landowner feedback.	• Vegetation monitoring. • Weed inspections. • Inspect ESC measures.	• Erosion (qualitative – photo evidence of scarring, rill/sheet erosion). • Ground cover (%). • Canopy cover (%). • No declared weeds	• Additional seeding. • Livestock management. • Weed management.	• Repair and reinstate temporary ESC measures. • Remove weeds.	• Annual inspection report.
Completion of Rehabilitation	• Final inspection by SQP and landowner.	• Site inspection by a third-party SQP sign-off.	• As per rehabilitation success criteria outlined in **Section 5.**	• Dependent upon a third-party.	• Dependent upon a third-party report.	• Handover report with the landowner. • Signed off on final Environmental Report.

8. Rehabilitation 'Plan on a Page'

REHABILITATION PLAN (RP) EP 125				
Santos **REHABILITATION PLAN** **2023** **JACKO BORE 1DW1**	**Project Area Details**		**Contact Details**	
	EP Number:	125	**Title of Responsible Person:**	NT Senior Supervisor Civil Works
	Well Pad Name/Number:	Jacko Bore 1DW1	**Name:**	James Laverty
	Total Area of Surface Disturbance:	8.8 ha	**Phone Number:**	0407 584 908
	Total Area Covered by This RP:	62.3 ha	**Email:**	lavo.laverty@santos.com

MAPS OF THE RP

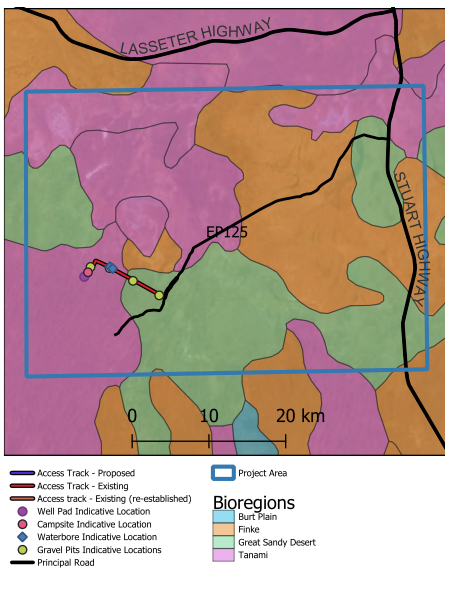

Figure 8—1 Project Area Bioregions

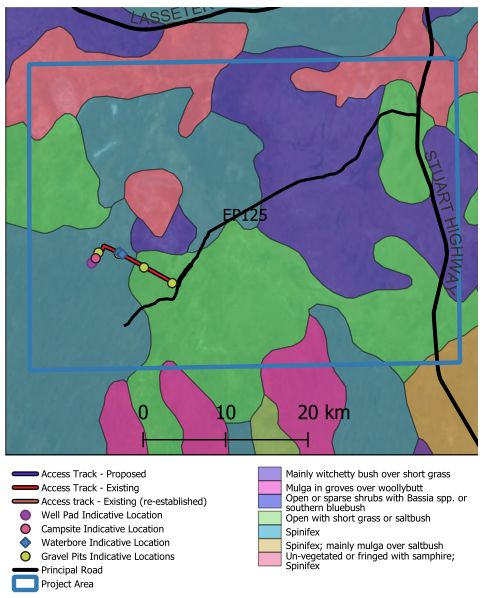

Figure 8—2 Project Area Vegetation

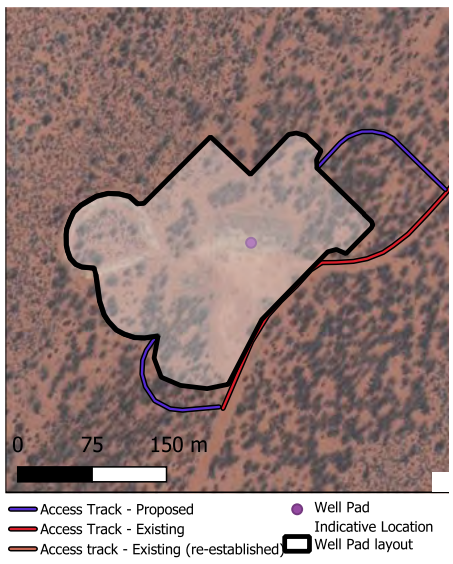

Figure 8—3 Well Pad Rehab Zone

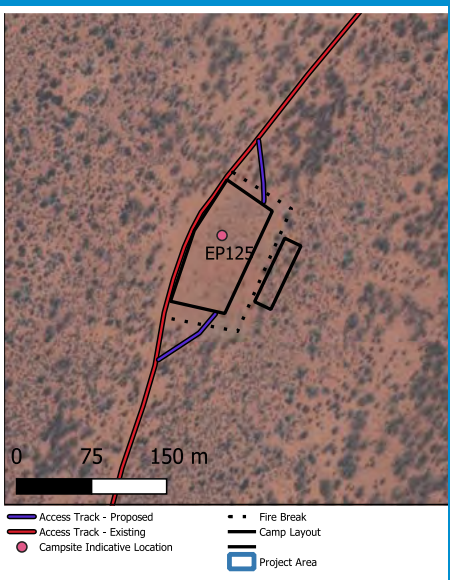

Figure 8—4 Camp Rehab Zone

Rehabilitation Management Zones & Objectives

Soils:

- There is no residual soil contamination on-site that is incompatible with the final land use of that poses a threat of environmental harm.

Ecosystem Rehabilitation:

- The vegetation composition (e.g., type, density, and maturity) of the rehabilitation is recognisable as the target vegetation community and on the trajectory to be indistinguishable from the surroundings.
- The vegetation structure of the rehabilitation is recognisable as or is trending towards the target plant community.

Access Tracks:

- Visually, track contours blend with the surrounding area and previous surface disturbance are becoming indistinguishable.

Infrastructure:

- All infrastructure that is not to be used as part of the final land use is removed to ensure the site is safe and free of hazardous materials.

Pastoral Revegetation:

- Revegetation is sustainable for the long term and only requires maintenance that is consistent with the final land use.

Land Uses and Rehab Objectives		Rehabilitation Management Zone			
Land Uses:	• Cattle grazing, gas exploration.	**Campsite**	1.25 ha	Spinifex	Minor areas of mobile sand, red dune sands and red clay sands.
Rehabilitation Objectives:	• Stable and self-sustaining (e.g., no visible erosion that requires maintenance). • Safe for the land users and fauna. • Returned to an agreed and close to the pre-disturbance level that requires little or no ongoing weed control measures. • Re-instated to reflect the natural ecosystem/s or establish an alternative outcome commiserate with the surrounding land use.	**Jacko Bore Well Pad**	5.33 ha		
		Gravel/ Borrow Pits	9.88 ha	Some mulga over short grass, some Spinifex.	Red clayey sands and sandy calcareous earths. Minor areas of mobile sand, red dune sands and red clay sands.
		Access Tracks	36.70 ha		

Rehabilitation Risks	Pre-Disturbance Land Condition Summary
• Loss of topsoil due to poor placement and/size of stockpiles. • Compaction from heavy vehicles/rigs on access tracks and well pads. • Extreme weather events (e.g., flood, fire, cyclone, drought) that destroy immature vegetation/regeneration. • Fauna (including cattle) grazing on tube stock/seedlings reduces rehabilitation outcomes. • Exposed land surface contributes to increased weed recruitment and increased fire intensity, decreasing revegetation success.	• The Project Area is dominated by the Finke and Tanami bioregions. The Project Area can be characterised as sand plains and alluvial plains, low ridges and stony rises with red clayey sands, red dune sans and minor areas of mobile sand. The Project Area comprises open or sparse shrubs with Bassia sp or southern bluebush, as well as spinifex and mulga over short and tall grass. The vegetation communities vary from the campsite and well pad (spinifex) to the gravel pit and access tracks areas (mulga over short grass and some spinifex. There are springs within the Project Area, but these are isolated and approximately 9km from the well pad.

Rehabilitation Plan prepared by suitably qualified person	**Name:** Trent Smith	**Role:** HSE & Compliance Manager inGauge

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DEPWS. (2020). *Rehabilitation Plan Guide for Surface Disturbance: Onshore Petroleum Exploration*. Retrieved from **https://depws.nt.gov.au/__data/assets/pdf_file/0004/936823/Rehabilitation-Plan-Guide-v0.4.pdf**

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Emergency Response Plan

Appendix 13

Amadeus Basin: Jacko Bore 1DW1 Drill and Test Program

EP125

Santos QNT Pty Ltd

DRILLING AND COMPLETIONS

EMERGENCY & WELL CONTROL

RESPONSE PLAN

DR-DC776-PLN-0608-0

Amadeus Basin

McArthur Basin

Author:

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Reviewed by:

Title	Name	Signature	Date
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NT D&C Project Lead	Steve Roberts		22/04/21

Endorsed By:

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Custodian:

Title	Name	Signature	Date
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D&C Manager	Tom Moore	Santos
NT OCR's	Multiple	Santos
NT D&C Material & Logistics Coordinator	Chris Skewes / Gavin Poschkens / Con Asker	Santos
NT D&C Field Engineers	Tom Harlow / Sophie Winters	Santos

Note: Uncontrolled copies will be distributed to all contractors at each revision.

Revisions:

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23/12/20	2	All	General pre-campaign review. Confirmation of emergency & contact phone numbers. S Atkins
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2 Document Control and Revision History

This document shall be maintained on the Santos Cooper D&C EHSMS SharePoint site and at – T:\Well Files\Northern Territory\McArthur Basin\0. EHS\9. EHSMS 13 Emergency Preparedness.

This document is the controlled version and revision announcements will be distributed via e-mail to relevant parties and electronically available on the Santos Emergency & EHS intranet site.

Copies or extracts of this document, which have been downloaded from the Santos intranet site - Discover, are uncontrolled copies and cannot be guaranteed to be the latest version. The person using a hard copy is responsible for ensuring they are using the latest version.

This document must be reviewed at least every three years from last issue for relevance and updated as required and revalidated. Responsibility for the review is with the Onshore D&C Operations Risk Lead.

In addition, relevant plans shall be reviewed where improvement opportunities have been identified by post emergency / incident / exercise debriefs. A review may also be triggered by the handover of major items of equipment, contractor and organisational change.

In reviewing this document, the relevant sites / activities Significant Hazard Risk Register (SHRR) shall be used to assist with the validation of the Plan.

Suggestions for further improvement to the content of this document should be sent to the Document Custodian.

Northern Territory D&C Superintendent at: nt.dc.field.superintendent@santos.com

3 Definitions

AME	Aeromedical evacuation (use of a helicopter and/or fixed wing aircraft to medivac)
BUSHFIRE CATEGORIES	Category-1: Fire can be extinguished by person/s that started it at point of ignition, under normal site / activity / emergency response procedures. The fire is in an area of less than a few square meters and is attacked using beaters, tree branches, wets sacks, jackets, etc. Category-2– 5: Fire requires initiation of On-Scene Commander and Field Response Team and may require the Incident Management Team to be activated
CAREFLIGHT	AME provider
CMT	Santos Crisis Management Team A team of nominated Santos senior management based in Adelaide who will where required augment the capability and skills of the Adelaide based IMT. The Crisis Management Team Leader is responsible for coordinating the necessary resources to support the IMT response and recovery efforts.
CMTL	Crisis Management Team Leader
CWCE	CUDD Well Control Equipment
DM (CMT)	Duty Manager (CMT) The responsible person who is “on call” and who initiates the call out of the CMT. The DM is contactable via a central contact number and forms part of a rotational roster
D&C SANTOS SUPPORT REPRESENTATIVE	A person sent to the scene of the emergency or incident if the On-Scene Commander is not available or mobilisation time is extensive. When on site this person is responsible for liaising with and supporting the On-Scene Commander and Contractor Supervisor (D&C) if required. Role is filled by a D&C representative or contractor who is familiar with the operations e.g. a Civils person in a civil contractor’s emergency, or a Wellsite Engineer for a well control event.
EMERGENCY	A site/field/area based unplanned event, which requires a response and which may result in: • injury to people; • loss of control of any aspect; • damage to the environment; • loss of business; • loss or damage to product or assets; • loss of production; or the potential for any of the above
ERN	Emergency Response Numbers. Document containing wellsite contact numbers and directions
EWCRP	Emergency and Well Control Response Plan (this plan)
FRT	Field Response Team Personnel who immediately respond to an emergency at the affected site. Acts under the supervision and guidance of the On-Scene Commander.
FCP	Forward Command Point May be used in a well control event; this will be set up in a prominent but safe location adjacent to the event site. If available, a site office should be used. From the FCP the On-Scene Commander (or well control specialist) directly deploys and supervises resources to manage the event.
INCIDENT	An emergency that has escalated, during which control may be lost to some extent/degree, which requires immediate action to prevent or minimise injury, loss or damage which may give rise to the following to be managed: • generate attention by the media, financial institutions, Government authorities, the public etc.;

	• the potential for major loss of asset value; • the presumption that the Company is not fit to operate; or • inability to deliver product
IMT	Santos Incident Management Team A nominated group of Santos senior and other support personnel who provide support to the site/field/area in the case of an escalation of an emergency
IMTL	Incident Management Team Leader The individual in overall command, responsible for the management of all incident operations and coordination of the IMT
IOC	Incident Operations Centre The Corporate Head Office location where the IMT and CMT convene (in separate rooms) to respond to an incident
MUSTER CONTROLLER	Person who, in the event of an emergency, conducts a personnel headcount and manages personnel as instructed by the OSC. Undertakes other duties as directed. At some field locations, this may be the first Santos person, or in the event there is no Santos person, the most senior member of a work party who reports to a muster point.
NOK	Next of Kin
OCR	Operating Company Representative
OSC	On-Scene Commander Senior person in charge at the scene of the Emergency or Incident and is responsible for directing and supervising all wellsite work and operations in relation to the Emergency at the Forward Command Point (FCP)
PPE	Personal Protective Equipment
RFDS	Royal Flying Doctor Service
SMS	Santos Safety Management System forms the overall framework under which all Santos activities are undertaken
SAR	Search and Rescue
SHRR	Significant Hazard Risk Register
SITREP	Situation Report A communication providing a structured update of the incident and distributed to key stakeholders at regular intervals.
SMEAC	A structured briefing process to communicate information pertaining to an incident. S - Situation M - Mission E - Execution A - Administration & Logistics C - Command & Communication
WELLSITE (SITE)	A well location where work on a well is carried out, or where equipment is situated, stored or is being moved to or from a wellsite under the control of ONSHORE D&C.
STANDALONE OPERATIONS (D&C)	Those drilling and completions activities that are not conducted within a greater Santos operational area such as (e.g.) the Cooper Basin.
WELL CONTROL EVENT	A well control event is where the integrity of the wellbore or where drilling, work-over or other well intervention operations are in jeopardy. This event could be a pressure control situation or as catastrophic as a blowout with or without fire. The categorisation of a well control event is as follows: • Level 1 - Standard Well Control Event • Level 2 - Abnormal Well Control Event • Level 3 - Total Loss of Well Control/Fire/Blow-out

4 Introduction

4.1 Purpose and Scope

This Emergency and Well Control Response Plan (EWCRP) sets out the emergency response arrangements and requirements for Santos Onshore Drilling & Completions (Wellsite) operations to ensure an effective and timely response and recovery to emergency and well related events.

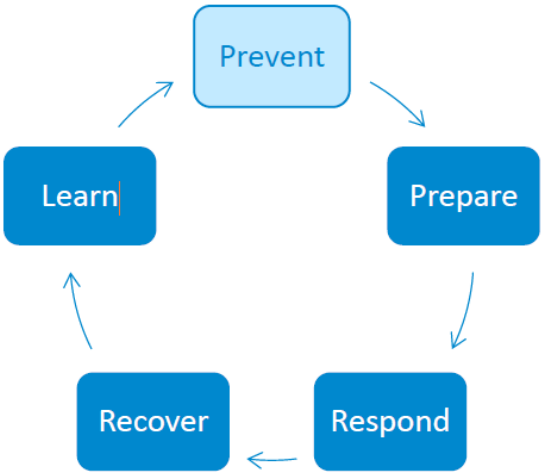
This EWCRP must be implemented when:

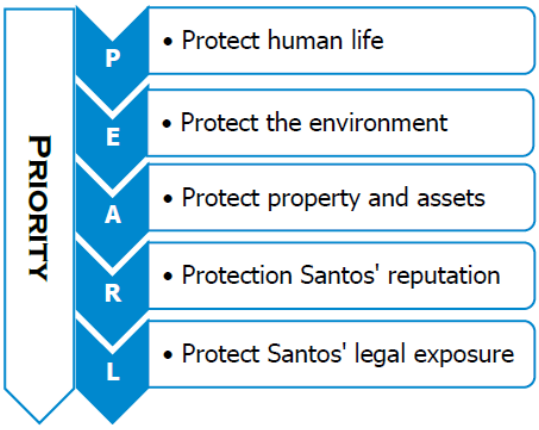
- An emergency exceeds wellsite resources
- Well control events relating to:
  - rig operations (drilling, completions, workover, other)
  - non-rig operations (Stimulation, Coiled Tubing, Snubbing, Electric line, Slick line, other well interventions)
  - producing or shutting in wells

This EWCRP is aligned with Santos SMS ST1 – Emergency and Crisis Management Procedure.

4.2 Emergency Response Priorities

Santos' emergency and crisis management framework applies the following principles:





- Prevent – place highest priority on the prevention of emergencies and crises (achieved via various aspects of the Santos Management System).
- Prepare – identify, establish and regularly test response and recovery capability via documented plans, competent personnel and necessary resources
- Respond – manage events at the lowest practicable level, while enabling the flow of information to the highest useful level where assessment of the needs may be determined, and appropriate resources allocated or directed
- Recover – implement recovery or business continuity plans to minimise the business impact
- Learn – identify opportunities for improvement after exercises or actual events

NOTE

- All Santos employees and contractors have the authority to stop relevant activities to follow the above emergency priorities

- Whilst the procedures and processes outlined in this plan should be followed to the greatest possible extent during an emergency response, variations based upon sound management, engineering judgement and operational experience are at the discretion of the respective response leaders
- Activation of the various response teams operates on the basis of prudent over-reaction, accurate assessment and rapid de-escalation

4.3 Related Documents

- SMS-MS11-ST1 – Emergency and Crisis Management
- SMS-MS11-ST2 – Incident Reporting, Investigation and Learning
- Santos Crisis Management Plan (SCMP)
- Well Control Specialist Emergency Response Plans
- Site and Contractors Emergency Response Plans

4.4 Who Uses this Plan

- Santos Onshore D&C personnel
- Santos Incident Management Team
- Other personnel involved in the emergency response

5 Accountabilities

Person	Accountability
Manager D&C	• Ensure emergency response arrangements and resources are available for all drilling and completions operations • Ensure this Plan is current and relevant for intended operation • Ensure the relevant D&C organisation is trained and competent to perform the duties as described in this Plan
NT Project Lead	• Ensure that sufficient resources are available at the wellsite in accordance with this Plan • Ensure this Plan is current and relevant for intended operation • Verify that parties with allocated responsibilities are suitably trained and competent for their roles • Maintain the currency and integrity of this Plan and supporting documentation • Ensure that Emergency Response equipment is maintained and available at all times • Ensure Well Control and associated specialist emergency response contracts are in place • Ensure that contractors are aware of and appropriately bridge to this plan
D&C Superintendent	• Maintain and update this Plan; • Oversee the preparedness of contingency equipment as defined in this plan • Coordinate the movement of materials and contractors from the field base to site in an emergency • Assist as required in the field base or at the emergency site • Confirm readiness of D&C sites for emergency management • Ensure the Plan is exercised as per SMS-MS11-ST1 – Emergency and Crisis Management • Assist with drills and training
D&C Responsible Officer (Project D&C Engineer)	• Assist with the maintenance and update of this Plan • Confirm the distribution of the Plan, and readiness of D&C sites for emergency management • Facilitate and participate in training and reviews.
D&C Operations Risk Lead	• Ensure consistency with other Santos Emergency Procedures, Plans and Standards. • Support Contract Representatives and Contractors in the appropriate bridging to this plan. Facilitate Plan training and reviews. • Coordinate emergency response debriefs and capture any lessons learnt so as to improve this Plan. • Ensure that Contractors are aware of and appropriately bridged to this Plan; including resource requirements.
Operating Company Representative (OCR)	• Assist with Plan drills and training and fulfilling requirements of the Onshore D&C Operations Risk Verification Schedule. • Review contractor Well Control shut in procedures. • Issue emergency response numbers to wellsite contractors’

6 Assessment & Activation

6.1 Santos Incident Severity Assessment and Activation Matrix

The purpose of the matrix is to determine the level of team support required for an emergency based on the events potential. The matrix is to be used as a guide only.

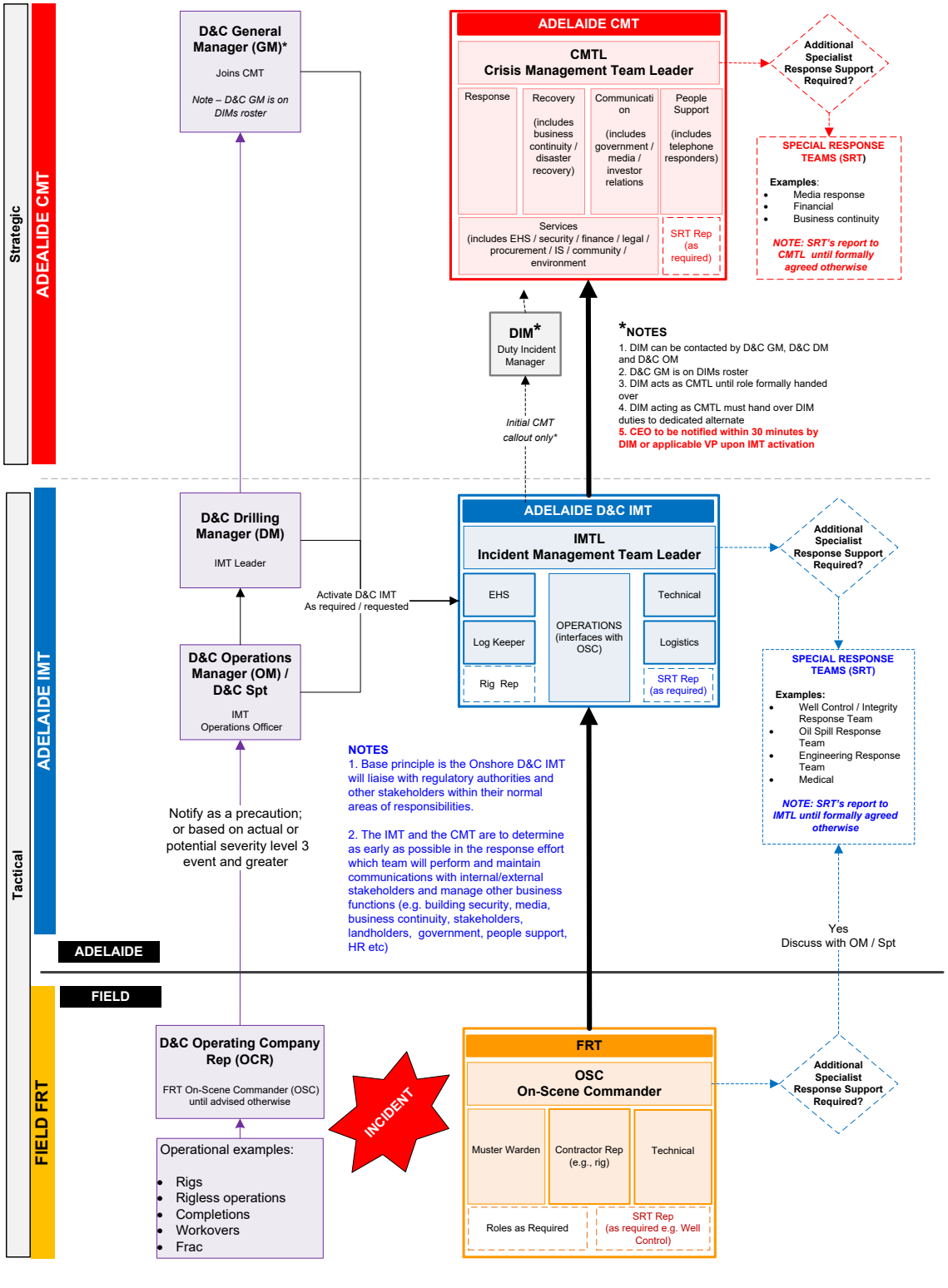
Santos ER Team/s Activation Assessment Matrix					
Santos Response Teams	**Severity Category** (consider actual & potential)	**Health and Safety**	**Well Related**	**Environment**	**Reputation & Regulatory**
CRISIS MANAGEMENT TEAM / INCIDENT MANAGEMENT TEAM / FIELD RESPONSE TEAM	**5&6**	• Fatality/fatalities • Significant irreversible disability to multiple people	Total Loss of well control (fire; blow-out; etc.)	• Destruction of sensitive environmental features. • Regional and long-term impacts on an area of significant environmental value • Remediation not practical or possible • Regulatory & high-level Government intervention/action • # Category 5 Bushfire	• Shareholders and Board exercise control • National level media exposure • Major litigation or prosecution with damages/fines >$100m plus significant costs • Potential class action
	4	• Permanent disabling injury and/or long term off work with high potential to become life threatening • Multiple lost time injuries • High impact process safety incident	• Total Loss of well control (fire; blow-out; etc.)	• Long-term impact of regional significance on sensitive environmental features. • Remediation possible but may be difficult or expensive • Regulatory intervention /action • # Category 4 Bushfire	• Involvement of shareholders • Investigation by regulators • Litigation or prosecution >1m • State level media coverage over several days
	3	• Multiple injuries requiring medical treatment, time off work rehabilitation with the potential to escalate • LOC tier-1	• Abnormal well control event	• Short-term impact on sensitive environmental features. • Triggers regulatory investigation • Remediation possible but may be difficult or expensive • # Category 2 & 3 Bushfire	• State level media exposure • Interest by regulator • Major breach of regulation with punitive fines • Involvement of senior management
	2	• Injury requiring medical treatment with no lost time and rehabilitation • LOC tier 2or any loss of primary containment irrespective of the quantity	• Standard well control event	• Impact on fauna, flora and/or habitat but no negative effects on ecosystem • Readily treated • Requires regulatory notification • # Category 1 Bushfire	• Local media coverage • One or two local complaints • Breach of regulation with investigation or report to authority with possible prosecution and fine
	1	• Minor injury – first aid treatment or no effect • Process safety exception		• Negligible impact on flora/fauna, habitat, aquatic ecosystem or water resources. • Readily dealt with • # Category 1 Bushfire	• No media or community interest • Minor legal issues • Non-compliance and breaches with regulation

Team response activation operates on the basis of prudent over-reaction, accurate assessment and rapid de-escalation.

It is considered better to engage surplus resources up front and subsequently stand down as required.

6.2 Emergency Activation Flowchart

D&C EMERGENCY RESPONSE ARRANGEMENTS (DETAILED)
- Standalone Operations -



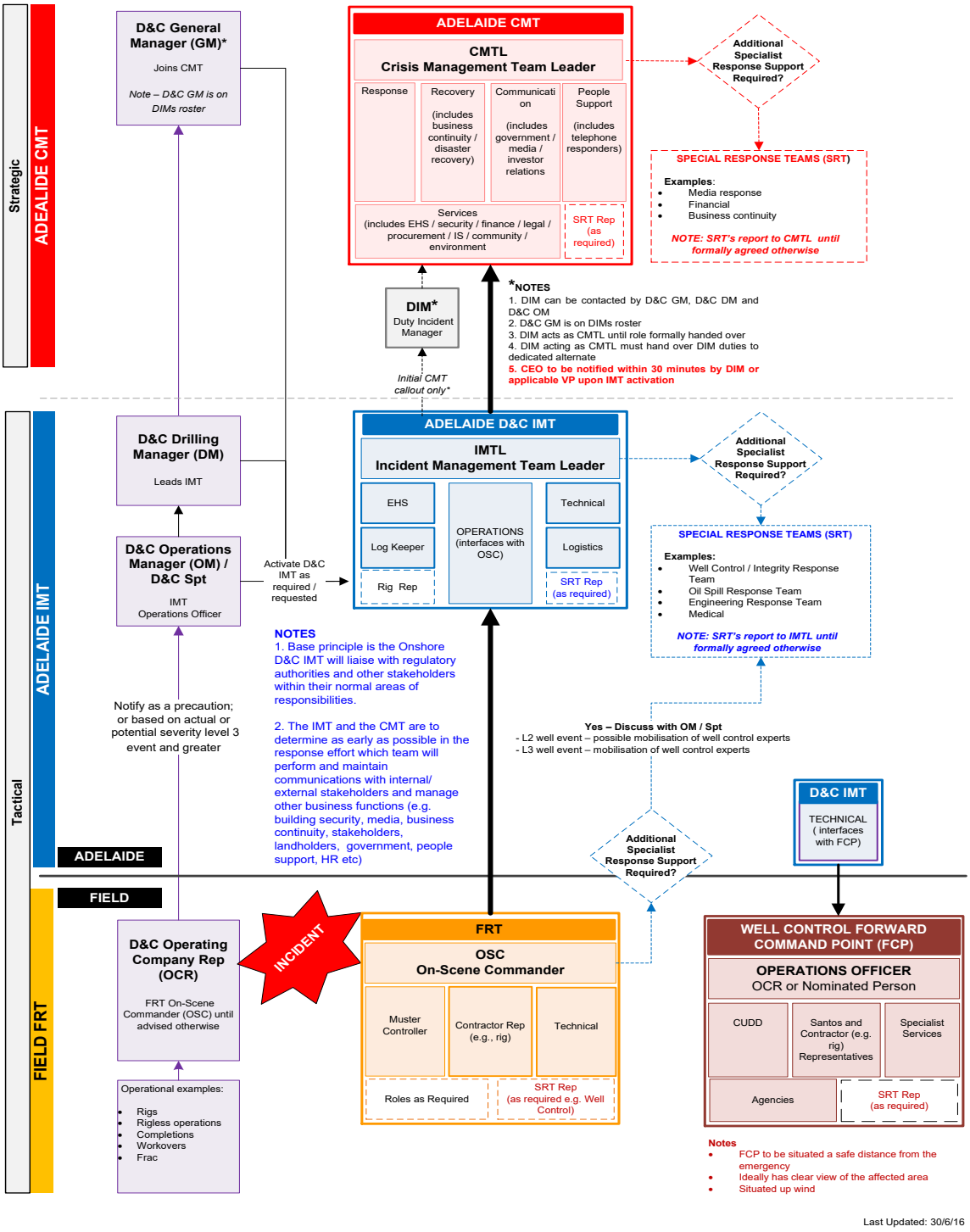
Notes:

- The above flowchart should be referenced against the 'Santos Emergency Response Team/s Activation and Severity Assessment Matrix' at s.6.1

- OCR is to ensure the D&C Superintendent and Operations Risk Supervisor &/or Coach are informed of an incident occurring in a timely manner.

6.3 Well Control Assessment and Activation Flowchart

D&C EMERGENCY WELL CONTROL EVENT RESPONSE ARRANGEMENTS (DETAILED)
- Standalone Operations -



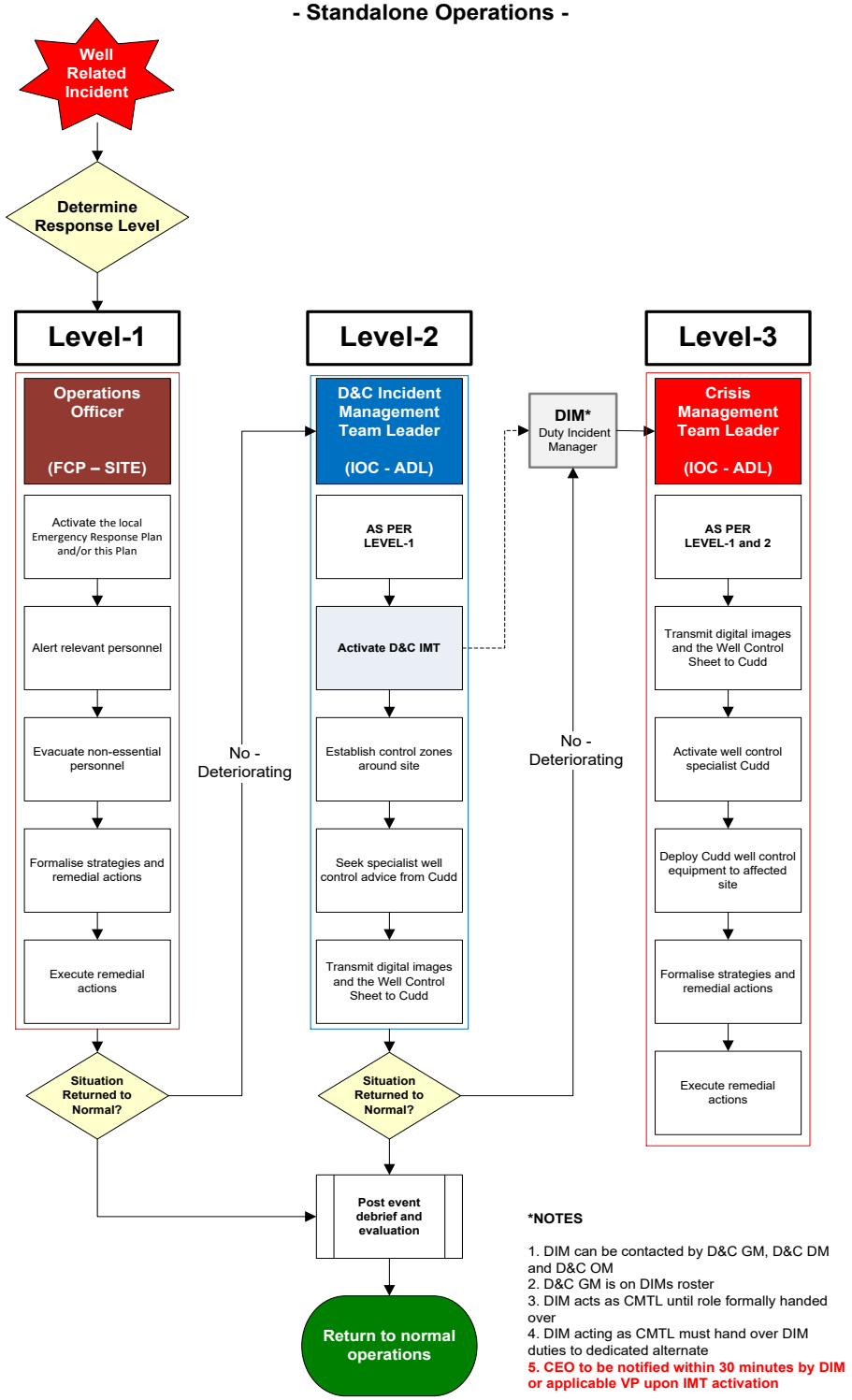
Last Updated: 30/6/16

NOTE

- The above flowchart should be referenced against the 'Santos Incident Management Team/s Activation and Severity Assessment Matrix' at s.6.1
- See s.12.5.1 for well control severity levels, priorities, responses and authorisations

6.4 Assessment and Activation Flowchart – Well Control Severity Level

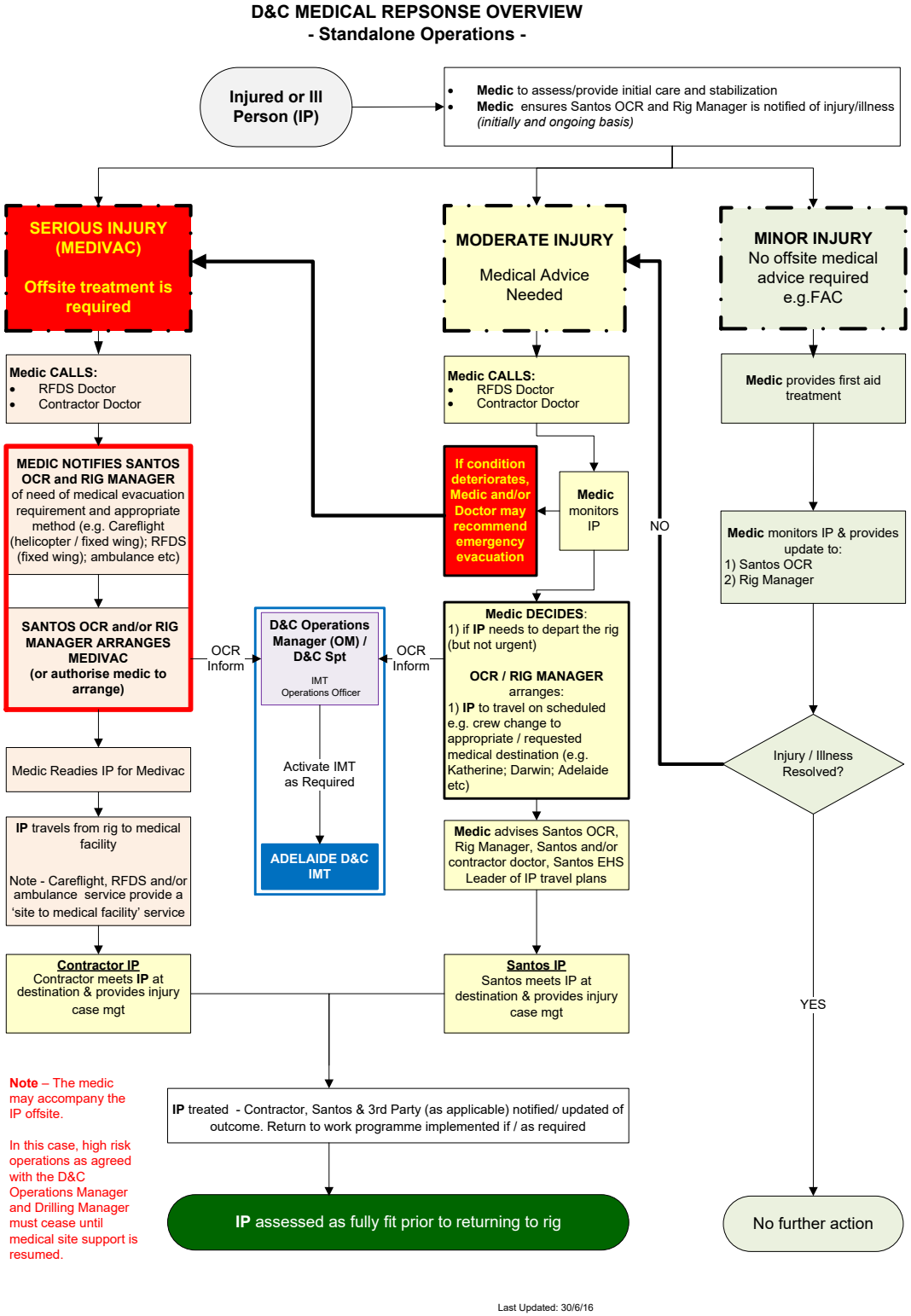
WELL CONTROL EVENT SEVERITY ASSESSMENT AND RESONSE FLOWCHART
- Standalone Operations -



Last Updated: 30/6/16

- See s.12.5.1 for well control severity levels, priorities, responses and authorisations

6.5 Medical Response Flowchart – Overview



Notes

- OCR is to ensure the Santos Superintendent/Operations Manager are timely informed whenever an IP is presented to the medic for a moderate or serious injury issue.

- The medic may accompany the IP offsite. In this case, high risk operations as agreed with the D&C Operations Superintendent and Project Lead must cease until medical site support is resumed.

7 Emergency Response Organisation

For standalone D&C operations, Santos has a three-tiered emergency response structure as per below.

1. Field Response Team (FRT – Northern Territory field location)
2. Incident Management Team (IMT - Adelaide)
3. Crisis Management Team (CMT - Adelaide)

7.1 FRT - Field Response Team (Site)

The FRT is a response team usually situated at the incident site and typically comprises a mix of Santos and contractor personnel appropriately supplemented with technical and other support as required. The FRT is typically led by the Santos Operating Company Representative (OCR).

The Field Response Team (FRT) is typically comprised of the following roles:

- On-Scene Commander (OSC)
- Contractor Supervisor
- Muster Controller
- Medic / First Aid Officer

Notes:

- With the exception of the OSC (and medic if one is available on site), the FRT members will largely comprise personnel of the principal D&C contractor on site.
- Emergency response duty cards for the Field Response Team are located at s.0 of this Plan.

7.2 IMT - Incident Management Team (Adelaide)

The purpose of the Incident Management Team (IMT) is twofold:

1. To support the FRT by providing required resources, assistance and advice in a timely manner so as to respond and recover from the incident safely and without undue delay

2. Ensure matters affecting the business and stakeholders are appropriately considered and addressed; typically, in consultation with the CMT

The Onshore D&C IMT is typically comprised of the following roles:

- Incident Management Team Leader (IMTL)
- Technical Officer
- Operations Risk S'visor/Coach
- Operations Officer
- Logistics Officer
- Log Keeper

NOTE

- Base principle is the D&C IMT will liaise with regulatory authorities and other stakeholders within their normal areas of responsibilities.
- The IMT and the CMT are to determine as early as possible in the response effort which team will perform and maintain communications with internal/external stakeholders and manage other business functions (e.g. switchboard, building security, media, business continuity, stakeholders, landholders, government, people support, HR etc.)
- Emergency response duty cards for the Adelaide based D&C IMT are located at s.10 of this Plan.

7.3 CMT - Crisis Management Team (Adelaide)

The purpose of the CMT is to augment the capability of the IMT for a crisis which may have a Santos-wide impact, or which require additional resources to resolve.

The Crisis Management Team is typically comprised of the following roles:

- Crisis Management Team Leader (CMTL)
- Response
- People Support
- Services
- Log Keeper
- Communication

8 Emergency Communications

8.1 General Guidance to Emergency Response

- Incident Management Team Leader (IMTL) informed of incident and establishes contact with affected site to be provided with details of the incident, understanding of severity and response resource requirements
- Assessment of the emergency situation and severity is made (based on information from the affected site) and an emergency/incident response level determined
- IMT activated so as to provide support to the affected site or facilities
- D&C Superintendent attends the IMT (where practicable) and liaises with IMTL to provide technical input and guidance
- IMTL maintains open communications with the affected site - On-Scene Commander (OSC)
- Affected site On-Scene Commander (OSC) supervises the Field Response Team (FRT)
- Other D&C personnel (roles) may be conscripted into the IMT as required

8.2 Wellsite Emergency Response Numbers (ERN)

Maintaining key well information and contact details is critical to ensure a timely response to an emergency.

Wellsite ERNs provided for and available at each wellsite location include the following details:

- Name of the well
- Wellsite and camp site location coordinates and driving route
- Estimated travel distance to the nearest medical support
- Contact details for contractor personnel (mobile phone and satellite phone)
- Contact details of local Santos base (if relevant) and nearest emergency response support facilities

See Appendix s.14.8 for an example. (Appendix G)

8.3 Incident Notification from Site

The Santos OCR (or in their absence the Contractor Supervisor) is to promptly assume the role of the On-Scene Commander (OSC) and carry out all the functions assigned to that role (see duty card in s.9).

Provide the following information as available (examples below):

Elements	Information Considerations (examples)
Incident type and description	Fire Explosion Well related Injury Vehicle Missing personnel
Incident location	The cross road, landmark or Lat/longs (DDMMSS) Distance from landmark or identifiable equipment ERN directions and or coordinates
Incident size	Area Height Volume
Details of injuries	Number of injured personnel Description of Injuries Assessment of any medical assistance required
Current status	Has the energy source has been stopped, contained or reduced Level of emergency response required Level/degree of situational control Direction/Movement of hazard (fire) Environmental/Climatic situation (wind, rain etc.)

8.4 Stakeholder Communication and Business Functions

During an emergency situation it may be necessary to communicate the state/type of the emergency, the possible cause, its effects/consequences, likely duration and impact to all potential stakeholders.

The IMT may be required to liaise with regulatory authorities and other stakeholder groups such as local councils, landowners and emergency services.

All other external Stakeholder Communication is typically managed through the IMC (unless otherwise delegated) and may include (not exhaustive):

- Local landowners and community representatives
- Government agencies and Ministers
- Non-Government Organisations and special interest groups
- Service providers and commissioned agencies
- Santos employees and family members
- Affected contractor management
- Customers and producers
- Media
- Insurers and lawyers

All information that is communicated to external stakeholders must be controlled and authorised by the IMTL and/or the Santos Incident Management Team (IMT)

8.5 Personal Response Log

Individuals who have responsibilities under this Plan are required to maintain personal emergency response log during the emergency. This records key contacts and decisions made during response activities.

When the emergency and recovery is complete, the personal emergency response logs are forwarded to the Onshore D&C Operations Risk Lead. Records relating to the emergency are maintained with the incident investigation records.

D&C operations are provided an emergency log for completion during an emergency event (formatted A4). An emergency response log template is provided in this Plan at Appendix-F at s.14.7.

9 Duty Cards - Field Response Team (Site)

9.1 FRT On-Scene Commander

FRT On-Scene Commander	
Performed By	Santos Operating Company Representative (OCR)
Reports To	IMT Operations Officer Special Response Teams (as activated / agreed)
ROLE	
	• Effective leadership of the Field Response Team • Oversight of field response procedures and activities (Santos and Contractor) • Ensure effective communications are established and maintained with the IMT Operations Officer • Ensures timely and accurate information is being provided to the IMT Operations Officer (if activated). • Ensure that all necessary support is identified and requested via IMT to support the affected site(s) in a timely and effective manner (at time and forecast) • When it is a Santos controlled emergency situation (e.g. well control) will lead and instruct the Field Response Team • Verify that the contractors Well Control Plan is on site and is suitable
EVERY TEAM MEMBER	
	• Ensure the FRT is set up appropriate to the event • Ensure regular time-outs are called to maintain team wide information accuracy and currency • Look out for the health and welfare of your team members (plan for handovers / change of shifts) • When you have spare capacity, offer yourself to assist the greater response effort • Participate in ER duty handovers; incident debriefing and investigation processes • Do not communicate with the media or transmit information via (e.g.) social media platforms
RESPONSIBILTIES	
Pre-Emergency	• Attend training • Remain familiar with responsibilities within the IMT

Immediate Actions	• Ensure a muster is performed and obtain status of personnel accounted for
	• If required, assist with site muster or evacuation or provision of first aid
	• Establish and clarify details of the emergency (people, environment, asset etc.)
	• Brief all FRT members on factual information and the current status of the emergency to ensure FRT members are fully aware of their respective roles and responsibilities
	• Consult with the Operations Manager as to the considered emergency classification level and discuss if the emergency should be escalated up to the Santos Crisis Management Team
	• Consider if Special Response Team support is or may be required and discuss with the Operations Manager
	• Designate an appropriate location to set up the FRT, having consideration for safety and functional operation
	• Ensure that a direct line of communication is established with the IMT
	• Assess with the Contractor Supervisor (D&C) what immediate response can be undertaken by personnel at the wellsite prior to the arrival of further assistance (e.g. Emergency Services etc.)
	• Determine with the Contractor Supervisor (D&C) if outside assistance/external support is required (this should be done on a continual basis)
	• Ensure contractor's field emergency response plans and procedures are immediately implemented
	• Oversee the safe shutdown of equipment/plant in the affected area (if possible) as long as personnel are not endangered in the process
	• When emergency alarm is raised, determine the source/type of emergency and gather all available information. The following questions may be useful:
	  ◦ How many casualties if any?
	  ◦ If known, the types of injuries are suspected?
	  ◦ Rescue plans and/or first aid being administered?
	  ◦ Immediate well control measures in place?
	  ◦ Assistance requested or required (internal and external)?
	  ◦ Does the injured person/s normally perform an emergency response role (e.g. Senior First Aider or OSC)?
	  ◦ Will the emergency services be met at a designated location?
	  ◦ Any potential or existing hazards?
	  ◦ Is there any actual or potential impact to the environment?

	• Are the correct GPS coordinates known for the incident location?
	• What are the weather conditions?
	• What are the road/track conditions?
	
	• In the event of a Well Control situation:
	  • See s.12.4 for well control emergency information
	  • Locate a Forward Command Point in a prominent but safe location adjacent to the event location. If available, a site office should be used. A staging area should be set up in an adjacent area for personnel and equipment.
	  • The staging areas should be set up where there is:
	  • less than 60dB background noise level
	  • access and egress that will not become congested
	  • a triage area, if necessary, for medical personnel in a clearly identified area, but away from all other activities
	  • Be responsible for all activities, personnel and equipment. Establish a check-in/check-out system that accounts for all personnel at all times
	  • Assign a D&C Santos Support Representative for actions such as log keeper and to act as the focal point of communication to and from the site location
	
	• In the event of a spill, the On-Scene Commander advises the IMT Operations Officer of following details:
	  • Type of product that has been spilt
	  • Location of the spill
	  • Description of the terrain – flood plain, wetlands etc.
	  • How the spill occurred
	  • The size of the spill

During Emergency	• Consider possible length of incident response and make plans to provide handover between team's roles to allow for breaks and avoid fatigue (etc0 • Provide regular SITREPs to the IMT Operations Officer • Maintain a Personal Response Log recording events/actions/messages/decisions • Arrange regular FRT briefing • Ensure response specific convened meetings (outside of team briefings) are minuted • Assess FRT room conditions and services for any possible EHS matters and rectify as appropriate (fatigue; temperature; congestion; food and drink; noise etc.) • Ensure no information is discarded (as it must be collated at the end of the incident to assist with the investigation) • Lead Field Response Team briefings and keep the team informed on the actions • Ensure group actions, decisions and events are accurately recorded and documented • Continue to assess with the Contractor Supervisor (D&C) what response actions can be safely undertaken at the wellsite prior to the arrival of further assistance (e.g. Special Response Team etc.) • Continue to determine with the Contractor Supervisor (D&C) if outside assistance/external support is required (this should be done on a continual basis) • Support and assist the Field Response Team in the coordination of response support/resources coming to site • Assist in gathering permits that are in use and ascertain what work is currently in progress and what other work may impact on the emergency • If warranted, ensure that the emergency site is cordoned off so that access to the site is restricted to authorised personnel only and if relevant there is no contamination of evidence that may be required • Assist with medical response as able
Post Emergency	• Account for all personnel and ensure the site has been made safe before issuing a stop and stand-down for the emergency • Conduct a debrief with all FRT personnel • Assess the emergency response equipment utilised and arrange for repair/replacement if required • Consult with the FRT team on the status of information, Personal Logs, actions etc. • Ensure that no information is deleted / discarded from status / information boards until all notes have been captured • Ensure information and data is filed for ease of discovery and access • Provide the Incident Management Team Leader and IMT Operations Officer with a comprehensive debrief and report if requested • Participate in the Incident Management Team debrief (if able) • Contribute to emergency post-crisis review • Participate in post incident investigation

9.2 FRT Contractor Supervisor

FRT Contractor Supervisor	
Performed By	Senior Site Contractor Representative (normally the Rig Manager/Toolpusher on location)
Reports To	FRT On-Scene Commander Own company response team leader
ROLE	
	• Responsible for the activation of Contractor Field Response Plans and management of Field Response Team (FRT) • Ensure the safe and effective evacuation of site personnel from the site as required • Ensures that appropriate Emergency Shut Down procedures are implemented • Responsible for communicating with the On-Scene Commander
EVERY TEAM MEMBER	
	• Assemble at the FRT staging location and receive a detailed briefing on the emergency • Maintain Personal Log of events • Ensure regular time-outs are called to maintain team wide information accuracy and currency • Look out for the health and welfare of your team members (plan for handovers / change of shifts) • When you have spare capacity, offer yourself to assist the greater response effort • Participate in ER duty handovers; incident debriefing and investigation processes • Do not communicate with the media or transmit information via (e.g.) social media platforms
RESPONSIBILTIES	
Pre-Emergency	• Remain contactable while on duty • Ensure the wellsite has adequate emergency response equipment and personnel are trained in its use • Ensure adequate numbers of trained First Aiders • Ensure personnel onsite are trained in Field Response Team roles and responsibilities • Understand Contractors emergency response plan, arrangement and requirements • Attend training
Immediate Actions	**The following actions are minimum expectations; they are required to enable Santos Emergency Response Plans to be effective.** **The Contractor Representative must also complete all actions required in their Contractor Field Emergency Response Plan.** • Assume initial responsibility for control of the emergency at the wellsite from a contractor perspective • Ensure contractor's field emergency response plans and procedures are immediately implemented • Establish and clarify details of the emergency (people, environment, asset etc.) • Confirm the source/type of emergency and gather all available information • Ensure a muster is performed and obtain status of personnel accounted for • Establish communications with the Santos On-Scene Commander • Oversee the safe shutdown of equipment/plant in the affected area (if possible) as long as personnel are not endangered in the process • Determine if the situation is static or escalating and any immediate actions being carried out or requirements for support • Ascertain the nature of any injuries that personnel may have sustained • In consultation with the On-Scene Commander, assess what immediate response can be undertaken by personnel at the wellsite prior to the arrival of further assistance • Determine if outside assistance/external support is required (this should be done on a continual basis). If required, the On-Scene Commander will engage the assistance of a local Santos base • Evaluate the situation and agree type of response required including if the emergency requires a Santos controlled field response (e.g. well control) • See s.12.4 for well control emergency information • Ensure any responding agencies have the correct details/location of the emergency and give directions as required • Conduct safe removal of injured personnel to a safe location and administer first aid • Confirm with First Aider what additional assistance may be required • Arrange for the safe shutdown of equipment/plant in the affected area (if possible) as long as personnel are not endangered in the process • Maintain open and regular communications with the On-Scene Commander with current and planned response actions and resource needs • Ensure personnel are responsible for maintaining an events log recording activities / actions / messages / decision. • Assess and manage technical matters relating to the emergency response (e.g. engineering; operational; infrastructure; support services / agencies; repairs / replacement

	etc.) • Determine requirement for technical information (drawings; PIDs; engineering etc.) and technical resources
During Emergency	• Attend Field Response Team briefings and keep the Field Response Team informed on relevant actions • Assess and manage technical matters relating to the Santos response (e.g. engineering; operational; infrastructure; support services / agencies; repairs / replacement etc.) • Determine requirement for technical information (drawings; PIDs; engineering etc.) and technical resources • Establish if personnel are required to evacuate from the wellsite and agree transportation needs with the On-Scene Commander • Continually monitor the site for any other hazards that may be present • Gather permits that are in use and ascertain what work is currently in progress and what other work may impact on the emergency • If warranted, ensure that the incident site is cordoned off so as not to contaminate any evidence that may be required • Monitor the welfare of all personnel at site and ensure that any provisions required are provided (i.e. water/food/shelter) • In consultation with the FRT On-Scene Commander, ensure that access to the wellsite is restricted to authorised personnel only and keep a log of all personnel who enter the location • Act as the primary point of contact for the Emergency Services upon their arrival and provide a detailed briefing on the emergency and known hazards • Formulate a roster for the site if the emergency is expected to require field response over a 12-hour shift/handover period. Ensure a factual briefing/handover for all parties. • Consider what contractors should be put on notice of actual or possible use of their services and discuss with FRT On-Scene Commander • Provide input to briefings to the Field Response Team and other interested parties • Provides technical support to response including well engineering, relief well planning etc. • Liaise with internal and external technical personnel as required (including rig contractor) • Contribute to the development of the response plan • Contribute to the development of the recovery plan • Document all personal actions and decisions on an individual log sheet • Ensure group actions, decisions and events are accurately recorded and documented, and also recorded in the Field Response Team Log • Assist with medical response as able
Post Emergency	• Account for all personnel and ensure the site has been made safe before standing down personnel and stating that the emergency has concluded • Follow-up on injured personnel status • Maintain security of the emergency site until an investigation has been completed • Assist in the assessment and integrity of plant/equipment for use after the emergency • Provide the On-Scene Commander with a comprehensive debrief • Consult with the FRT On-Scene Commander on the completion of all necessary internal and external emergency termination communications • Participate in the Field Response Team debrief • Assess the emergency response equipment utilised and arrange for repair/replacement if required • Assist with demob of response / excess equipment and product • Ensure that no information is deleted from status / information boards until all notes have been captured • Ensure information and data is filed for ease of discovery and access • Participate in post incident investigation (as required) • Participate in the FRT debrief (if requested)

9.3 FRT Technical Officer

FRT Technical Officer	
Performed By	Alternate Santos Operating Company Representative (OCR) or Santos Engineer
Reports To	FRT On-Scene Commander
ROLE	
	• Manages engineering and technical support and service activities for the response • Assist in other duties as directed by the On-Scene Commander
EVERY TEAM MEMBER	
	• Assemble at the FRT staging location and receive a detailed briefing on the emergency • Maintain Personal Log of events • Ensure regular time-outs are called to maintain team wide information accuracy and currency • Look out for the health and welfare of your team members (plan for handovers / change of shifts) • When you have spare capacity, offer yourself to assist the greater response effort • Participate in ER duty handovers; incident debriefing and investigation processes • Do not communicate with the media or transmit information via (e.g.) social media platforms
RESPONSIBILTIES	
Pre-Emergency	• Attend training • Remain familiar with responsibilities within the FRT
Immediate Actions	• Establish and clarify details of the emergency (people, environment, asset etc.) • Attend incident FRT briefing • Consider if Special Response Team support is or may be required and discuss with the On-Scene Commander • Assess and manage technical matters relating to the Santos response (e.g. engineering; operational; infrastructure; support services / agencies; repairs / replacement etc.) • Determine requirement for technical information (drawings; PIDs; engineering etc.) and technical resources
During Emergency	• Attend Field Response Team briefings and keep the Field Response Team informed on relevant actions • Liaise with support agencies as directed by the OSC (e.g. RFDS) • Assess and manage technical matters relating to the Santos response (e.g. engineering; operational; infrastructure; support services / agencies; repairs / replacement etc.) • Consider what contractors should be put on notice of actual or possible use of their services and discuss with IMT Operations Officer • Provide technical briefings to the Field Response Coordinator and other interested parties • Provides technical support to response including well engineering, relief well planning etc. • See s.12.4 for well control emergency information • Point of contact for any additional support personnel mobilised to site (technical, engineering etc.) • Liaise with internal and external technical personnel as required (including rig contractor) • Contribute to the development of the response plan • Contribute to the development of the recovery plan • Document all personal actions and decisions on an individual log sheet • Ensure group actions, decisions and events are accurately recorded and documented, and also recorded in an FRT Log • Assist with medical response as able
Post Emergency	• Consult with the FRT On-Scene Commander and IMT Operations Officer on the completion of all necessary internal and external emergency termination communications • Participate in the Field Response Team debrief • Assess the emergency response equipment utilised and arrange for repair/replacement if required • Assist with demob of response / excess equipment and product • Ensure that no information is deleted from status / information boards until all notes have been captured • Ensure information and data is filed for ease of discovery and access • Provide the FRT On-Scene Commander with a comprehensive debrief and report if requested • Participate in post incident investigation (as required) • Participate in the FRT debrief (if requested)

9.4 FRT Muster Controller

FRT Muster Controller	
Performed By	Typically, contractor personnel
Reports To	FRT On-Scene Commander Own company response team leader
ROLE	
	• Ensure the safe and effective evacuation of site personnel from the site as required • Maintain information on location and medical status and welfare of mustered personnel • Responsible for communicating with the On-Scene Commander and Contractor representative • Assist in other duties as directed by the Contractor representative
EVERY TEAM MEMBER	
	• Assemble at the FRT staging location and receive a detailed briefing on the emergency • Maintain Personal Log of events • Ensure regular time-outs are called to maintain team wide information accuracy and currency • Look out for the health and welfare of your team members (plan for handovers / change of shifts) • When you have spare capacity, offer yourself to assist the greater response effort • Participate in ER duty handovers; incident debriefing and investigation processes • Do not communicate with the media or transmit information via (e.g.) social media platforms
RESPONSIBILTIES	
Pre-Emergency	• Ensure personnel onsite are trained in Field Response Team roles and responsibilities • Understand Contractors emergency response plan, arrangement and requirements • Attend training
Immediate Actions	**The following actions are minimum expectations; they are required to enable Santos Emergency Response Plans to be effective.** **A person nominated with the responsibilities of Muster Point Warden must also complete all actions at the direction of the Contractor Representative** • Ensure that the muster point is safe to have people congregate • Arrange first-aid for any injured persons at the muster point • Conduct the initial headcount of mustered personnel – compare against site personnel register if possible • Confirm emergency status with Contractor Representative (i.e. ensure the whole site is aware of the emergency and mobilising accordingly) • Communicate headcount result, including details of injured and missing personnel to the Contractor Representative
During Emergency	• Attend Field Response Team briefings and keep the Field Response Team informed on relevant actions • Maintain a log of personnel movements in and out of the muster point (ensure there are no non-essential movements) • Ensure the safe transfer of all muster point personnel to any nominated areas • Update personnel at the muster point with relevant information on the emergency gathered from the Contractor Representative • Report and update relevant emergency information to the Contractor Representative • If warranted, ensure that the incident site is cordoned off so as not to contaminate any evidence that may be required • Monitor the welfare of all personnel at site and ensure that any provisions required are provided (i.e. water/food/shelter) • Assist with medical response as able
Post Emergency	• Pass on stand-down information to muster point, including any no-go areas as directed by the Contractor Representative Attend Field Response Team debrief • Follow-up on injured personnel status • Participate in the Field Response Team debrief

10 Duty Cards – Incident Management Team (Adelaide)

10.1 IMT Incident Management Team Leader

IMT Incident Management Team Leader	
Performed By	Santos D&C Project Lead (or delegate) NOTE – SUPERINTENDENT ASSUMES IMT LEADER ROLE UNTIL DRILLING MANAGER (OR DELEGATE) TAKES OVER
Reports To	Santos Drilling & Completions General Manager
ROLE	
	☐ Effective leadership of the Incident Management Team (IMT) from the Incident Operations Centre (IOC) ☐ Be mindful of the need to lead the response rather than work the response (i.e. broad response overview to be maintained) ☐ Ensure that all necessary support is provided to the affected site(s) to ensure a timely and effective emergency response and recovery outcome ☐ Ensures effective communications are established with all appropriate internal and external parties ☐ IMT / CMT interaction • Activate the CMT as required (via Duty Incident Manager – DIM) • Ensure timely and accurate information is being provided to the CMT (if activated) ☐ **IMT / CMT internal / external notifications and management** ➢ Base principle is the Onshore D&C Incident Management Team will liaise with regulatory authorities and other stakeholders within their normal areas of responsibilities ➢ The IMT and the CMT are to determine as early as possible in the response effort which team will perform and maintain communications with internal/external stakeholders and manage other business functions (e.g. switchboard, building security, media, business continuity, stakeholders, landholders, government, people support, HR etc.)
EVERY TEAM MEMBER	
	• Ensure the IOC is set up correctly • Maintain Personal Log. Do not hoard information - update relevant Information Boards as appropriate before passing Personal Log to the IMT Log Keeper for data capture • Ensure regular time-outs are called to maintain team wide information accuracy and currency • Look out for the health and welfare of your team members (plan for handovers / change of shifts) • When you have spare capacity, offer yourself to assist the greater response effort • Participate in ER duty handovers; incident debriefing and investigation processes • Do not communicate with the media or transmit information via (e.g.) social media platforms
RESPONSIBILTIES	
Pre-Emergency	• Attend training • Remain familiar with responsibilities within the IMT
Immediate Actions	• Consult with the Drilling General Manager and/or On-call Duty Incident Manager (DIM) as to the emergency classification level and determine if the emergency is to be escalated up to the Santos Crisis Management Team • Assemble at the Incident Operations Centre and provide/receive a detailed briefing on the emergency • Establish and clarify details of the emergency (people, environment, asset etc.) • Implement the D&C appropriate ERP • Confirm that IMT members have been contacted and are attending the IOC • Ensure the IOC has been activated and setup • Brief all IMT members on factual information and the current status of the emergency to ensure IMT members are fully aware of their respective roles and responsibilities • For large scale and/or complex incident responses, consider convening Special Response Team/s (SRT) (e.g. well control, spill response team; technical response team; relative response team etc.); noting respective SRTs report to the IMT Leader in the first instance unless otherwise formally agreed
During Emergency	**General** • Be mindful of the need to lead the response rather than work the response (i.e. broad response overview to be maintained) • Maintain current details of the emergency (people, environment, asset etc.) • Hold regular team 'time-outs' to gather latest information and ensure each team member is working with the current information • Attend Incident Management Team briefings and keep the Incident Management Team

	informed on the actions • Contribute to the development of the response plan • Contribute to the development of the recovery plan • Document all personal actions and decisions on an individual log sheet • Ensure group actions, decisions and events are accurately recorded and documented, and also recorded in the Incident Management Team Log **Field** (Note – Liaise with IMT Operation Leader as that role interfaces with the FRT) • Ensure regular and effective communications with the On-Scene Commander (OSC) / FRT • Ensure the On-Scene Commander is adequately supported and kept informed of Incident Management Team actions • Confirm the FRT is adequately resourced • Ensure people management strategy is in place (appropriate numbers; fatigue; stress; accommodation; food; etc.) • Confirm the status of Special Response Teams (e.g. Well Control) and other specialist response agencies (e.g. Ambulance; fire fighters; government; etc.) **Agency Reporting** • Ensure designated agency reporting requirements are being undertaken in a timely and in the prescribed manner (if applicable) (e.g. Government; Police etc.). Note – confirm notification arrangements with the CMT so as to not over/double report • SEE COMMENTS UNDER 'ROLE – IMT/CMT INTERNAL EXTERNAL …' **EHS** • For environmental incidents (including spills), ensure the EHS Officer has contacted the Santos Environment department for advice and possible mobilisation to the IOC • Consider possibility of environmental impact – reporting, response, recovery (is a Special Response Team required?). • Ensure actions and plans have been adequately assessed prior to execution from an EHS perspective • Consult on specific regulatory reporting requirements and any commitments Santos has made / is expected to meet • SEE COMMENTS UNDER 'ROLE – IMT/CMT INTERNAL EXTERNAL …' **Medical** • Ensure appropriate medical responses have been activated (if required) (e.g. Santos contracted doctor; specialist people support services such as aeromedical services such as RFDS, CareFlight; hospitals etc.) **Special Response Teams (if activated) (SRT's)** • Maintain engagement with any Special Response Team/s (SRT) that may have been activated (e.g. well control, spill response team; technical response team; relative response team etc.); noting respective SRTs report to the IMT Leader in the first instance unless otherwise formally agreed • For well control events, liaise with the IMT Technical Officer as to status of operations as IMT Technical Officer is the interface with the well response team at the Forward Command Point (FCP) • See s.12.4 for well control emergency information **Administration** • Ensure IMT Log Keeper role is capturing all incident information (electronically and/or hard copy) and being retained (it will be used during the investigation phase) • Establish dedicated phones in IOC for IMT Leader (etc.) • Ensure each IMT member is keeping a Personal Log of events relative to their role **Technical** • Ensure all required information is gathered, response plan devised and being implementing • Ensure role is adequately resource (given possible complex issues to be worked) • Ensure role is provided adequate contracting support to enable plan implementation

Post Emergency	• Ensure that any post emergency communication commitments are completed
	• In consultation with IMT Operations
	  • Ensure that all personnel have been accounted for and that it is safe to resume normal operations
	  • Ensure the affected site and key stakeholders have been provided final emergency communications
	  • Ensure the On-Scene Commander at site provides a detailed debrief report that
	• Liaise with the Log Keeper to ensure that all issues and actions have been recorded in the Log
	• Ensure that no information is deleted / discarded from status / information boards until all notes have been captured
	• Any audio recordings must be labelled, retained and sealed with the Incident Operations Centre confidential files
	• Ensure the termination of the emergency is communicated to all ER personnel (typically IMT

	and FRT or as agreed with the CMT) • Conduct a detailed debrief with the IMT to ensure all issues, actions and lessons learnt are captured • Participate in post incident investigation (as required) • Assist with the restoration of the Incident Operations Centre and secure filing of all records

10.2 IMT Operations Officer

IMT Operations Officer	
Performed By	D&C Superintendent or Senior Designated D&C Person
Reports To	Incident Management Team Leader
ROLE	
	• OPERATIONS OFFICER ASSUMES IMT LEADER ROLE UNTIL DRILLING MANAGER (OR DELEGATE) TAKES OVER • Responsible for direct communication with the On-Scene Commander throughout response and recovery activities • Gather regular SITREPS on the emergency from the On-Scene Commander • Assist in other duties as directed by the Incident Management Team Leader
EVERY TEAM MEMBER	
	• Ensure the IOC is set up correctly • Maintain Personal Log. Do not hoard information - update relevant Information Boards as appropriate before passing Personal Log to the IMT Log Keeper for data capture • Ensure regular time-outs are called to maintain team wide information accuracy and currency • Look out for the health and welfare of your team members (plan for handovers / change of shifts) • When you have spare capacity, offer yourself to assist the greater response effort • Participate in ER duty handovers; incident debriefing and investigation processes • Do not communicate with the media or transmit information via (e.g.) social media platforms
RESPONSIBILTIES	
Pre-Emergency	• Attend training • Remain familiar with responsibilities within the IMT
Immediate Actions	• Assemble at the Incident Operations Centre and receive a detailed briefing on the emergency • Assist setting up the Incident Operations Centre and ensure an up-to-date 'Emergency Contact' list is available to the Incident Management Team • After initial contact by the FRT, maintain communications and receive ongoing SITREPs • Ensure appropriate communication mediums are available at all times (i.e. radio / landline / mobile) • Ensure that a direct line of communication is established with the affected site • As requested by the Incident Management Team Leader, communicate with nominated parties and relay messages / instructions given • Obtain contact details (if not on Emergency Contact List) for any external parties involved • Maintain a Personal Log
During Emergency	• Continually review and assess the effectiveness of all communication mediums within the Incident Management Team and with the field and rectify any problems • Ensure the On-Scene Commander is adequately supported and kept informed of Incident Management Team actions • Manage and monitor all event response activities including site evacuation if required • Ensure Emergency Services are briefed, inducted and appropriately guided in their response • Assist in the timely delivery of all correspondence and internal and external communiqués • Assist in the setup of any conference calls with either the affected site or Incident Management Team • Consult with the Incident Management Team Leader to maintain effective liaison with all stakeholders • Review all site SITREPs to assess long term communication issues • Ensure that important correspondence and messages are delivered to Incident Management Team members • Keep Log Keeper informed of any developments at Incident Operations Centre or affected site • Attend Incident Management Team briefings and keep the Incident Management Team informed on the actions • Contribute to the development of the response plan • Contribute to the development of the recovery plan • Document all personal actions and decisions on an individual log sheet • Ensure group actions, decisions and events are accurately recorded and documented, and also recorded in the Incident Management Team Log
Post Emergency	• Consult with the Incident Management Team Leader on the completion of all necessary internal and external emergency termination communications • Liaise with the affected site as to final emergency communication issues with all key stakeholders, including the On-Scene Commander and Emergency Services • Ensure that any post emergency communication commitments are completed • Liaise with the Log Keeper to ensure that all issues and actions have been recorded in the Log • Ensure that no information is deleted from status / information boards until all notes have been captured • Any audio recordings must be labelled, retained and sealed with the Incident Operations Centre confidential files

	• Participate in the Incident Management Team debrief • Assist with the restoration of the Incident Operations Centre and secure filing of all records

10.3 IMT Technical Officer

IMT Technical Officer	
Performed By	Santos D&C Engineer
Reports To	Incident Management Team Leader
ROLE	
	• Manages technical support and service activities for the response • Assist in other duties as directed by the Incident Management Team Leader
EVERY TEAM MEMBER	
	• Ensure the IOC is set up correctly • Maintain Personal Log. Do not hoard information - update relevant Information Boards as appropriate before passing Personal Log to the IMT Log Keeper for data capture • Ensure regular time-outs are called to maintain team wide information accuracy and currency • Look out for the health and welfare of your team members (plan for handovers / change of shifts) • When you have spare capacity, offer yourself to assist the greater response effort • Participate in ER duty handovers; incident debriefing and investigation processes • Do not communicate with the media or transmit information via (e.g.) social media platforms
RESPONSIBILTIES	
Pre-Emergency	• Attend training • Remain familiar with responsibilities within the IMT
Immediate Actions	• Assess and manage technical matters relating to the Santos response (e.g. engineering; operational; infrastructure; support services / agencies; repairs / replacement etc.) • Determine requirement for technical information (drawings; PIDs; engineering etc.) and technical resources
During Emergency	• Attend Incident Management Team briefings and keep the Incident Management Team informed on the actions • Assess and manage technical matters relating to the Santos response (e.g. engineering; operational; infrastructure; support services / agencies; repairs / replacement etc.) • Place major contractors on notice of actual or possible use of their services (ensure Incident Management Team Leader, contracting and legal advice is obtained on communication method and tone of engagement) • Provide technical briefings to the Incident Management Team Leader and other interested parties • Ensure technical associated costs are being recorded and tracked (liaise with finance function to agree data capture arrangements • Provides technical support to response including well engineering, relief well planning etc. • For well control events, act as the interface with the well response team at the Forward Command Point (FCP) • See s.12.4 for well control emergency information • Activates and assembles additional technical support as required • Liaise with internal and external technical personnel as required (including rig contractor) • Contribute to the development of the response plan • Contribute to the development of the recovery plan • Document all personal actions and decisions on an individual log sheet • Ensure group actions, decisions and events are accurately recorded and documented, and also recorded in the Incident Management Team Log
Post Emergency	• Consult with the Incident Management Team Leader on the completion of all necessary internal and external emergency termination communications • Liaise with the Log Keeper to ensure that all issues and actions have been recorded in the Log • Ensure that no information is deleted from status / information boards until all notes have been captured • Any audio recordings must be labelled, retained and sealed with the Incident Operations Centre confidential files • Participate in the Incident Management Team debrief • Participate in post incident investigation (as required) • Assist with the restoration of the Incident Operations Centre and secure filing of all records

10.4 IMT Logistics Officer

IMT Logistics Officer	
Performed By	Santos Logistics
Reports To	Incident Management Team Leader
ROLE	
	• Manages Incident Management Team related support and service activities for the response • Responsible for coordinating personnel, equipment, facilities and materials for response operations (including food, shelter, transportation, facilities, security, communications etc.) both for the Field Response Team and Incident Management Team • Ensure that internal and external service needs are met • Assist in other duties as directed by the Incident Management Team Leader
EVERY TEAM MEMBER	
	• Ensure the IOC is set up correctly • Maintain Personal Log. Do not hoard information - update relevant Information Boards as appropriate before passing Personal Log to the IMT Log Keeper for data capture • Ensure regular time-outs are called to maintain team wide information accuracy and currency • Look out for the health and welfare of your team members (plan for handovers / change of shifts) • When you have spare capacity, offer yourself to assist the greater response effort • Participate in ER duty handovers; incident debriefing and investigation processes • Do not communicate with the media or transmit information via (e.g.) social media platforms
RESPONSIBILTIES	
Pre-Emergency	• Attend training • Remain familiar with responsibilities within the IMT
Immediate Actions	• Assemble at the Incident Operations Centre and receive a detailed briefing on the emergency • Confirm the level of activation of the Logistics Group with the Incident Management Team Leader • Mobilise any additional resources or specialist advisors required for the Logistics Group and conduct an initial group briefing where applicable • With the assistance of the EHS, assess need for regulator notification • Consider exclusion zones and road closures • Start and maintain an individual log • Start a status board that captures the current status of the emergency response and key activities

During Emergency	• Identify the location and status of off-site equipment and personnel suitable to deal with the issue and coordinate their deployment as required
	• Mobilise personnel to implement exclusion zones and road closures
	• Liaise with the relevant Incident Management Team and staff members to provide transport and care / accommodation for the injured, other employees and relatives if necessary
	• Ensure an overall inventory is maintained of all equipment, materials and supplies purchased, rented, borrowed or used
	• Inform the Incident Management Team Leader of logistical movements (include names and locations)
	• Develop a resource plan in support of the response plan to:
	  ◦ Prioritise needs
	  ◦ Identify alternative resources and supplies
	  ◦ Coordinate delivery / deployment
	  ◦ Ensure actions and plans have been adequately assessed prior to execution from an EHS perspective
	• Attend Incident Management Team briefings and keep the Incident Management Team informed on the actions of the Logistics Group
	• Contribute to the development of the response plan
	• Contribute to the development of the recovery plan
	• Contribute to the Incident Management Team situation reports
	• Document all personal actions and decisions on an individual log sheet
	• Ensure group actions, decisions and events are accurately recorded and documented, and also recorded in the Incident Management Team Log
	• See s.12.4 for well control emergency information

Post Emergency	• Consult with the Incident Management Team Leader on the release of all relevant resources, equipment and personnel • Identify any group follow-on actions required and allocate responsibilities and deadlines • Ensure that no information is deleted / discarded from status / information boards until all notes have been captured • Liaise with the Log Keeper to ensure that all issues and actions have been recorded in the Log • Participate in the Incident Management Team debrief • Contribute to emergency post-crisis review • Participate in post incident investigation (as required)

10.5 IMT Log Keeper

IMT Log Keeper	
Performed By	Santos Administration Assistant
Reports To	Incident Management Team Leader
ROLE	
	• Provide advice to assist with ensuring the overall health & safety of all personnel involved in the emergency • Provide EHS support and regulatory advice • Assist in other duties as directed by the Incident Management Team Leader
EVERY TEAM MEMBER	
	• Ensure the IOC is set up correctly • Maintain Personal Log. Do not hoard information - update relevant Information Boards as appropriate before passing Personal Log to the IMT Log Keeper for data capture • Ensure regular time-outs are called to maintain team wide information accuracy and currency • Look out for the health and welfare of your team members (plan for handovers / change of shifts) • When you have spare capacity, offer yourself to assist the greater response effort • Participate in ER duty handovers; incident debriefing and investigation processes • Do not communicate with the media or transmit information via (e.g.) social media platforms
RESPONSIBILTIES	
Pre-Emergency	• Attend training • Remain familiar with responsibilities within the IMT
Immediate Actions	• Assemble at the Incident Operations Centre and receive a detailed briefing on the emergency • Assess room conditions and services for any possible EHS matters and rectify as appropriate (pens/pads etc.; fatigue; temperature; congestion; food and drink; noise etc.) • Set up log keeping arrangements • Inform the Incident Management Team Leader of the need to actively promote the need for each IMT member to complete a Personal Log and provide to the Log Keeper in a timely and ongoing manner
During Emergency	• Arrange meetings and take minutes • Periodically check the information boards for accuracy, that IMT members are recording key information in their Personal Logs, and remind IMT members of the need to hand information to the Log Keeper in a timely manner • Assess room conditions and services for any possible EHS matters and rectify as appropriate (fatigue; temperature; congestion; food and drink; noise etc.) • Ensure each IMT member is adequately stocked with pens, paper, logbooks etc. • Ensure no information is discarded (as it must be collated at the end of the incident to assist with the investigation) • Assist with information filing and data retention • Attend Incident Management Team briefings and keep the Incident Management Team informed on the actions • Ensure group actions, decisions and events are accurately recorded and documented, and also recorded in the Incident Management Team Log
Post Emergency	• Consult with the Incident Management Team Leader on the status of information, Personal Logs, actions etc. • Ensure that no information is deleted / discarded from status / information boards until all notes have been captured • Ensure information and data is filed for ease of discovery and access • Participate in the Incident Management Team debrief • Contribute to emergency post-crisis review • Participate in post incident investigation

11 Emergency Conclusion

After the emergency has ended and the Incident Management Team and Field Response Team are no longer required, several key issues must be considered when standing down personnel.

These issues relate to ongoing emergency control, investigation processes and recovery actions including appropriate resources for key responsibilities. In consultation with the Santos CMT, final information releases must be considered for affected parties and key stakeholder groups including:

- External Contractors and Services;
- Government Authorities;
- Shareholders;
- Media;
- Employees/employee relatives.

For a Level 3 or above incident, the Incident Management Team and/or the Santos Crisis Management Team will advise all internal and external parties that the emergency is over when:

- Where involved, the Emergency Services have formerly declared the emergency is over and returned control of the affected site back to Santos
- The Incident Management Team declares the emergency has been terminated and the site facilities have been returned to a safe condition
- All people have been accounted for
- Injured persons have been stabilised and / or evacuated
- Effective environmental controls are in place.

The termination of an emergency will be the responsibility of the:

- On Scene Commander for Level 1 and 2 incidents
- Incident Management Team Leader for Level 3 incidents
- Incident Management Team Leader in consultation with the Crisis Management Team for Level 4 incidents
- Crisis Management Team for Level 5 incidents

NOTE

All information that is communicated to external stakeholders must be controlled and authorised by the Incident Management Team and/or the Santos Crisis Management Team

11.1 Debriefing

A debriefing is to be conducted by the Project Lead to discuss problems and necessary improvements for incorporation into the emergency preparedness and procedures. Where appropriate, the timing of these debriefs will be co-ordinated in consultation with the Onshore Operations Risk Lead.

This discussion should include:

- Recognition of success and what was accomplished exceedingly well
- Equipment or procedure deficiencies
- Unsafe practices/near miss incidents
- The cause of any injuries sustained
- Unforeseen problems and relevant resolution steps
- Communication/supervision problems
- Environmental considerations
- External problems, i.e. media, landowners, local authority, producers or customers

The minutes from the debrief meeting, when available, will be sent to all attendees.

12 Supporting Information

12.1 Event Specific Emergency Response Checklists

The following Emergency Situation Checklists can be used by the On-Scene Commander (OCR) and D&C IMT and are located at Appendix B:

- Well Control
- Injury / Fatality
- Electric Shock
- Aircraft Accident
- Bomb / Terrorist / Security Threat
- Bushfire
- Fire / Explosion
- Confined Space
- Person / Vehicle Missing
- Evacuation
- Chemical / Gas Release
- Vehicle Accident
- Helicopter Search and Rescue (SAR)

12.2 Spill Response

Small spills – typically managed locally at the site by the use of dedicated spill kits; which are readily available and appropriately stocked.

Large spills – Typically beyond the capability of site to complete the response. In these circumstances, the OCR is to notify the D&C Superintendent as shown in the Activation and Escalation flowchart at s.6.2. to provide incident details and initiate an appropriately response supported.

All spills will be managed in accordance with:

- This Plan
- Contractors ERP
- SMS-MS1 Risk – ST13 Environmental Hazard Controls Procedure
- Incident & Crisis ST2 - Incident Reporting, Investigation and Learning Procedure
- Project Environment Plan (including regulatory reporting)

12.3 Journey Management Plan

Each campaign is to have a project specific Journey Management Plan (JMP). A copy of the JMP is made available on site.

Contractors will adhere to their own company JMP's as it applies to their operations and personnel, where appropriate.

All vehicles leaving site will be equipped with water, first aid kit and appropriate communication apparatus (e.g. mobile phone, satellite phone).

In the event of an emergency (e.g. overdue arrival; failure to make planned inter-trip contact), a response will be formulated based on collective information known at the time such as last contact location/time, agreed/expected travel route, anticipated driving speed, environmental considerations (e.g. wind, rain, heat) and understood travel hazards (e.g. wild animals, livestock etc.). Assistance to affect a Search and Rescue (SAR) can come from external sources such as the police and the local community (e.g. land holders; local council intelligence etc.).

Overdue arrivals or failure to make contact at agreed points/estimated times will invoke the emergency response arrangements as shown in the 'All Emergency Activations and Escalation Flowchart'.

12.4 Santos Risk Matrix

CONSEQUENCE		I	II	III	IV	V	VI
	Legal	• Minor legal issues, non-compliances and breaches of regulation	• Breach of regulation with investigation or report to authority with possible prosecution and fine	• Major breach of regulation with punitive fine. • Involvement of senior management	• Litigation or prosecution costing >$1m • Investigation by regulatory body • Litigation involving weeks of senior management time	• Major litigation or prosecution with damages or fines of >$10m+ plus significant costs	• Public inquiry taking up resources and executive time • Major litigation or prosecution with damages/fines of >$100m+ plus significant costs. • Custodial sentence for a manager
	Management Involvement	• Will require some local management attention over several days.	• Event that will require some site-level management time over several days.	• Moderate event that will require the involvement of head office staff and will take up the time of site managers for several weeks.	• Major event that will require considerable senior management time to handle over several weeks	• Long-term severe disruption that requires senior management to devote much of their time and attention for several months	• Prolonged, continuous senior management involvement for over a year. • Operations severely disrupted due to management distraction
	People	• Minor injury, minor medical/first aid treatment or no effect.	• Injury requiring medical treatment with no lost time.	I- Medium term reversible disability to one or more persons. - Significant medical treatment, disabling or lost time injury.	• Extensive injuries or irreversible disability or inpairment to one person.	• Single fatality and/or severe irreversible disability to multiple people.	• Multiple fatalities or significant irreversible effects on 10's of people.
	Environment and Community	• Localised and short term environmental or community impact – readily dealt with	• Localised and short term impact to an area, plants or animals of environmental value. • Readily treated • One off community protest requiring intervention and management attention.	• Localised and medium term impact to areas, plants or animals of significant environmental value. • Remediation may be difficult or expensive. • Immaterial effect on community.	• Extensive and medium-term impact to an area, plants or animals of recognised environmental value. • Remediation possible but may be difficult or expensive. • High potential for complaints from interested parties.	• Destruction of an important population of plants or animals or of an area of significant environmental value. • Complete remediation not practical or possible. • Prolonged community outrage that impacts the viability of the business.	• Regional and long term impact on an area of significant environmental value. Destruction of an important population of plants and animals with recognised conservation value. • Complete remediation impossible. • Complete loss of trust by affected community leading to to long-term social unrest & outrage.
	Growth (NPV)	<$150k loss or gain	>$150k, <$1.5m loss or gain	>$1.5m, <$15m loss or gain	>$15m, <$150m loss or gain	>$150m - <$1.5b loss or gain	>$1.5b
	Financial (EBITDAX)	<$30k loss or gain	>$30k, <$300k loss or gain	>$300k, <$3m loss or gain	>$3m, <$30m loss or gain	>$30m, <$300m loss or gain	>$300m loss or gain
	Reputation	• Kept on site. No media or community interest	• Local media coverage. • One or two community complaints	• State media coverage. • Interest by regulator	• State media coverage over several days. • Involvement by regulator and shareholders	• National media coverage over several days. • Shareholders and Board exercise control. • Potential for class action	• Prominent International media coverage over several days. • Long term affect on share price • Changes at executive level. • Shareholders desert stock.
		I	II	III	IV	V	VI

LIKELIHOOD			I	II	III	IV	V	VI
	Almost Certain Is expected to occur in most circumstances or Could occur within days to weeks	f	Low	Medium	High	Very High	Very High	Very High
	Likely Could occur in most circumstances or Could occur within weeks to months	e	Low	Medium	High	High	Very High	Very High
	Occasional Has occurred before in Santos or Could occur within months to years	d	Low	Low	Medium	High	High	Very High
	Possible Has occurred before in the industry or Could occur within next few years	c	Very Low	Low	Low	Medium	High	Very High
	Unlikely Has occurred elsewhere or Could occur within decades	b	Very Low	Very Low	Low	Low	Medium	High
	Remote Requires exceptional circumstances, is unlikely even in long term, 100 year event	a	Very Low	Very Low	Very Low	Low	Medium	Medium
			I	II	III	IV	V	VI

12.5 Well Control Emergency

12.5.1 Well Control Severity Levels, Priorities, Responses and Authorisation

Depending on the nature and severity of a well control event there are three response levels. These levels (detailed below) are an indication of event types that may occur during drilling and completions, petroleum engineering or production activities. For Onshore Australia, if a well is an active or inactive producing well, and a level 1, 2, or 3 event occurs, the well immediately becomes the responsibility of Onshore Drilling & Completions. This responsibility shall remain until the event has been controlled. The well will then be formally handed back to Production. The response levels are intended as guidance and may be upgraded or downgraded as conditions warrant. It should be noted that a conservative approach should be taken, and a higher level of response initiated where appropriate, and downgraded later when deemed necessary.

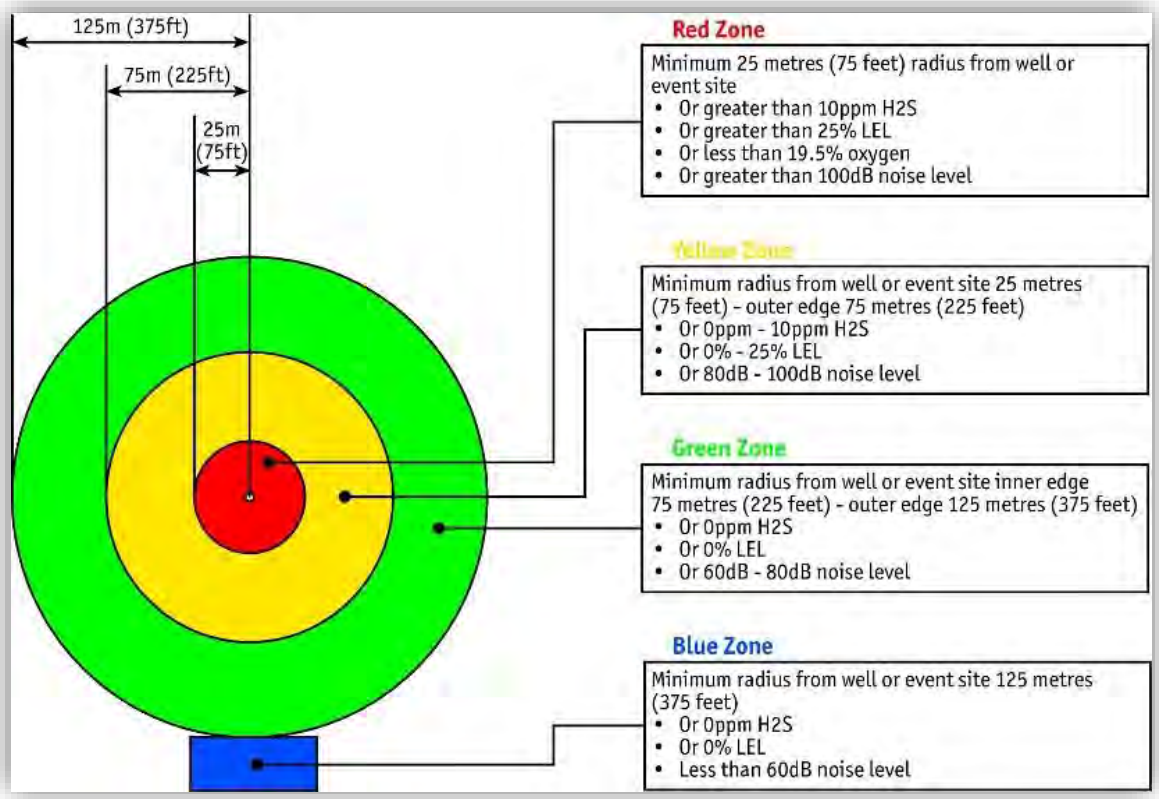
	LEVEL 1 Well Control Event	LEVEL 2 Abnormal Well Control Event	LEVEL 3 Total loss of well control / fire / blowout
IDENTIFYING RESPONSE LEVEL	• Fluid standard barrier failed or compromised and unable to be restored, so that well kill is required • Appropriate secondary pressure control barriers are in place and functional • Standard Program or Drilling and Completions Management System kill methods are applicable • Personnel on site adequate for response with support as required (e.g. D&C Superintendent, and D&C Team) • Surface leak or deficiency that is minor or able to be controlled with hydrostatic, wellhead or BOP equipment	• Standard well control method not effective • Non-standard procedure or Well Control Specialist may be required • Repairable leaks or failures in (e.g.) BOP, surface equipment or inside-pipe controls, plugged drill string/bit, or unable to pump, total pump failure • Potential underground flow, unexpected pressures during kill • Abnormal annulus pressure behaviour • Diagnostics and analysis needed • Flaring/diverting where a shut-in would cause loss of control • Gas or liquid handling problems during kill, pit overflows, potential environmental effects • Well flow/pressure during or after tripping, wire line, casing or cementing	A Total Loss of Well Control/Fire/Blowout Event is described where the following conditions exist: • Full scale surface blow-out • Surface well fire • Deteriorating/escalating conditions of abnormal well control event • Well control specialist required • Underground flow confirmed • Breaching – major flow of well fluids outside casing to surface
WELL CONTROL PRIORITIES AND RESPONSES	• Activate the local Emergency Response Plan and/or this Plan • Alert and notify all relevant personnel. • Evacuate non-essential personnel. • Use SOPs to formulate and execute the necessary remedial actions.	• Activate the local Emergency Response Plan and/or this Plan; involving office personnel as necessary. • Alert and notify all relevant personnel. • Evacuate non-essential personnel. • Consult Well Control Specialist as required; or mobilise Well Control Specialist • Establish Control Zones around the incident site if necessary.	• The local Emergency Response Plan and this Plan and Santos Crisis Management Plan as determined • Alert and notify all relevant personnel • Evacuate non-essential personnel • Consult with Well Control specialist by transmitting all relevant data pertaining to Discover and the incident • Transmit digital images and Well Control Worksheet to Well Control Specialist via email where possible • Establish Control Zones around the incident site • Mobilise Well Control specialist personnel to site • Deploy Cudd well control equipment

AUTHORISATION TO DECLARE RESPONSE LEVELS	• Santos OCR • Santos D&C Superintendent or Field Coordinator	• Santos OCR • Santos D&C Superintendent or Field Coordinator • Santos D&C Manager	• Santos OCR • Santos D&C Superintendent or Field Coordinator • Santos D&C Manager / D&C Superintendent • Santos General Manager D&C

12.5.2 Well Control Operational Area – Safe Distance Overview

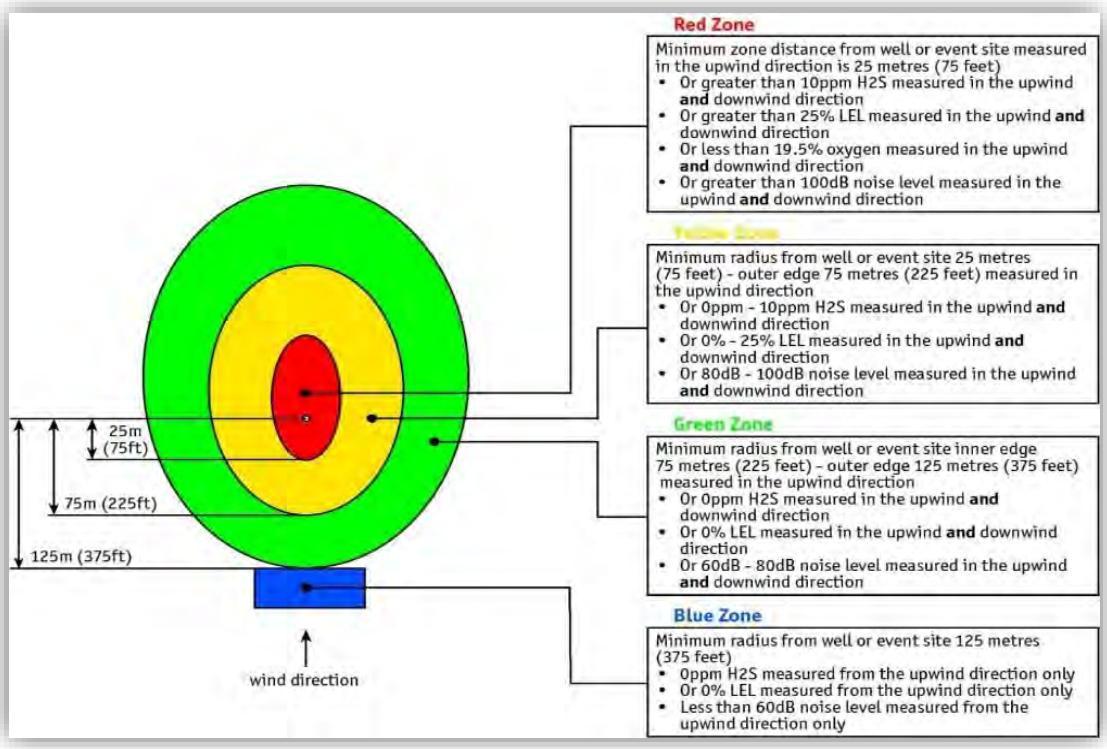
The area around Discover/Control event needs to be secured from non-essential personnel and the public. Only essential personnel will be allowed in Discover/Control Operational Area. The area is divided into four different zones. The figures and information in the following diagrams illustrate the layout of a generic Well Control Operational Area based on wind and no wind

Wind conditions could change the shape of Discover/Control Operational Area as shown below. To determine and mark out the extent of each zone a minimum two-person team suited up in appropriate personal protective equipment shall approach the event site from the upwind directions (and downwind only if agreed and practical). Use the information below to place appropriate markers to satisfy each of the minimum criteria listed for each zone. Distances are a guide only and the On-Site Commander shall determine the actual zone distances.



Santos

Well Control Operational Area - Not Wind Affected



Well Control Operational Area - Wind affected

12.5.3 Well Control Operational Area – Safe Distance Zones Guide

	BLUE	GREEN	YELLOW	RED
General	• The Forward Command Point would be set up in this area. • The Blue Zone is considered to be safe for all personnel and equipment. This zone will be used as a staging area for all personnel and equipment entering the yellow, green and red zones. • This area shall be adjacent to the other well control response zones (Red, Yellow and Green).	• The Green Zone is limited to secondary support personnel. • The On-Scene Commander approves access to the Green Zone and retains an active record of all persons in that zone during a level 3 event. • All personnel entering the Green Zone must sign in at the Forward Command Point upon entering or exiting.	• Access to the Yellow Zone is limited to essential support personnel. • The On-Scene Commander approves access to the Yellow Zone and retains an active record of all persons in that zone during a level 3 event. • All personnel entering the Yellow Zone must have the appropriate Personal Protective Equipment (PPE) and must sign in at the Forward Command Point upon entering and exiting	• Access to the Red Zone will be limited to Well Control Personnel and Emergency Services Personnel during Level 3 events. Emergency Services Personnel may include Santos personnel and personnel from external agencies. • The Well Control Specialist will accompany personnel (other than Emergency Services Personnel) into the Red Zone during a Level 3 event. • The On-Site Commander approves entry to the Red Zone and ensures an active record is retained of all persons in this zone.
No wind	• minimum distance from well or event site 125 metres (~ 375 ft.) • or 0ppm H2S • or 0% LEL • or less than 60 dB noise level • access from two directions • large staging area available	• minimum radius from well or event site, inner edge 75metres (~ 225ft), outer edge 125metres (~375ft) • or 0ppm H2S • or 0% LEL • or between 65 – 79 dB noise level	• minimum radius from well or event site inner edge 25 metres (~ 75 ft.), outer edge 75 metres (~ 225 ft.) • or less than 10 ppm H2S • or less than 25% LEL • or between 80 – 100 dB noise level	• minimum 25 metres (~75 ft.) radius from well or event site • or greater than 10 ppm Hydrogen Sulphide (H2S) • or greater than 25% Lower Explosive Level (LEL) • or less than 19.5% oxygen • or greater than 100dB noise level
Wind	• minimum distance from well or event site 125 metres (~ 375tf) measured from the upwind direction • or 0ppm H2S measured from the upwind direction only • or 0% LEL measured from the upwind direction only • or less than 60 dB noise level measured from the upwind direction only • access from two directions • large staging area available	• minimum zone distance from well or event site measured in the upwind direction, inner edge 75metres (~225ft), outer edge 125metres (~375 ft.) • or 0ppm H2S measured in the up and downwind direction • or 0% LEL measured in the up and downwind direction • or between 65 – 79 dB noise level measured in the up and downwind direction	• minimum distance from well or event site measured in the upwind direction, inner edge 25 metres (~75 ft.), outer edge 75 metres (~ 225 ft.) • or less than 10 ppm H2S measured in the up and downwind direction • or less than 25% LEL measured in the up and downwind direction • or between 80 - 90 dB noise level measured in the up and downwind direction	• minimum 25 metres (~ 75 ft.) distance from well or event site measured in the upwind direction • or greater than 10 ppm H2S measured in the up and downwind direction • or greater than 25% LEL measured in the up and downwind direction • or less than 19.5% oxygen measured in the up and downwind direction • or greater than 100dB noise level measured in the up and downwind direction
Typical equipment for L3 event	• portable offices • living quarters • well control support equipment • safety monitoring equipment and personnel • Forward Command Post • Environmental monitoring equipment and personnel	• fire-fighting pump equipment • well kill pump equipment • fluid handling equipment • safety monitoring equipment and personnel • environmental monitoring equipment and personnel	• water monitor stations • Athey Wagon and accessories • bulldozers and operators • cranes and operators •	• Well Control Specialist • Athey Wagon and accessories • specialised fire-fighting equipment • specialised well control equipment

12.5.4 CUDD Information

12.5.4.1 CUDD Equipment - Storage Location

The main cache and two rapid response boxes of CUDD Well Control equipment are located at Moomba (Fire Training Ground).

The CUDD Well Control Equipment (CWCE) has been designed for Santos Onshore Operations in Australia and may be moved to different Santos operations depending on Santos' well programs and activities.

Santos personnel should accompany and deploy the equipment as required.

Refer to Appendices s.14.4 (Appendix C) for a summary of well control equipment and its storage.

12.5.4.2 CUDD Equipment – Deployment Guide

The CWCE shall be available to be mobilised to the event site during any Level 2 or 3 well control event.

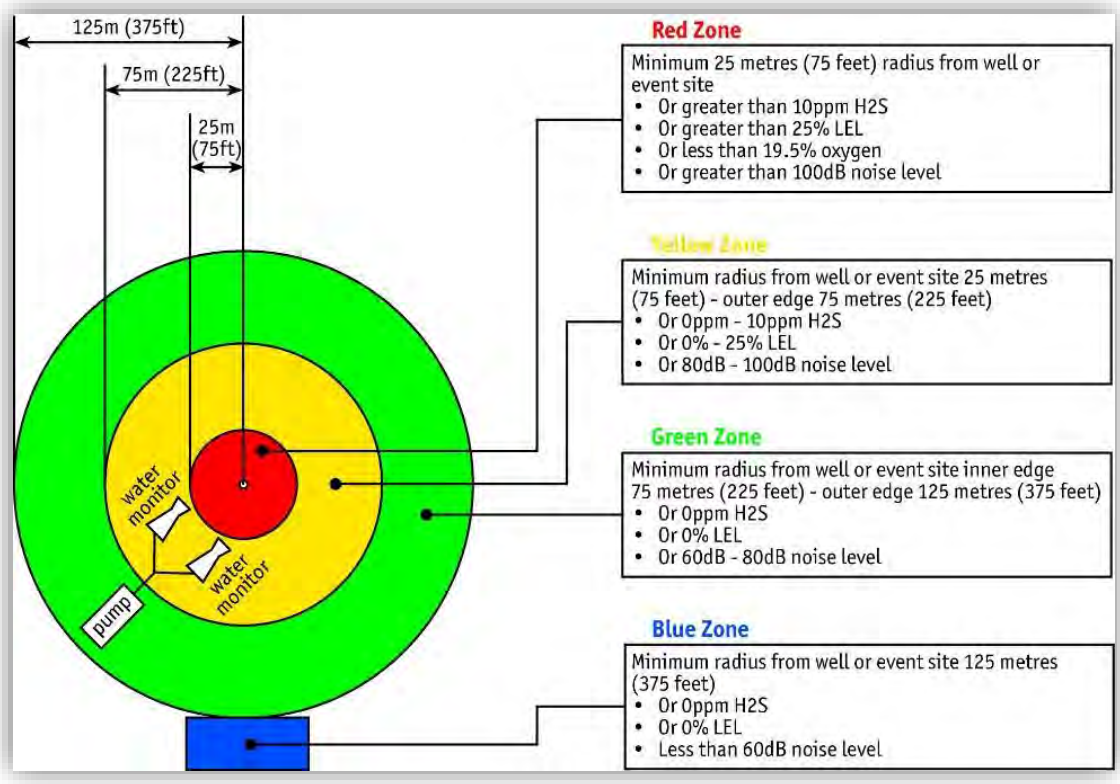


Figure 10.6.4 Generic rig up of Cudd Well Control Equipment

Outlined below are the deployment parameters involved with the deployment of the CWCE.

- Where possible, a Santos supplied well control pump to be used with the CWCE.
- Position pump and water source inside of the Green Zone or a minimum of 75 metres (~ 225 ft.) upwind of any hydrocarbon release.
- Secure a minimum of 2,000 bbl. (~ 84,000 US gallons) of fresh water positioned in Stimulation tanks or similar manifold together.

- Use a Stimulation blender capable of producing 1000kpa (~150 psi) at 60bpm (~ 2,500 gpm) to support two monitors.
- A Stimulation blender must use 1 x 100mm (4inch) hose from the blender discharge to the Rapid Response manifold.
- Santos supplied well control pump unit capable of pumping 12 bpm (~ 500 gpm) to support one monitor.
- A pump unit must use 2 x 50mm (2 inch) lines from the pump to the Rapid Response manifold.
- Position the Rapid Response manifold approximately 8 metres (~.25 ft.) inside the Yellow Zone.
- Two monitor hoses (75mm/3 inch) will be required for each monitor. A minimum of 4 x 15 metre (approx. 50 foot) hoses will be needed to position the monitors 30 metres (~100 ft.) from the well.
- Position monitors 15 to 30 metres (~50 to 100 ft.) apart to allow overlapping spray on to the hydrocarbon release.

Note: Under no circumstance is the CWCE equipment to be moved or positioned inside the **Red Zone** without approval from Well Control Specialist.

12.5.4.3 CUDD Equipment – Usage Scenarios

As a precaution, the CWCE shall be deployed whenever there is a potential for, or a continuous uncontrolled release of, hydrocarbons at the surface. Used properly the CWCE will lessen the risk of the hydrocarbon release igniting and causing severe damage. The CWCE should be rigged up and used for the three scenarios listed below.

(A) Search and Rescue Operations

The CWCE should be rigged up prior to, and used during, any search and rescue operations around a hydrocarbon release. The search and rescue operation should only be performed by qualified personnel. The CWCE is used to provide protected entry and egress routes for the search and rescue operations.

The personnel performing the search and rescue operations should be covered in water spray at all times. The proper personal protective equipment must be worn by the search and rescue personnel.

After deployment of the CWCE is completed and the operation is discussed with Well Control Specialist, search and rescue operations may begin.

No search and rescue operations will commence inside the **Red Zone** without Well Control Specialist or their designate on location.

No remedial work to the well or its surrounding equipment should be performed in the **Red Zone** without Well Control Specialist or their nominee on location.

(B) Uncontrolled Hydrocarbon Release

The CWCE should be used during an uncontrolled release of hydrocarbons as an ignition suppressant agent.

The CWCE will be able to provide a water deluge on the release to lessen the risk of ignition.

(C) Ignition of Hydrocarbon Release

After ignition of an uncontrolled hydrocarbon release, the CWCE should be used to lessen the damage to the rig and/or surrounding equipment.

Proper use of the CWCE should contain the fire and reduce the severe heat loading on the rig, thereby lessening the damage.

12.6 Road and Air Considerations

12.6.1 Response to an Emergency - Road

Where emergency services such as ambulance, police and fire services are dispatched by road, a Santos employee or contractor will meet the emergency service at a designated location.

12.6.2 Response to an Emergency - Helicopter

The helicopters in the Northern Territory Santos Operations can be utilised to transport personnel and equipment for field emergency responses and medivac operations during daylight hours only

The following steps detail the safe operational considerations and procedures required for setting up landing areas for helicopters at an incident site.

12.6.3 Approaching the Aircraft Safely

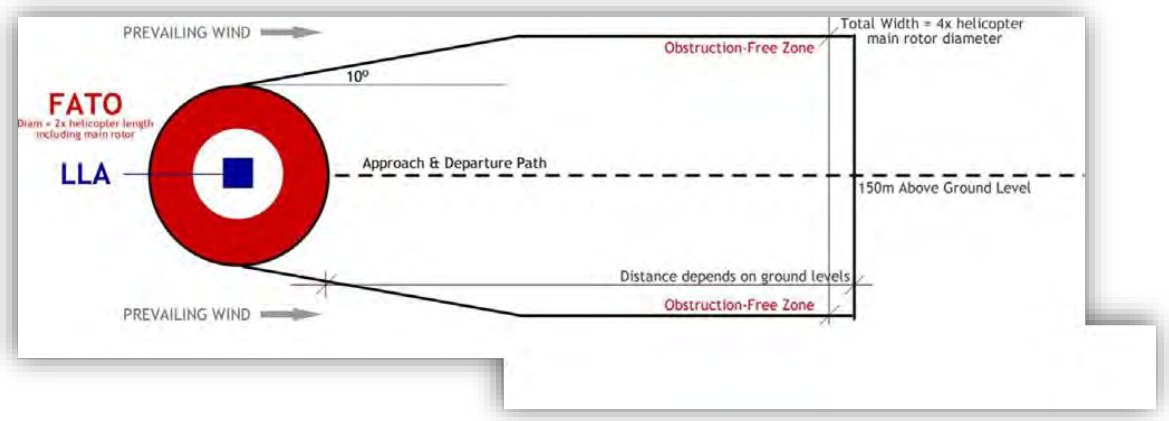
- Always approach helicopter from side and remain outside of rotor path.
- Before approaching aircraft extend right arm sideways with thumb extended upwards. When the pilot wants you to approach, he/she will in turn give the thumbs up signal.
- Do not approach helicopter from the front or rear
- Do not proceed past rear locker on fuselage.
- Remove hats and secure or remove loose clothing when approaching the helicopter and when indicating wind direction.
- Never approach helicopter through the danger zones indicated in the figure below:

Helicopter Safe Approach

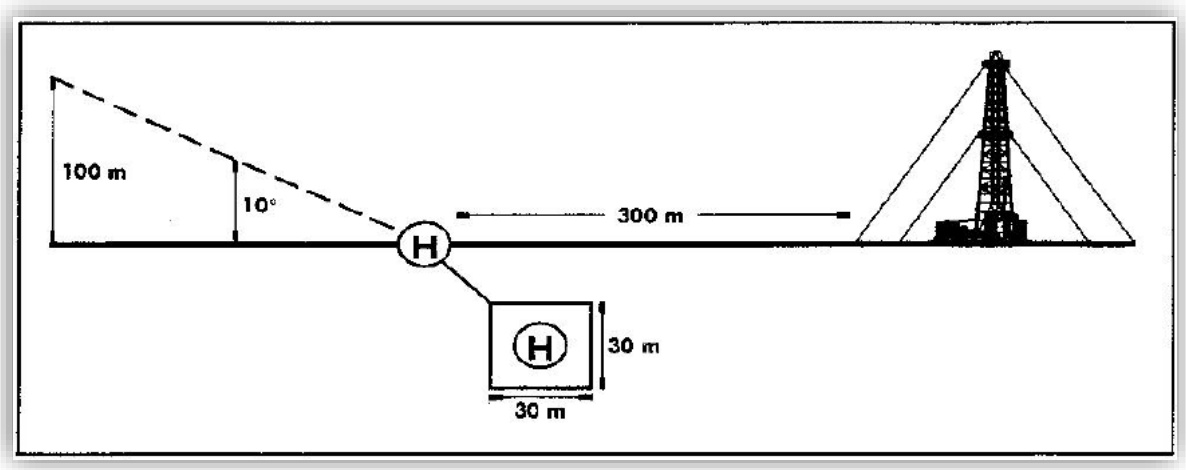
12.6.4 Preparing for Landing / Take-Off

- Have a Final Approach and Take Off (FATO) area large enough to accommodate the helicopter safely – a circular area of 30m diameter (or equal to twice the length of the helicopter, when the rotor(s) are turning); free of obstacles; no loose materials or any rubbish likely to interfere with the operation of the helicopter.
- When preparing landing strip ensure area is clear of moveable debris.
- Never site helipad in an area with more than a 7.5^0 degree slope (this is reasonably flat ground - 1:8 vertical to horizontal).
- If possible, water down the landing pad as this will reduce the dust problem.
- Never land a helicopter in an area where scrub is higher than 0.5 metre as the tail rotor could sustain damage.
- Ensure flight path for take-off and landing does not require helicopter to pass over power or phone lines, trees, buildings, or vehicles.
- If possible, do not use a road as a landing pad, particularly if the road has poor visibility, bends, or T-junctions.
- Ensure wind socks are in place, or flags flying to indicate wind direction. If no wind sock or flag on location, stand with back to wind and arms outstretched at ten to two positions. Situate other members of the party 5 metres behind you crouching, kneeling, or sitting.

NOTE - Helicopter rotor blades are very finely balanced and even a light object such as a plastic bag drawn up into the rotor disc can cause major damage. Additionally, loose objects may be drawn into the engine air intakes causing catastrophic engine damage.



Final approach and take off area for helicopter



Layout for Helipad

12.6.5 Response to an Emergency – Fixed Wing

12.6.5.1 Landing on an Existing Strip

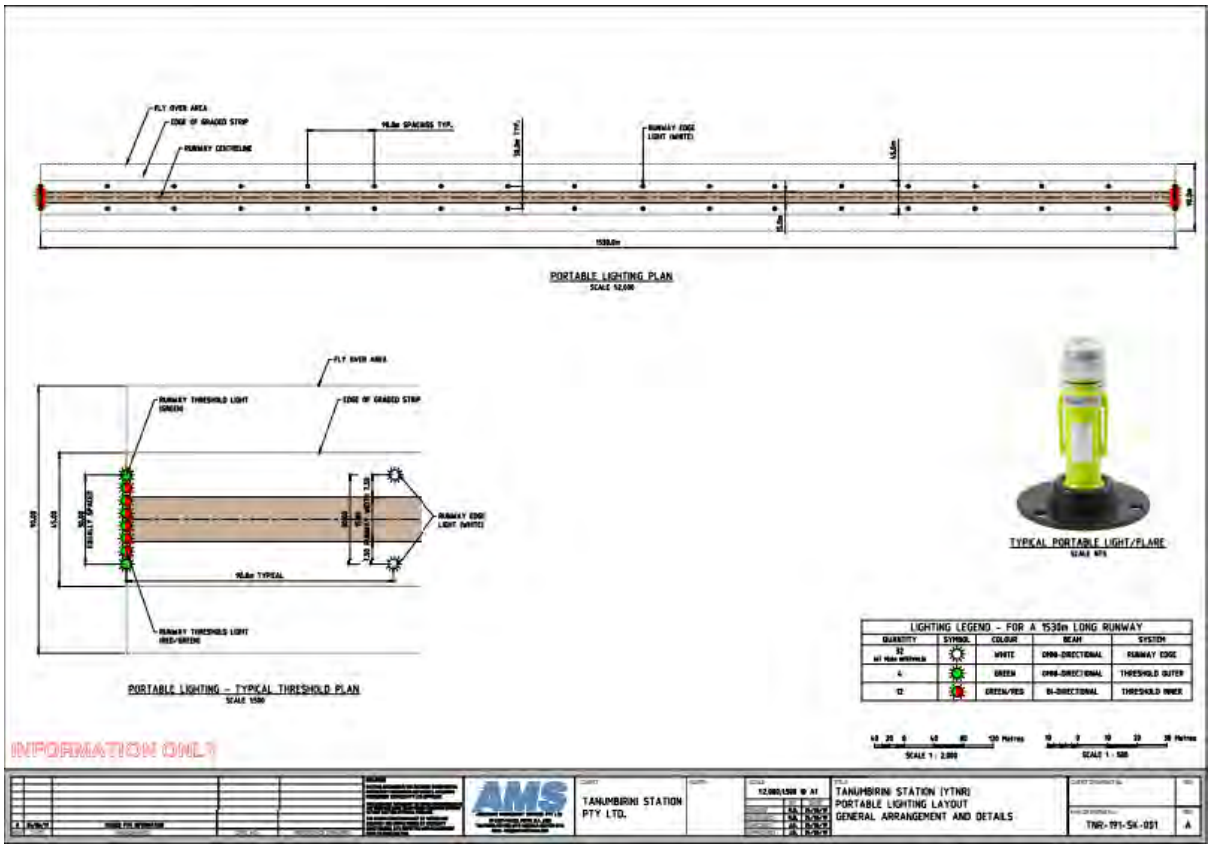
The runway will only require a condition inspection and check for wildlife prior to operations. This should be done BEFORE the aircraft departs to our location as the crew will need assurance on the strip condition. If runway is wet, then alternate must be used (Daly Waters)

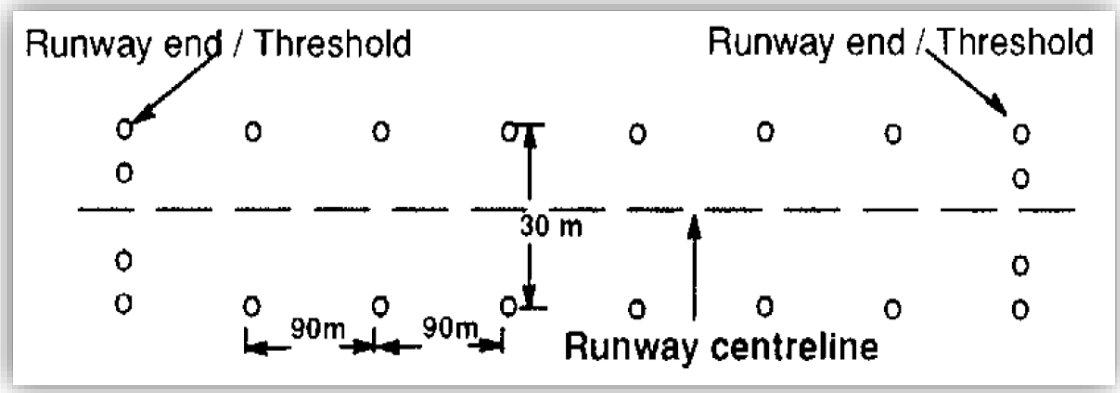
Where a fixed wing field landing is required (e.g. Aeromedical):

- Take radio and mobile phone to allow communication between the site and the aircraft to ensure airstrip is clear of all livestock and wild animals (etc.)
- Check condition of airstrip for potholes or large ruts. If unsure of hardness, drive 4WD vehicle through the middle of the runway and if wheels sink, advise the pilot to direct aircraft to alternative strip
- Where available set up 'White Runway Cones' to mark the perimeter of the runway
- When airstrip is clear and in good condition, advise pilot that the airstrip is ready to receive the aircraft
- Maintain watch to ensure the airstrip remains clear and be prepared to advise the aircraft of wind direction and condition of airstrip if requested.

12.6.5.2 Landing at Night

Runway lights to be placed as per diagram on site





Airstrip Landing Lights

12.6.5.3 Fixed Wing Aircraft Safety (e.g. CareFlight)

The following principles apply in relation to fixed wing aircraft safety.

- Do not approached an aircraft unless instructed by the crew.
- Don't approach an aircraft with the anti-Collison beacon (red) flashing.

- Beware of jet blast from moving aircraft as loose items may become missiles and injure or kill someone.
- Do not drive closer than 5 metres to any part of the aircraft and test vehicle brakes 2 twice once at 15 and again at 10 metres from aircraft.
- Approach the aircraft at walking speed if driving.
- Do not walk under ANY part of an aircraft.
- Hearing protection must be worn of immediately available.

- Maintain at least 15m distance when stationary unless advised by the crew or assisting medical staff in patient transfer

- Do not smoke near the aircraft or at the landing area

13 Training & Exercises

Personnel shall be trained to effectively fulfil their roles and responsibilities.

Training against this Plan may be in the form of classroom review, simulated emergencies, practical drills, desktop exercises, resources and equipment checks, or other exercises designed to systematically include personnel likely to be involved.

Emergency exercises shall be conducted to:

- verify that the emergency plans provide adequate coverage across the range of incident categories;
- test the effectiveness of this Plan;
- validate the competency and response times of key emergency response personnel, including knowledge of individual roles and responsibilities;
- assess the capability to respond to an emergency;
- reinforce prior training;
- identify opportunities for improvement to this Plan;
- provide confidence to participants around emergency decision-making, and
- verify adequacy of communication channels, both internally and externally.

This Plan will also be deemed to be exercised if an actual emergency occurs and components of the plan are activated.

Any non-conformance and improvements of the procedures outlined in the Plan shall be identified and action taken to remedy.

Emergency Response Drills/Exercises will be conducted in accordance with the requirements of Santos SMS-MS11-ST1 – Emergency and Crisis Management

In addition, exercises will be conducted in accordance with Contractor EHS System requirements, and further to that there will be an annual exercise that should incorporate as many aspects of this Plan as practicable.

Exercises may be internally or externally facilitated.

Records of exercises are kept in the Emergency Response module of Santos EHS Toolbox.

14 Appendices

14.1 Appendix A – Contact Numbers

Santos			
Name	**Number**	**Name**	**Number**
Steve Roberts NT Project Lead (Adelaide)	Wk. – (08) 8116 5249 M – 0400 282 805	**Travis Marriott / Justin Horan** NT **Project** Drilling Superintendents (B2B)	Wk. – (08) 8228 8228 Travis – 0407 744 441 Justin – 0478 653 632
Steve Mastin D&C Project Engineer (Brisbane)	Wk. – (07) 38383068 M – 0430 488 867	**Nearest Local Santos Base:** NT D&C 24hr. coverage (Steve Roberts)	0400 282 805
Onshore D&C Operations Risk **Satellite Phone in Blue**	Scott Atkins or Simon Parker - 08 8228 8223 0417 163 158	**NT Project D&C Materials Co-ordinator** Alternate 24hr Contact:	Gavin Poschkens or Con Asker - 08 8228 8225

Rig / Operations			
Santos OCR **Satellite Phone in Blue**	Office – 08 8228 8221 0417 184 539	**Aspen Medical Paramedic**	(07) 5306 1804
EWE 106 Rig Manager	–Office – (08) 6595 4841		
MS Contracting – Main Camp site	–Office – (07) 5306 1801 Kitchen - (07) 5806 1800		

Northern Territory Government			
Dept. Primary Industry & Resources (Petroleum)	**General** (08) 8999 7348	**Emergency** (08) 8999 6350 **AH** 1300 935 250	

OTHER		
Hospitals & Medical Services		
Royal Darwin Hospital 105 Rocklands Drive, Tiwi NT 0810	(08) 8922 8888	**Major Hospital** - is the largest teaching hospital in the Northern Territory & is also recognised as Australia's National Critical Care & Trauma Response Centre.
Katherine Hospital –Lot 1939 Gorge Rd, Katherine NT 0850	(08) 8973 9211	**District Hospital** - an accredited 60-bed non-specialist medical, diagnostic & treatment facility, catering for the needs of the population of Katherine and District.
St Johns Katherine Ambulance – Lot 3159 Chardon St, Katherine South NT 0850	(08) 8972 8500	
St Johns Alice Springs Ambulance – Telegraph Tce., Alice Springs	(08) 8959 6600	
Aeromedical Services		
Care Flight	(08) 8928 9777 **24hr Emergency** 1300 655 855	CareFlight has Agusta AW 139 & Kawasaki BK117-B2 helicopters, Beechjet 400 & B200 King Air aircraft based in the NT, available 24 hours a day.
RFDS	**24hr Emergency** NT – 1800 167 222 SA – 1800 733 772 **HF Radio** – 4010kHz, 6890Hz or 8165kHz	The RFDS has 4 different planes that are used for operations. WA & NT - Hawker 800XP WA, SA & NT - Pilatus PC-12

	Satellite – (08) 8648 9555		
Police			
Emergency 000 24hr Assistance 131 444			
Alice Springs Police	(08) 8951 8823 (NT Police general #, when prompted, press '1' for local station or '000' for emergency)	**Katherine Police (0830hrs – 1600hrs Mon-Fri only)**. Address: Stuart Hwy, Katherine East NT 0850	(08) 8951 8823 (NT Police general #, when prompted, press '1' for local station or '000' for emergency)
Fire Services			
NT Fire & Rescue AH – 000			
Alice Springs Fire Station	000 or (08) 8951 6688	**Katherine Fire Station**	000 or (08) 8973 8014
General			
BP Service Station Katherine 6 Katherine Tce, Katherine NT 0850	(08) 8971 9924 (08) 8971 9925	**Erldunda Roadhouse** Stuart Hwy & Lasseter Hwy, Erldunda NT 0872	(08) 8956 0984
BP Service Station Adelaide River - NT 106 Stuart Hwy, Adelaide River NT 0846	(08) 8976 7046	**Hi-way Inn Daly Waters Petrol Station** Cnr Stuart & Carpentaria Hwys Daly Waters NT 0852	(08) 8975 9925
United Petroleum Service Station 44 Moule St, Pine Creek NT 0847	(08) 8976 1217	**United Petrol Station** 13 Roper Tce, Mataranka NT 0852	(08) 8975 4761
United Service Station 68 Palm Circuit, Ross (Alice Springs) NT 0873	(08) 8952 1638	**Coles Express Service Station** Lilbili St & Dalgety Road, Alice Springs NT 0870	(08) 8968 5538

14.2 Appendix B – Emergency Situation Checklists

Checklists have been developed to assist with responding to a variety of emergency situations. The checklists are detailed in the following pages and can be found on the Cooper D&C SharePoint site at:

http://teams.santos.com/sites/DC/EADC/DCEHS/Emergency_Response/Forms/Public_View.aspx?InitialTabId=Ribbon%2EDocument&VisibilityContext=WSSTabPersistence

14.2.1 Bushfire Procedure Activity Checklist

Initial site activity by all personnel

• If you start a fire and can put it out with a beater or fire extinguisher do so. If the fire is larger than a few square metres, flame height greater than 0.3m, or the fire is gaining on your attempt to extinguish it, stop and ensure the fire is immediately reported.	
• If you observe a fire or smoke, notify the local Fire & Rescue Service immediately via 000 or phone number contained in the contact numbers listed in this plan, providing as much information on the fire as possible: - time of reporting the fire - location of the fire and any distinguishing landmarks - approximate size of the fire and/or height of the flames - the speed that it is moving and in what direction - whether it is contained or likely to spread - the approximate wind speed and direction - the nature of the vegetation and terrain the fire is in - the nature of the vegetation and terrain where it might spread to - any sites close to the fire	
• If unsafe to remain in your location due to fire heading your way, go to the nearest camp, town or large cleared area.	
• If you are unable to get to any of the above, take actions to prepare your vehicle for a potential burn-over.	

On Scene Commander

• Ensure the following pertinent information is obtained from the scene and forwarded to the IOC - Potential human threat, any injuries and/or fatalities. - Local weather conditions, wind direction and speed - Equipment, infrastructure threat and damage - Ownership of land, equipment, infrastructure at threat - Environmental threat and damage. - Available resources - What caused the fire - Whose responsibility is the fire - What actions are currently being undertaken at the scene	
• Ensure the safety of all operators.	
• Provide assistance with plotting of the fire from the ground if requested.	
• Assist with identification of key facilities in the predicted fire path. Consider associated dynamic risks i.e. gas venting and include in strategy development.	
• Stop unauthorised entry into the area.	
• Supply appropriate and timely situation reports to Emergency Response Coordinator.	
• Consider requirement for any isolations and task resources to carry out same if deemed necessary.	

IMT Operations Officer

• Confirm that Emergency Services have been notified of event.	
• Obtain pertinent information from the scene - Potential human threat, injuries and/or fatalities. - Local weather conditions, wind direction and speed - Equipment, infrastructure threat and damage - Ownership of land, equipment, infrastructure at threat - Environmental threat and damage. - Available resources - What caused the fire - Whose responsibility is the fire - What actions are currently being undertaken at the scene	
• Assist with formulation of a management plan to deal with the emergency and deploy resources as necessary	
• Arrange for fire area to be plotted and mapped to aid management and reporting requirements	
• Maintain an operations log of initial planning discussions and activities	
• Assist with formulation of emergency management plan with assembled IMT.	
• Ensure fire plot is correctly overlaid on to Santos GIS mapping and disseminate as required.	
• Deploy other field services resources as necessary	

IMT Leader

• Obtain pertinent information from the scene - Potential human threat, injuries and/or fatalities. - Weather report/forecast wind direction and speed - Equipment, infrastructure threat and damage - Ownership of Land, Equipment, infrastructure at threat - Environmental threat and damage. - Available resources - What caused the fire - Whose responsibility is the fire	
• What actions are currently being undertaken at the scene	
• Ensure medical care is available for any injured persons	
• Ensure the necessary notifications are carried out • Santos management as per normal IMTL responsibilities • Northern Territory Government Departments Primary Industries & Resources (DPIR) • Northern Territory Fire & Rescue Authority • Land owner	
• Develop and implement overall action plan in consultation with IMT	
• Provide resources to On-Scene Commander / Operations Officer as required	
• Supply appropriate and timely situation reports to management	
• Manage and maintain costs of emergency	

14.2.2 Evacuation Procedure Activity Checklist

All Personnel

• On hearing an alarm or receiving verbal instruction, evacuate area on foot	
• Go to Muster Point, stay until directed by On-Scene Commander/Muster Warden	
• If the Primary Muster Point is unsuitable (e.g. due to smoke/wind direction etc.) relocate to Secondary Muster Point as nominated by the On-Scene Commander/Muster Warden	
• If located in a remote area (that is not affected by emergency), contact your Supervisor by radio/phone, notify them of your location and stay there	
• Personnel unfamiliar with site when an evacuation is triggered, must follow the Muster Warden's directions to the Muster Point.	
• Take all escorted visitors to Muster Point	
• Provide First Aid to any injured persons if qualified to do so	
• Remain at Muster Point until instructed further by the Muster Warden or On-Scene Commander.	

On Scene Commander

• Determine level of evacuation necessary in response to the emergency (and initiate alarms as appropriate)
  ◦ Confer with D&C Superintendent (IMT Operations Officer)
  ◦ Audible alarms, broadcast on radio, word of mouth	

• Arrange for the safe shutdown of equipment / plant in the affected area (if possible) as long as personnel are not endangered in the process	
• Advise the IMT Operations Officer of emergency situation and request support if required	
• Review suitability of the primary Muster Point. Determine an alternate location if necessary	
• Confirm unaccounted personnel with Muster Point Warden	
• Request the IMC to assist with resources for rescue or evacuation as necessary	
• Arrange searches for any personnel reported missing (coordinate with IMC and/or Muster Warden)	
• Instruct the Muster Warden in consultation with the IMT Operations Officer regarding further proceedings (i.e. whether personnel should leave the site and where personnel should be relocated)	
• Stay in communication with all Muster Points and keep the IMT Operations Officer up to date with emergency developments (for communication to evacuees)	
• Following conclusion of the emergency, give the Muster Warden the "All Clear" for evacuees to leave the Muster Point and advise them of any restrictions on their movements (e.g. restricted areas for site personnel).	

Muster Warden

• Ensure that the affected site is clear (that all personnel have evacuated)	
• Check muster board for tags and conduct head count	
• Pass on emergency status/developments to the evacuees	
• Do not allow personnel to leave Muster Point without permission from the On-Scene Commander	
• Maintain log of events including movements in and out of the Muster Point	
• Assist with further evacuation of personnel/relocation of evacuees as required.	

14.2.3 Injury / Fatality Procedure Activity Checklist

Person at the Emergency Scene

• Raise the alarm and notify On Scene Commander, report the nature, location and extent of emergency.	
• Evaluate the emergency area and take actions to make it safe (do not take unnecessary risks)	
• Provide first aid to injured persons (if qualified to do so) – only move patient if their injuries are minor or they are in IMMEDIATE danger	
• Cordon off the area involved to preserve the scene and the integrity of any subsequent investigation	
• Stay at emergency scene with injured person until help arrives (if safe to do so).	

On Scene Commander

• Proceed to emergency scene and assess the situation (hazard assessment/response options)	
• Ensure D&C Superintendent (IMT Operations Officer) has been notified of the emergency	
• Cordon off scene and exclude all non-essential personnel from area	
• If injury is minor and patient can be moved, transfer patient to first aid station/medical centre	
• Arrange for the safe shutdown of equipment/plant in the affected area if it is presenting a hazard to the injured personnel/their rescuers	
• Notify IMT Operations Officer of required rescue/transport/on scene medical assistance and provide a SITREP (details/location/conditions)	
• Take actions as appropriate to make the incident scene safe	
• Develop ongoing response strategy in consultation with IMC	
• If IMC is activated, provide regular updates/briefings to allow appropriate responses to emergency developments	
• Request assistance from IMC for treatment/evacuation of injured personnel (e.g. to medical centre) and that the destination facility is capable of treating injuries (e.g. has appropriately skilled doctors/access to machines/drugs/antidotes)	
• Do not move fatalities without Police approval	
• In the event of a serious injury/fatality, refer all notification requirements to the IOC (DO NOT undertake notification of next of kin, other site employees, regulators media, general public, external parties etc.)	
• Secure the scene.	
• Assist with investigation and review of the procedures/actions taken.	

14.2.4 Fire / Explosion Procedure Activity Checklist

Person at the Emergency Scene

• Remove yourself and others from danger (DO NOT place yourself in unnecessary danger). Stop all work, extinguish any possible ignition sources and evacuate the area on foot.	
• Activate the Emergency Shutdown if applicable	
• Raise the alarm and report the nature, location, extent of emergency, wind direction and product if known – (Raise the alarm and notify On Scene Commander, report the nature, location and extent of emergency)	
• Contain the fire with correct extinguisher if trained and it is safe to do so	
• For a vehicle fire; stop the vehicle and if possible, use a hand-held dry powder extinguisher to extinguish fire (red with white band)	
• Evacuate the area if fire spreads/escalates beyond control (remember your safety is paramount). Shut down equipment/plant if safe to do so	
• Go to Muster Point and stay until directed by Muster Warden or On-Scene Commander	
• When evacuating from a fire, DO NOT GO DOWNWIND OF THE SOURCE, AS EXPOSURE TO THE SMOKE/FUMES MAY BE LIFE THREATENING	
• Do not enter smoke filled buildings and avoid passing through smoke plumes en route to Muster Point	
• Close doors/windows etc. as you evacuate buildings to help contain the fire	
• Provide First Aid to any injured persons if qualified and safe to do so.	

On Scene Commander

• Initiate alarms to warn site personnel – audible alarms, broadcast on radio, word of mouth	
• Mobilise appropriate firefighting resources if safe to do so	
• Proceed to scene and assess the situation (hazard assessment/response options). Consider the following:	
• Combustible materials (flammable stores, toxic fumes/gas, vehicles, buildings etc.)	
• Structures affected by the fire (heat damage to buildings/steelwork)	
• Arrange for the safe shutdown of equipment/plant in the affected area	
• Ensure medical aid is provided to injured personnel	
• Notify the IMT Operations Officer and provide a SITREP (emergency details/location/conditions)	
• If primary Emergency Muster Point is downwind of fire/affected by products of combustion from fire, determine an acceptable alternate Muster Point (in consultation with the Muster Warden)	
• Identify any chemicals that may be involved in the fire and the risks associated with them (e.g. toxic products of combustion, handling/exposure) – communicate to IMT Operations Officer and attending Emergency Services. Obtain the relevant Chemical Manifests and/or SDSs as required	
• Initiate alarms to warn site personnel – audible alarms, broadcast on radio, word of mouth	
• Identify possible escalation targets for fire (nearby storage areas, vehicles) and arrange for mitigation actions to protect them in consultation with the Rig Manager (Field Response Team Leader (FRTL))	
• Provide regular SITREPS to the IMT Operations Officer and develop ongoing response strategy in consultation.	
• If fire/explosion escalates or creates secondary hazards to personnel, consider further/more extensive evacuations (or relocation of evacuated personnel)	

• For bushfire – consider safety of site and possibility of smoke affecting other services/properties/personnel	
• For a significant bushfire consult with the IMT Operations Officer /FRT regarding the use of fire breaks at site	
• Assist with/request further evacuation of personnel as required	
• Assist in investigating the emergency and reviewing the procedures/actions taken.	

14.2.5 Chemical Spill / Gas Release Procedure Activity Checklist

Person at the Emergency Scene

• Remove yourself and others from danger (DO NOT place yourself in unnecessary danger)	
• Raise the alarm and notify On Scene Commander, report the nature, location and extent of emergency	
• Evacuate areas that may be affected by the spill either directly or through exposure to fumes (remember your safety is paramount)	
• Immediately try to locate the source of the spill, remaining up wind	
• When evacuating a chemical spill/gas release, DO NOT GO DOWNHILL/DOWNWIND OF THE SOURCE, AS EXPOSURE TO THE FUMES MAY BE LIFE THREATENING	
• If release is from a storage facility, isolate/contain the release (if it is safe to do so) by closing valves, switching off pumps, blocking drains, establishing temporary bunds, use of spill kits, contacting control room etc.	
• Disperse escaping flammable gas vapours at the source using water spray if safe to do so	
• Identify and isolate any potential sources of ignition	
• Go to Muster Point, stay until directed by the Muster Warden or On-Scene Commander	
• Provide First Aid to any injured persons if qualified to do so	
• Ensure that any contaminated personnel utilise emergency showers and eye washes	
• Safely dispose of any contaminated clothing.	

On Scene Commander

• Initiate alarms to warn site personnel – audible alarms, broadcast on radio, word of mouth	

• Ensure site of emergency is evacuated to a safe distance; evacuate all areas that:
  • Are directly affected by the release (impinged / engulfed)
  • May be indirectly affected (e.g. exposure to toxic fumes / vapour cloud, access restrictions	

• Arrange for the safe shutdown of equipment/plant in the affected area	
• Ensure that emergency services have been contacted	
• Notify the IMT Operations Officer and provide a detailed SITREP of the situation (details, site location/conditions)	
• Identify released materials and source appropriate chemical manifests and/or SDSs; make these available for response personnel as necessary	
• In consultation with the Muster Warden, determine the suitability of the Primary Muster Point (is it affected by/downwind of release); determine alternate Muster Point as required	
• For an offsite spill/release, ensure that the IMT Operations Officer has all information required to carry out appropriate notification of government departments, Police etc.	
• Relay all environmental information to the IMT Operations Officer and ensure that appropriate environmental/governmental agencies are notified	
• Determine containment/decontamination requirements (in consultation with FRT or specialists – onsite or offsite) and source equipment from offsite as required – confer with IMT.	
• Continue to provide SITREPS to the IMT Operations Officer and FRT - develop ongoing response strategy in consultation with them	

• When developing response strategies, consider:
  • Physical response constraints (weather, wind direction/strength, release location)
  • Review available chemical manifests and/or SDSs	

• PPE/response equipment availability • Exposures of site personnel (injuries/trapped personnel)	
• Ensure that appropriate toxic/chemical exposure monitoring is conducted during response to limit responders' exposure to within acceptable levels (refer to relevant chemical manifests and/or SDSs)	
• If spill/release escalates or creates secondary hazards to personnel (e.g. escalation, exposure to spill/release), consider further/more extensive evacuations (or relocation of evacuated personnel)	
• Arrange for barricading of affected area until remediation is complete/atmosphere is clear	
• When considering the impacts of the release, take into the account any potential for contamination of site water supplies – provide alternate drinking water supply if required	
• Try to minimise the impact of the spill by implementing the three C's rule: • CEASE flow of release into the surrounding area • CONTAIN the spillage • CLEAN-UP spill	
• Review the need for any offsite expertise or equipment to control/contain the spill/release and communicate requirements to the IMT Operations Officer	
• Assist with investigation and review of the procedures/actions taken.	

14.2.6 Electric Shock Procedure Activity Checklist

Person at the Emergency Scene

• Remove yourself and others from danger (DO NOT place yourself in unnecessary danger)	
• Raise the alarm and notify On Scene Commander, report the nature, location and extent of emergency	

• Evaluate the situation and take actions to make it safe (do not take unnecessary risks) such as;
  • Isolate the source of the electricity
  • If source cannot be isolated, use a non-conductive lever to move the casualty from the source	

• DO NOT TOUCH any injured persons until area has been made safe	
• Provide first aid to any injured persons (if qualified to do so) – only move them if the injuries are minor or they are in IMMEDIATE danger	
• Stay at scene with injured person until help arrive (if safe to do so)	

On Scene Commander

• Ensure that Emergency Services have been notified	
• Cordon off scene and exclude all non-essential personnel from area	
• Confirm that electricity to the scene has been isolated/controlled prior to commencing response	
• Arrange for the safe shutdown of equipment/plant in the affected area if it is presenting a hazard to the injured personnel/their rescuers	
• Ensure that any injured personnel are provided with appropriate first aid and are monitored until help arrives	
• Notify the IMT Operations Officer and provide a detailed SITREP of the situation (details, site location/conditions)	
• Consult with a qualified electrician (either onsite or via the IMC) for advice on response related electrical matters	

• When conducting electrical isolation of a process/area, consider the potential for;
  • Detrimental effects on safety systems i.e. will the isolation disable a critical control of personnel safety?
  • Loss of positive control of equipment
  • Loss of amenities (e.g. lighting, mains power supply)	

• Continue to provide SITREPS to the IMT Operations Officer- develop ongoing response strategy in consultation with them	
• Request support from the IMC for treatment/evacuation of injured/deceased personnel (e.g. to medical centre)	
• In the event of a serious injury/fatality, refer all notification requirements to the IMT Operations Officer (DO NOT undertake notification of next of kin, other site employees, regulators, media, general public, external parties etc.)	
• Assist with investigation and review of the procedures/actions taken.	

14.2.7 Confined Space Procedure Activity Checklist

Person at the Emergency Scene

• Remove yourself and others from danger (DO NOT place yourself in unnecessary danger)	
• Raise the alarm and notify On Scene Commander, report the nature, location and extent of emergency	
• Refer to the CSE Emergency Plan developed from the CSE Risk Assessment	
• DO NOT ENTER (and prevent others from entering) confined space until the atmosphere has been tested and declared safe	
• ONLY when atmosphere is declared safe (LELs O2) - Provide first aid to injured persons (if qualified to do so) – only move patient if their injuries are minor or they are in IMMEDIATE danger	
• Stay at scene with injured person until help arrives (if safe to do so).	

On Scene Commander

• Determine details of confined space activity and any related hazards (e.g. contaminated/flammable atmosphere, electrical, gravity) – refer to Confined Space Entry Permits	

• Proceed to scene and assess the situation (hazard assessment/response options), consider:
  • Type of activity being conducted in confined space (e.g. hot work, atmospheric testing)
  • The need to forcibly ventilate the confined space (or use BA gear to work in it)
  • The need for continual monitoring of the atmosphere (for breathability, flammability)	

• Determine the need for external assistance	
• Cordon off scene and exclude all non-essential personnel from area	
• Ensure that the confined space has been tested/made safe prior to commencing response	
• Notify the IMT Operations Officer and provide a detailed SITREP of the situation (details, site location/conditions)	
• Ensure that any injured personnel are provided with appropriate first aid and are monitored until help arrives	
• Continue to provide SITREPS to the IMT Operations Officer	
• Request support from the IMC for treatment/evacuation of injured personnel (e.g. to medical centre)	
• Assist with investigation and review of the procedures/actions taken.	

14.2.8 Vehicle Incident Procedure Activity Checklist

Person at the Emergency Scene

• Remove yourself and others from danger (DO NOT place yourself in unnecessary danger).	

• Raise the alarm and notify On Scene Commander &/or Emergency Services (phone '000'), report the nature, location and extent of emergency, exact location of incident and distance/direction from nearest major site or landmark. Provide GPS co-ordinates if possible (confirm co-ordinate format)
  • Number of vehicles involved
  • Number of persons injured
  • Nature of injuries
  • Number of persons possibly trapped in vehicle
  • Any hazardous materials or dangerous goods involved
  • Any signs of smoke or fire	

• Position other vehicles in a fend-off position with hazard lights activated to protect scene from oncoming traffic. NOTE: If vehicle is in contact with power lines stay clear and tell occupants to stay in vehicle	
• Provide First Aid to any injured persons if qualified to do so	
• Do not try to remove casualties from vehicle unless other dangers are present which may endanger life it they were not removed	

• Make vehicle safe, including;
  • Lower hydraulic equipment (e.g. raised buckets/lifting platforms etc.)
  • Switch off vehicle ignition, isolate power
  • Cover any split petrol/diesel with sand	

On Scene Commander

• Proceed to scene, assess the situation and render assistance to vehicle occupants (hazard assessment/response options), including consideration of:
  • Danger from oncoming traffic
  • Ensure that vehicle is stable
  • Dangerous goods carried by the vehicle (e.g. fuel, explosives)
  • Location hazards (e.g. presence of electricity, potential for escalation)
  • Damage to buildings/equipment from incident (e.g. structural damage	

• If safe to do so, extinguish any fires - mitigate against any fires beginning	
• Control any Chemical hazards (refer Chemical Spill/Gas release procedure)	
• Arrange for the safe shutdown of equipment/plant in the affected area if it is presenting a hazard to the injured personnel/their rescuers	
• Ensure the trapped / injured are provided with appropriate first aid treatment and monitored until help arrives	
• Notify the IMT Operations Officer; provide a detailed SITREP of the situation (details, site location / conditions)	
• Determine the need for any other external assistance and advise IMC	
• Continue to provide SITREPS to the IMT Operations Officer – develop ongoing response strategy in consultation with them	
• Cordon off scene and exclude all non-essential personnel from area NOTE: Consider requirement for establishment of a landing zone for rotary wing aircraft that may be used for medical evacuation of injured parties (refer Helicopter Support section)	
• Assist with investigation and review of the procedures/actions taken	

14.2.9 Aircraft Incident Procedure Activity Checklist

Person at the Emergency Scene

• Remove yourself and others from danger (DO NOT place yourself in unnecessary danger) consider high risk associated with spinning rotors, propellers and/or turbines	

• Raise the alarm and notify On Scene Commander &/or Emergency Services (phone '000'), report the nature, location and extent of emergency, exact location of incident and distance/direction from nearest major site or landmark. Provide GPS co-ordinates if possible (confirm co-ordinate format) and provide the following information:
  • Exact location of accident and distance/direction from nearest major site or landmark. Provide GPS co-ordinates if possible (confirm co-ordinate format)
  • Number of persons injured
  • Nature of injuries
  • Number of persons possibly trapped in vehicle
  • Any hazardous materials or dangerous goods involved
  • Any signs of smoke or fire	

• Provide First Aid to any injured persons if qualified to do so	
• Cover any spilt aviation fuel with sand or firefighting foam if available	
• Do not try to remove casualties from aircraft unless other dangers are present which may endanger life it they were not removed.	

On Scene Commander

• Proceed to scene, assess the situation and render assistance to aircraft occupants (hazard assessment/response options), including consideration of;
  • Dangerous goods carried by the aircraft (e.g. fuel, explosives)
  • Location hazards (e.g. presence of electricity, potential for escalation)
  • Damage to buildings/equipment from accident (e.g. structural damage)	

• Ensure Moomba Communications have been notified and have all relevant information	
• Assist with the extrication of trapped personnel from aircraft, if safe to do so – injuries permitting	
• Ensure the trapped/injured are provided with appropriate first aid treatment and monitored until help arrives	
• If safe to do so, extinguish any fires, take necessary steps to prevent any new ignition	
• Confirm number of personnel/visitors on board	
• Notify the IMT Operations Officer and provide a detailed SITREP of the situation (details, site location/conditions)	
• Continue to provide SITREPS to the IMC to develop ongoing response strategy (e.g. further resource requirements/CASA/Air Services Australia)	
• Request support from the IMC for treatment / evacuation of injured personnel (e.g. to medical centre/temporary Casualty Clearing Area	
• Cordon off scene and exclude all non-essential personnel from the area	
• Assist with investigation and review of the procedures/actions taken	

14.3.1 Missing Person / Vehicle Procedure Activity Checklist

Identification

Emergency response may be initiated by Journey Manager; 30 minutes after person fails to make contact or comply to normal schedule routines

Uncertainty Phase: - 30 minutes after person fails to make contact or comply to normal schedule/routine

On Scene Commander

• Attempt to contact the missing person via phone/radio or by calling their destination to ascertain if there was anything that prevented the person from meeting their schedule	
• Refer to Journey Management details; confirm departure time, number of personnel on board, intended route, destination ETA, vehicle details and last communication received	
• Initiate continuous attempts to contact vehicle using sat phone, local phones or VHF radio – maintain efforts	
• Ensure dedicated personnel monitor radio and phone continuously but specifically every hour/half hour for any distress call	
• Contact any local route checkpoints for last known contact, maintain liaison.	
• Contact the driver's supervisor / team leader to establish if the driver / persons are unaccounted for	
• Check Rig muster board	
• Check missing person(s) room at camp, office, lunch room and ablutions area	
• Ensure all other relevant site personnel are informed	
• Confirm "last seen" details with any witness(s)	
• Notify the IMT Operations Officer and provide a detailed SITREP of the situation (details, site / location / conditions)	

IMT Leader

• Active the IMC – allocate tasks to record Search & Rescue (SAR) actions taken / contacts made	
• Calculate theoretical fuel range of missing vehicle, use range as search radius from point of last known contact; dissect radius into search grids for controlled SAR activity	
• Specialist access information may be required if vehicle was being used for off-road scouting or inspections	
• Utilise large scale maps for monitoring/organising of search areas/parties (plot missing persons last known activities/locations)	
• Make reproductions of area map for use by search teams	
• Dispatch search vehicle, helicopter etc. (GPS equipped if possible) from closest location to initiate preliminary search along last known route of missing person/vehicle	
• Ensure that only experienced personnel are mobilised and that at least 2 people are present in the vehicle (search vehicle journey management procedures must be in place)	
• Consider the suspension of current work program pending SAR activities	
• Alert any other facilities/operations/vehicles in the area	
• Determine further SAR resources and place on short notice standby.	

Distress Phase: - 1.5 hours after initiation of 'Uncertainty Phase'

Incident Management Centre

• Maintain liaison with Journey Management, update them regularly of any developments	
• Dispatch further search vehicle(s) (GPS equipped if possible) to cover specific search grids as determined by preliminary search	
• Instruct search personnel to look for signals on the hr. / ½ hr. (e.g. smoke, heliograph, flare)	
• Maintain communication with SAR vehicle(s) (VHF, sat phone, local phones etc.)	
• IMTL to alert authorities (e.g. Police) and request participation in SAR as appropriate	
• IMTL to mobilise other external SAR resources (e.g. aircraft/Police) as required to carry out effective SAR	
• Consider calling off search at night or if conditions become hazardous to searchers	
• Consider escalation of SAR operations the longer the vehicle is missing	
• IMTL to handover SAR control to Police/other authorities) if Initial search by Santos resources fails to locate missing persons / vehicle	

• When planning the SAR, ensure that the following points are addressed:
  • SAR is led by a suitably trained/experienced person
  • Suitable vehicles and equipment (rescue/recovery gear, first aid kit, survival gear) are used in SAR
  • Adequate clothing, water and food is provided for both the searchers and the survivors
  • Clear communications rules/procedures are developed, and reliable communications equipment used
  • Suitable maps and locating equipment (e.g. GPS) are supplied to all searchers	

Incident Management Teal Leader

• Notify IMT and provide updates on SAR progress at regular intervals	
• Oversee and maintain communications with SAR teams	
• Ensure ongoing support is maintained for the provision of fuel, meals, supplies and relief of SAR team members as required	
• Ensure that Emergency Services have been notified and are on alert (for prompt response following discovery of missing person/people)	
• Following location of the missing vehicle, ensure the provision of first aid or medical treatment to the occupants and/or transport to hospital	
• Inform the IMT & SAR team members when the emergency is over	
• Conduct a debrief with all involved personnel following SAR conclusion	
• Assist in the investigation and review of the procedures/actions taken.	

14.3.2 Helicopter SAR Procedure Activity Checklist

Identification

Emergency Response may be initiated by Journey Manager; 20 minutes after person fails to make contact scheduled arrival

Uncertainty Phase: - 15 minutes after person fails to make scheduled report or arrival

Journey Manager

• Notify On-Scene Commander	
• Continue attempts to establish communications with the aircraft	
• Check scheduled destination contact for any available information	
• If no contact is made with aircraft after 20 minutes after failure to make a scheduled report or arrival, declare Alert / Distress Phase	
• Notify IMTL and provide a detailed SITREP (details, site location / conditions)	

Alert / Distress Phase: - 20 minutes after failure to make a scheduled report or arrival

Incident Management Team Leader

• Activate the IMC – allocate tasks to record Search & Rescue (SAR) actions taken / contacts made	
• Contact AusSAR (1800 815 257) and advise of missing aircraft and actions being taken	
• Notify CMT DM and provide regular ongoing updates	

Incident Management Centre

• Prepare for commencing further SAR activities in consultation with IMTL	
• All other available aircraft to assist with search from point of last known contact;	
• Realistic search area to be defined by rotary wing contract company operations officer and dissected into search grids for controlled SAR activity	
• Utilise large scale maps for monitoring/organising of search areas/parties (plot missing aircraft' last known activities/locations)	
• Make reproductions of area map for use by search teams	
• Dispatch search vehicle, helicopter etc. (GPS equipped if possible) from closest location to initiate preliminary search in the vicinity of last known location of missing aircraft	
• Ensure that only experienced personnel are mobilised and that at least 2 people are present in the vehicle (ensure search vehicle journey management procedures are in place)	
• Consider the suspension of current work program pending SAR activities	
• Consider utilising landowner assistance with searches in their relative areas	
• Alert any other facilities/operations/vehicles in the area	
• Determine further SAR resources and place on short notice standby	
• Dispatch further search vehicle(s) (GPS equipped if possible) to cover specific search grids as determined by preliminary search	
• Instruct search personnel to look for signals on the hr. / ½ hr. (e.g. smoke, heliograph, flare)	
• Maintain communication with SAR vehicle(s) (VHF, sat phone, local phones etc.)	
• IMC to alert authorities (e.g. Police) and request participation in SAR as appropriate	
• IMC to mobilise other external SAR resources (e.g. aircraft/Police) as required to carry out effective SAR	
• Consider calling off search at night or if conditions become hazardous to searchers	
• Consider escalation of SAR operations the longer the vehicle is missing	

• IMC to handover SAR control to Police/other authorities) if Initial search by Santos resources fails to locate missing Aircraft	

• When planning the SAR, ensure that the following points are addressed:
  • SAR is led by a suitably trained/experienced person
  • Suitable vehicles and equipment (rescue/recovery gear, first aid kit, survival gear) are used in SAR
  • Adequate clothing, water and food is provided for both the searchers and the survivors
  • Clear communications rules/procedures are developed, and reliable communications equipment used
  • Suitable maps and locating equipment (e.g. GPS) are supplied to all searchers	

IMT Leader

• Notify CMT DM and provide updates on SAR progress at regular intervals	
• Oversee and maintain communications with SAR teams	
• Ensure ongoing support is maintained for the provision of fuel, meals, supplies and relief of SAR team members as required	
• Ensure that Emergency Services are on alert (for prompt response following discovery of missing person/people)	
• Following location of the missing aircraft, ensure the provision of first aid or medical treatment to the occupants and/or transport to hospital	
• Inform the IMT/SAR team members and Emergency Services when the emergency is over	
• Conduct a debrief with all involved personnel following SAR conclusion	
• Assist in the investigation and review of the procedures/actions taken.	

14.3.3 Bomb / Terrorist Threat Procedure Activity Checklist

The Police are responsible for evaluation of any bomb, terrorist or security threat. For bomb threats, avoid the use of mobile phones or two-way radios until Police declare the site safe

Person Receiving Threat

• Notify the On-Scene Commander/Team Leader or Manager IMMEDIATELY upon receiving a threat or a suspicious object/package	
For a written threat	
• Keep all paper, envelopes etc. to preserve evidence	
For an email threat	
• Keep a copy of the email and do not close down the PC	
For a telephone threat	
• Remain calm • Listen closely to what the caller says • Complete as much as possible of the Bomb / Threatening Call Record – appearing sympathetic and using a pleasant tone may extend the call • When the call hangs up - DO NOT HANG UP YOUR PHONE (it may be possible to trace the call) • Call for help as soon as possible USING ANOTHER PHONE or by attracting someone's attention visually	
For a suspect object / package	
• Do not touch the suspect object / package • Evacuate the immediate area • Notify the On-Scene Commander/Team Leader or Manager IMMEDIATELY	

On-Scene Commander

• Notify Police of the threat and actions taken by telephoning '000'.	
• Alert and coordinate with the Muster Warden a full site evacuation - initiate alarms to warn site personnel as appropriate	
• Notify all site personnel of the situation and brief them of the details	
• Establish Forward Command Post at least 300 meters from the scene	
• Arrange for the safe shutdown of equipment/plant in the affected area as appropriate	
• Notify the IMT Operations Officer	
• When threat nominates a detonation time, stop the search 30 minutes prior to that time. Do not resume search until 30 minutes after nominated detonation time	
• No radio transmissions should be made within 100 meters of the area	
• If a suspicious package is located, record description and exact location but do not allow anyone to touch the package/item	
• Evacuate all personnel to a safe distance	
• Pass on package/item details to IMC and await further instructions	
• Assist with investigation and review of the procedures/actions taken.	

IMT Leader

• Instigate the activation of the IMC and carry out an emergency briefing (details, site location/conditions)	
• Ensure all details have been passed on to OSC, relevant level 5 leader and/or contract company site leader	
• Notify CMT DM and provide ongoing updates	
• Call '000' – notify Police and brief them of the situation and any response actions underway	
• Ensure required site evacuations have been undertaken as appropriate	
• Implement Security Plan if deemed necessary	
• Assist Police as and when required/requested (develop response strategy in conjunction with Police)	
• Ensure all required resources are provided and maintained for FRT	
• Terminate the emergency under instructions from the Police ONLY	
• Ensure counselling is available to call receiver if required	
• Assist with investigation and review of the procedures/actions taken.	

14.3.4 Bomb / Terrorist Threat Record Form

IMPORTANT – DO NOT HANG UP THE PHONE / OBTAIN AS MUCH INFORMATION AS POSSIBLE TO ASSIST WITH IDENTIFYING THE NATURE, LOCATION AND LIKELY SUPPORT RESOURCES REQUIRED FOR THE EMERGENCY
EXACT WORDING OF THREAT (Use Note Paper as Required)

QUESTIONS TO ASK:
WHERE IS THE BOMB NOW?
WHEN WILL THE BOMB EXPLODE?
WHAT DOES THE BOMB LOOK LIKE?
WHAT KIND OF BOMB IS IT?
WHAT WILL SET THE BOMB OFF?
DID YOU PLACE THE BOMB?
WHY ARE YOU DOING THIS?
WHAT IS YOUR NAME?
WHAT IS YOUR ADDRESS?
WHERE ARE YOU NOW?
WHEN WILL YOU CALL AGAIN?
WHAT GROUP DO YOU REPRESENT?

COMMENTS (TICK AS REQUIRED)	**YES**	**NO**
IS THE VOICE FAMILIAR TO YOU?		
DID THE CALLER APPEAR TO BE FAMILIAR WITH YOUR QUESTIONS?		
IS THE CALLER GOING TO RING BACK WITH FURTHER INFORMATION OR DEMANDS?		
FINAL INFORMATION RELEASE TO (IDENTIFY WHAT INFORMATION WAS)		

DESCRIBE THE CALLER AS BEST YOU CAN (TICK AS REQUIRED)							
CALM		SLURRED		SOFT		DEEP BREATHING	
ANGRY		THROAT CLEARING		LOUD		CRACKING VOICE	
EXCITED		STUTTER		LAUGHTER		ACCENT	
SLOW		RAPID		CRYING		YELLING	
FAST		DISGUISED		NORMAL		THREATENING	

CALLER DESCRIPTION			**BACKGROUND SOUNDS**			
Male / Female	Age:	Race:	QUIET		MOTOR	
TELEPHONE (TICK)			VOICES		FACTORY	
Local	Long Distance	Sat Phone	STATIC		OFFICE	
Phone Box	Mobile		LOCAL		STREET NOISE	
OTHER DETAILS:			MUSIC		ANIMALS	
Time			CROCKERY		PA SYSTEM	
Duration (Min / Sec)			BOOTH		HOUSEHOLD	
Your Phone Number			AIRCRAFT		CHILDREN	
REMAIN CALM AND REPORT THE THREAT TO A SUPERIOR AND / OR THE AUTHORITIES IMMEDIATELY			**THREAT DELIVERY (TICK)**			
			FOUL		IRRATIONAL	
			TAPED		SCRIPTED	
			WELL SPOKEN		NERVOUS	

14.4 Appendix C – Site General Location

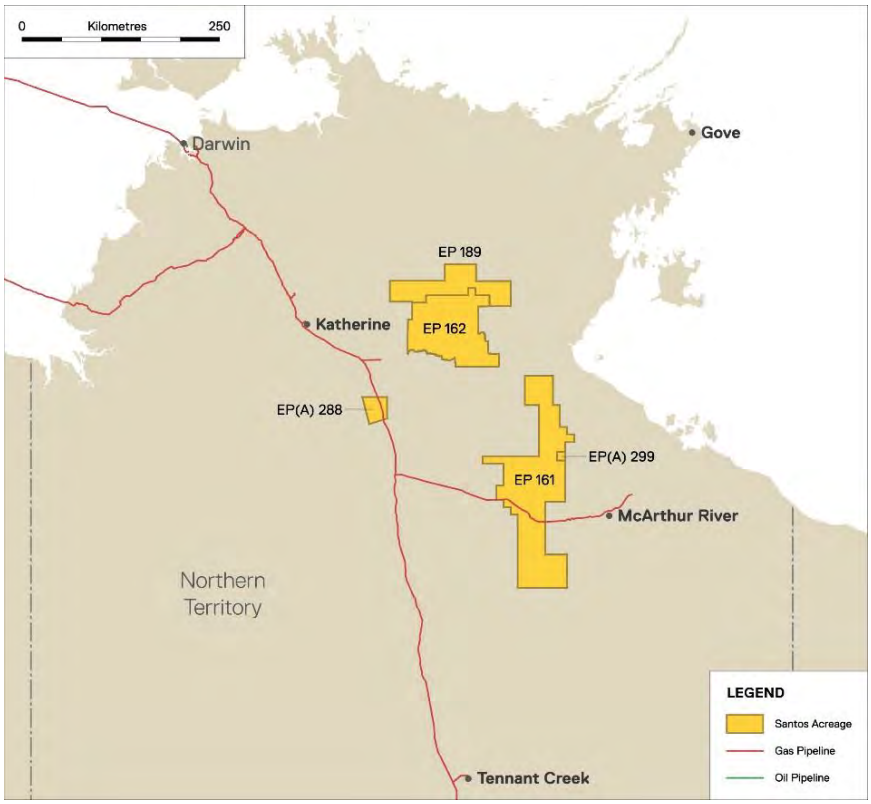


Figure 2A-1-1 McArthur Basin Project Area in Northern Territory

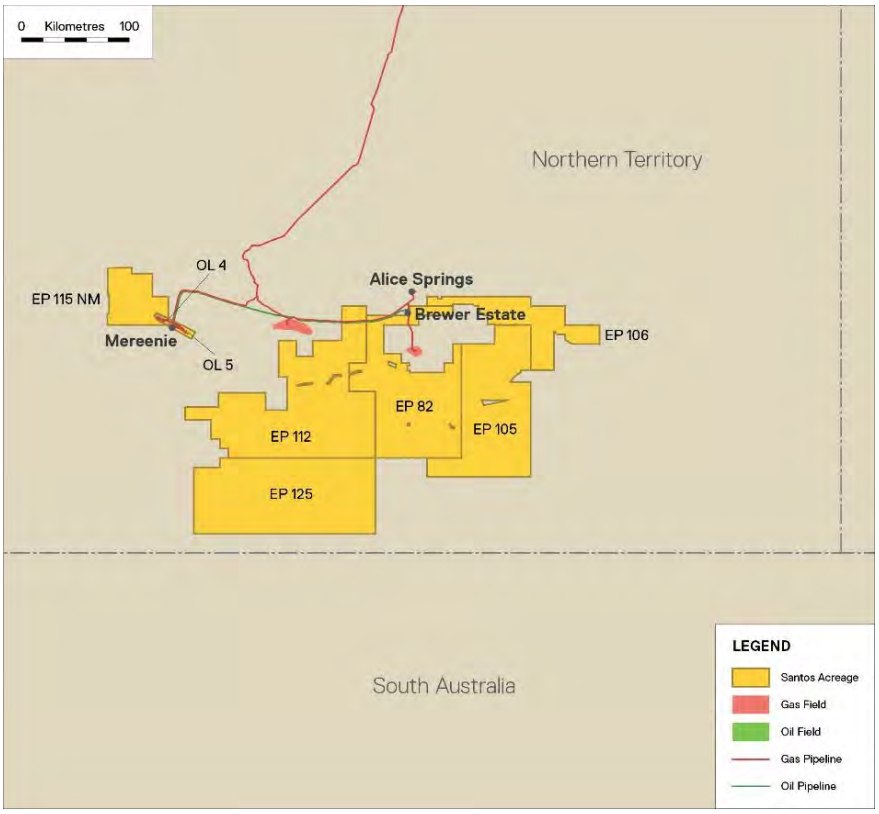


Figure 2A-1-2 Amadeus Basin Project Area in Northern Territory

14.5 Appendix D – Well Control Work Sheets

General Information		
Date:	Time:	Location:
Weather Condition:		

Operator Information	
Company	
Office Representative	Position
Phone Number	(email)
On-Site Representative	Position
Phone	(email)

Contractor Information	
Contractor	
Office Representative	Position
Phone	(email)
On-Site Representative	Position
Phone	(email)
Rig Name / Number	
Rig Type	

Well Information:		
Well Name:	Lease Name:	Field Name:
Well Type:	Well Location: GPS coordinates	
Wind Direction / Speed:		
Measured Depth:	True Vert. Depth:	Horizontal Section:
Relief Well Location Availability:	Closest Offset Well:	
Closest Town / City:	KM's From:	
Directions to Location:		
Closest Airport:	Runway Length:	
Closest hospital:	Closest police station:	

Blow-out Information:		
Blow-out Type:	Surface:	Underground Blow-out:
Blow-out Type:	Fire:	H2S:
	CO2:	Geothermal:
	Other:	
Product:	Gas:	Oil:
	Condensate:	Other:

Wellbore Information:					
Surface Casing					
Size:	Weigh:	Grade	Depth	LOT	SICP
Intermediate					
Size:	Weight:	Grade:	Depth	LOT	SICP
Long String					
Size:	Weigh:	Grade	Depth	LOT	SICP
Tieback Liner					
Size:	Weigh:	Grade	Depth	LOT	SICP
Production String					
Size:	Weigh:	Grade	Depth	LOT	SICP
Open Hole					
Size:	Weigh:	Grade	Depth	LOT	SICP
Tubular Data (Drilling):					
Drill Pipe 1	SIDPP				

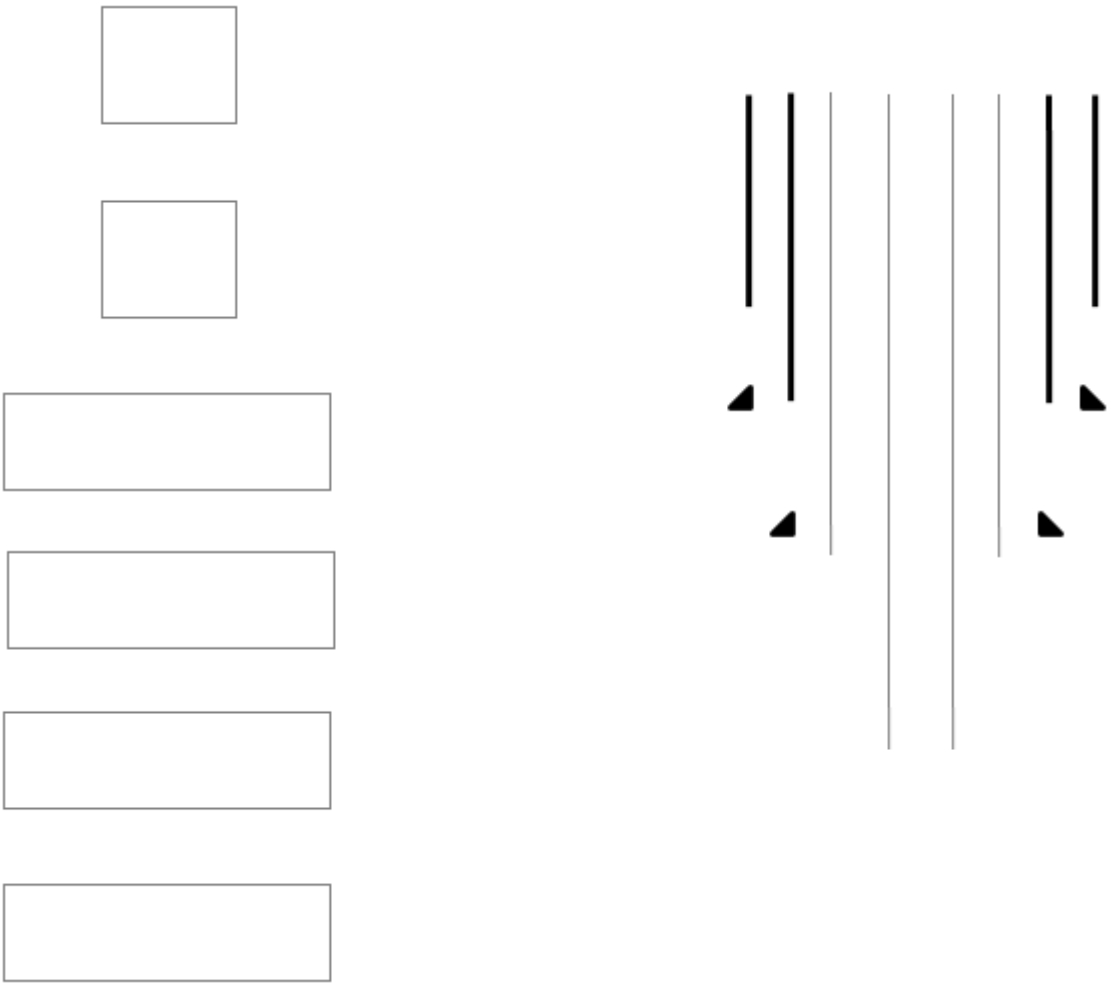
Size:	Weight	Grade	Length	Joints	
Drill Pipe 2					
Size:	Weight	Grade	Length	Joints	
HW Drill Pipe					
Size:	Weight	Grade	Length	Joints	
Drill Collars					
Size:	Weight	OD	ID	Length	Joint
Monel	Size	Weight	OD	ID	Length
Mud Motor	Type	Size		Length	
Stabilizers	Size	OD	ID	Number	
Bit	Size	No. Nozzles	Size Nozzles	Float	Type

Tubular Data (Production):					
Tubing 1					
Size:	Weight	Grade	Depth	SITP	
Tubing 2					
Size:	Weight	Grade	Depth		
Packer	Type	Depth	Min. ID		
SSSV	Type	Depth	Min. ID		
Nipple 1	Depth	Min ID	Nipple 2	Depth	Min ID
Other Downhole Equipment					

BOP Information:					
Annular 1	**Annular 2**	**Ram 1**	**Ram 2**	**Ram 3**	**Ram 4**

Wellhead Information:				
Wellhead Type	**Model**	**Pressure Rating**	**Connector**	**Size**

Note: Santos Engineers to provide information on the BOP Configuration and Casing Profile



14.6 Appendix E – Well Control Equipment Summary

STORAGE OF CUDD EQUIPMENT - MOOMBA

Moomba	
1 x 2.4m x 2.4m shipping container (well response tools)	2 x CUDD rapid response boxes
1 x 6m x 2.4m shipping container (pump hoses, well response tools and workshop facilities)	4 x fold up skid mounted (heat Shield) monitors
1 x skid mounted pump with manifold	1 x Longhorn manifold

Qty	Description
1	Knack 68 Tool Box
18 ea.	Snaptite 2½" NST x 50′ Hoses (900 feet)
2 ea.	Elkhart Portable Ground Monitors (Model 8297)
2 ea.	Elkhart – V Select – Nozzles (500 gpm – 1,250 gpm)
4 ea.	2½″ male NST x 2½″ male NST adapters
4 ea.	2½" NST x 3" FMPT adapters
1ea	6" x 4" swage with 1502 unions
1 ea.	4" x 2" x 2" 1502 adapter with unions or 2" x 4" x 2" 1502 adapter with unions
2 ea.	2" 1502 x 2½″ LR adapters
	Complete box weight = 350 lbs (160 kg)
	Complete box dimensions = 60" wide x 37" tall x 30" deep

WELL CONTROL TOOLBOX INVENTORY - MOOMBA

Qty	Description
1 ea.	15" Crescent wrench
1 set	Ez outs
4 pkg	Hacksaw blades
1 pr	Needle nose pliers
1 pr	Regular pliers
1 ea.	20 oz. Ball peen hammer
Misc.	Grinder parts
1 ea.	1¼", 1⅛" & $1^{1/16}$" x ½ drive sockets $1^{1/16}$"
15 pc	Combination end wrench set
8 pc	Screwdriver set
1 ea.	Hand toolbox
1 ea.	Large OD – ID calliper
1 ea.	½"air drill with crows foot connection
2 ea.	Long handle 8 lb brass hammers
1 ea.	Short handle 8 lb brass hammer
1 ea.	Long handle 6 lb brass hammer
2 ea.	Short handle 6 lb brass hammers
1 ea.	Wire brush
2 ea.	¾" hammer wrenches
2 ea.	7/8" hammer wrenches
2 ea.	1" hammer wrenches
2 ea.	1¼" hammer wrenches
2 ea.	11/8" hammer wrenches
2 ea.	13/8" hammer wrenches
2 ea.	1½" hammer wrenches
2 ea.	1 5/8" hammer wrenches
4 ea.	3/8" x 20 ft. chains with hooks
4 ea.	5/16" x 20 ft. chains with hooks
2 ea.	50 ft. x 1" air hoses with crow's feet connections
2 ea.	50 ft. x 3/8" air hoses with crow's feet connections
4 rolls.	1/2" x 50 ft. rope
1 ea.	25 ft. tape
1 ea.	48" chain tongs
1 ea.	36" chain tongs
2 ea.	12" 'C' clamps
2 ea.	8" 'C' clamps
2 ea.	6" 'C' clamps

Qty	Description
1ea.	50 ft. roll of 80 grit emery cloth
1 ea.	50 ft. roll of 60 grit emery cloth
1 bar	Babbitt
12 ea.	Rolls of friction tape
4 ea.	Duct tape
1 ea.	No. 2 cable cutter
1 ea.	O-ring kit
12 ea.	Rolls of 3/4" Teflon tape
1 box	Paint sticks
1 ea.	7" Air grinder
6 ea.	7" x 1/4" replacement grinder wheels (1 installed in grinder)
4 ea.	7" x 1/8" replacement grinder wheels
4 ea.	Straight wire wheels
4 ea.	Cup type wire wheels
2 ea.	Rolls Garlock packing
2 ea.	36" pipe wrenches
2 ea.	24" pipe wrenches
2 ea.	18" pipe wrenches
6 ea.	1" shackles
1 ea.	Complete air manifold
1 ea.	3-ton hand winch
1 ea.	2-ton hand winch
1 ea.	Complete monitor manifold for Rapid Response Equipment
1 set.	Drill bits

HAND TOOLBOX INVENTORY - MOOMBA

Qty	Description
1 ea.	½” Drive ratchet set
1 ea.	3/8” Drive ratchet set
1 ea.	Hacksaw with blade
1 ea.	½” Breaker bar
	Complete box weight = 900 lbs (410 kg)
	Complete box dimensions = 60" wide x 37" tall x 30" deep

EMERGENCY SERVICES RESOURCES - MOOMBA

This equipment can be sourced from current equipment available at Emergency Services – Moomba and transported to site with the CUDD Well Control equipment.

Number	Item	Comments	☐
Respiratory Protection Equipment			
6x	SCBA sets		☐
6x	Escape sets		☐
4x	Full-face (RA) masks respirators		☐
4x	Half-face mask respirators		☐
1x	Box of canister filters for masks		☐
2x	Air-lines		☐
1x	Air-skid		☐
12x	300 bar x 9 litre spare cylinders		☐
2x	Large plastic tubs		☐
1ea	Safety wash/Distal disinfectant		☐
1x	Roll of ROAR towel		☐
HAZMAT equipment			
12x	Disposable coveralls		☐
2x	Boxes of nitrile gloves		☐
1x	Roll of decontamination bags		☐
Working at Heights Equipment			
2x	Harnesses		☐
2x	Adjustable lanyards		☐
2x	Slings (anchor straps)		☐
Fire Fighting Equipment			
1x	Fire Appliance (Moomba or Ballera)	*Liaise with Emergency. Services T/L*	☐
4x	205L drums of Tridol AFFF-ATC foam	*Liaise with Emergency. Services T/L if required*	☐
1x	Air operated foam pump and hose	*Only required if foam transfer needed*	☐
Atmospheric Monitoring (Gas Detection)			
4x	X-Zone area detectors		☐
4x	X-am 5000's		☐
4x	X-am 2500's or 2000's		☐
4x	Charging cradles and charger		☐
1x	Bump test station and gas cylinder		☐
1x	Wind & Weather Instrument (Kestrel)		☐
Auxiliary Equipment			
1x	Portable Marquee		☐
3x	Trestle tables with folding legs		☐
2x	Large ice boxes (esky)		☐
6x	Cooling vests		☐
2x	Large dispenser of sun screen		☐
6x	Bunting tape (red/white)		☐
12x	Fly nets		☐
12x	Leather gloves		☐
6x	Rubber fire boots (assorted sizes)		☐
6x	Clear safety glasses		☐
6x	Tinted safety glasses		☐

Auxiliary Equipment			
6x	Plastic chairs		☐
1x	Whiteboard, markers & roll of chux		☐
1x	Bag of rags		☐
1x	Magnetic tags & label maker		☐
6x	Boxes of drinking water		☐
2x	E-flare kits (1 x Moomba & 1 x Ballera)		☐

14.7 Appendix F – Personal Response Log Sheet

Date	Time	Description	Contact (name and Number)

Notes:

- Print copies of this sheet and distribute to response team members to complete whilst performing Emergency Response Team duties
- Record key information and hand to log keeper/administrator
- Do not throw this sheet out as the information recorded may be used for investigative purposes

Santos Wellsite Emergency Plan

(WELL) (CONTRACTOR)

Project Code:

Latitude - Longitude -

FOR EMERGENCY RESPONSE CALL TEL # 08 8675 6222

Santos Drilling Supt. in Moomba	08 8678 4406 SAT Ph 0147161874		Drilling Engineer (Adelaide) (Primary Contact)	Off: Mob:
Santos Drilling Safety Rep (Moomba)	08 8678 4425 or 08 8678 4426 24hr. coverage		Nearest Local Santos Base: Moomba Supt., 24hr. coverage	08 8678 4406
Local base: Moomba Comms	08 8675 6666		MEDIC - Moomba Hrs - 7am to 5pm Moomba Emerg. RFDS Moomba Nurse AH MEDIC - Ballera Hrs - 6am to 4pm	08 8678 4165 08 8675 6222 0404 806 594 07 46468107

CONTRACTOR/OPERATION phone numbers			Company phone numbers	
Rig Manager:	Office		Drilling Safety Rep., Moomba	08 8678 4425
Santos / OCR, Number Satellite Phone in Blue	Office Sat		Santos Drilling Supt. Moomba	08 8678 4406
Ensign 970 camp site	Office Kitchen(Main #)		Alternate 24hr Contact: Materials Co-ordinator Moomba	0417739895 08 8678 4199

Location & Telephone of Nearest Air Strip:			Telephone of Airstrip: Moomba Telephone of Airstrip: Ballera	08 8678 4513 or 08 8675 6614 07 4646 8103

Directions for driving to site:

Helicopter landing can take place at

Camp Site Co-ordinates: Latitude: **Longitude:** (km from site).

14.9 Appendix H – Santos CareFlight Activation Process

CareFlight

SANTOS

MEDEVAC ACTIVATION PROCESS

Version 1: 24/05/2018

CALL CAREFLIGHT 24/7 CO-ORDINATION CENTRE

Numbers	
Primary Number	1300 650 654
Back-Up Number	+61 457 792 947
Email Address	lcu@careflight.org
Facsimile	+61 8 8928 9795

ACTIVATION SCRIPT TO CAREFLIGHT CO-ORDINATOR

My name is_____ and I am an Approved Person In Charge for medevac activation.
My contact number is <_____> and alternate number is
<_____>

I need to activate a medevac of <number> of patients from <insert location>. The treating Nurse Practitioner is <name> and can be contacted on <insert phone number>

Location of Santos Patient Location is_____

Patient(s) Name is_____

Patient(s) DOB is_____

Patient's Home Location/Place of Residence is _____

Patient Weight/Height_____

Patient Medical Condition

_____

_____

_____

Medevac process updates back to Santos need to be sent by phone/email to <name and phone/email contact details> (noting patient confidentiality restrictions)

The time is _____ < Darwin Time>

Traffic Impact Assessment

Appendix 14

Amadeus Basin: Jacko Bore 1DW1 Drill and Test Program

EP125

Santos QNT Pty Ltd

JACKO BORE 2/MT KITTY 2 (EP 125) LYNDAVALE ACCESS (STUART HIGHWAY), GHAN NORTHERN TERRITORY

TRAFFIC IMPACT ASSESSMENT

CIRQA™

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DOCUMENT CONTROL

Report title:	Jacko Bore 2/Mt Kitty 2 (EP 125) Lyndavale Access (Stuart Highway), Ghan, Northern Territory Traffic Impact Assessment
Project number:	23161
Client:	inGauge Energy
Client contact:	Adrian Gallagher (Fyfe Pty Ltd)

Version	Date	Details/status	Prepared by	Approved by
V1	06 Jun 23	For submission	TAW	TAW/BNW

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APPENDIX A: CONCEPT ACCESS PLAN PREPARED BY CIRQA

1. EXECUTIVE SUMMARY

CIRQA has been engaged to undertake a review of the traffic aspects associated with a proposed drilling program by Santos QNT Pty Ltd in Ghan, Northern Territory. Specifically, CIRQA has been requested to prepare a Traffic Impact Assessment (TIA) for the proposed access arrangements via the Lyndavale Access road (accessed via the Stuart Highway) for the exploration program.

This report summarises the traffic review undertaken of the access arrangements. The review has been prepared in accordance with the Austroads' "*Guide to Traffic Management – Part 12: Integrated Transport Assessments for Developments*" (including general adoption of its recommended report structure).

The subject exploration program comprises civil construction, drilling and testing in relation to the drilling of one new well (referred to as Jocko Bore 2/Mt Kitty 2) within an existing well pad (Jacko Bore 1/Mt Kitty 1) on NT Portion 3350. The exploration program will utilise a previously established campsite (located within Jacko Bore 1/Mt Kitty 1) as well as an existing vehicle (via an access on the Lyndavale Access road, which is accessed via the Stuart Highway over NT Portion 3351). The existing access road (accessed via the Lyndavale Access road) will be extended by approximately 1.0 km.

Assessment of the turning warrants against the requirements of the Austroads' Guide indicates that formalised separate turn lanes are not warranted. Furthermore, the Austroads' Guide also indicates that appropriate sight distance can be established at each of the access points.

Assessment of the additional traffic associated with the exploration program indicates that up to 22 daily vehicle movements could be generated by Santos QNT's proposed operations. These movements will be distributed to the Lyndavale Access road via a single (existing) access road, and via the Stuart Highway (via the existing Lyndavale Access/Stuart Highway intersection). Such movements will readily be accommodated at the access points and on the adjacent road network.

2. PROPOSED DEVELOPMENT

2.1 BACKGROUND DEVELOPMENT

Access to the well will largely be provided via an existing private (unsealed) roadway, albeit with a minor extension (in the order of approximately 1.0 km) to reach the new well. The existing roadway currently intersects with the Lyndavale Access road, and then the Stuart Highway, providing connectivity to the broader road network.

2.2 DESCRIPTION OF ON-SITE DEVELOPMENT

2.2.1 LAND USE AND INTENSITY

The land use comprises the drilling, completion, and testing of one helium appraisal well (Jacko Bore 2/Mt Kitty 2), as well as the re-establishment of an existing campsite, within the study area.

The intensity of traffic movements associated with the proposal will be low and it is anticipated that the highest level of traffic generation will occur at the end of the de-mobilisation of the 'drilling and completions' phase and the mobilisation of the 'extended production phase' (i.e., during the overlap period as detailed below).

2.2.2 LOCATION

The new well will be located within 60 km of the Ghan (Erldunda Roadhouse) township, on NT Portion 3350 ('Lyndavale' – under private ownership). The new well will be accessed via the extension of an existing access road, connecting to the Lyndavale Access road and, ultimately, the Stuart Highway. The re-established campsite is will also be accessed via the existing access road.

The Lyndavale Access road intersects with the Stuart Highway approximately 17 km south of the Erldunda Roadhouse.

2.2.3 ZONING

The subject well (and associated campsite) is not located within a Zone defined by the Northern Territory Planning Scheme (NTPS).

2.2.4 PHASING AND TIMING

The subject exploration program is anticipated to be undertaken over a two-year period. An indicative project schedule has been prepared by inGauge Energy (on behalf of Santos QNT), outlining the various activities throughout the program as well as their expected commencement and duration. Table 1 illustrates the indicative project schedule.

Table 1 – Indicative project schedule provided by inGauge Energy

Phase	Activity	Estimated Commencement	Estimated Duration
1	Water boring	Q3 2023	4 weeks
2	Civil Construction	Q3 2023	4 weeks
3	Drilling	Q4 2023	4 weeks
4	Completions	Q4 2023	3 weeks
5	Extended production testing	Q4 2023	78 weeks

The exploration program is expected to commence in the third quarter of 2023 (upon receipt of relevant planning approvals and other relevant considerations).

3. EXISTING AREA CONDITIONS

3.1 STUDY AREA

3.1.1 AREA OF INFLUENCE

The study area is located south of the township of Ghan, west of the Stuart Highway. The Lyndavale Access road, and private well pad access road, traverse the following land parcels:

- NT Portion 3350 ('Lyndavale' – under Private Ownership); and
- NT Portion 3351 ('Erldunda' – under Private Ownership).

Figure 1 illustrates the subject parcels of land with regard to the adjacent road network.

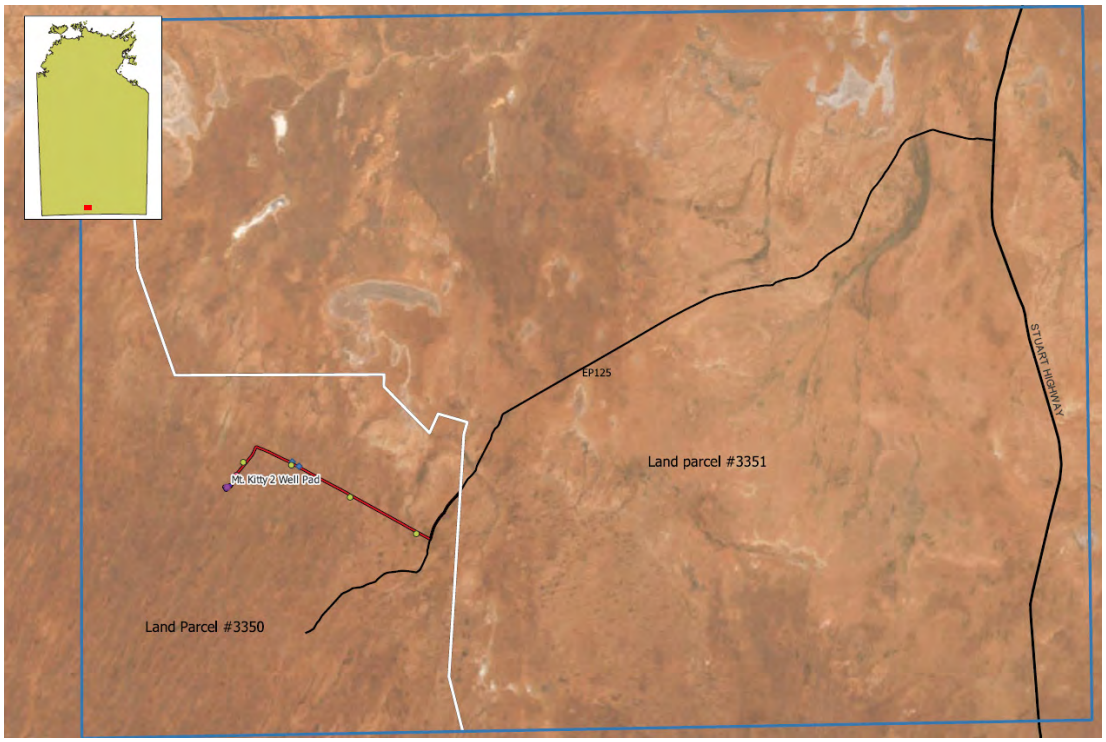

Figure 1 – The subject parcels of land (Source: inGauge Environmental Management Plan, dated 12/02/2023)

3.1.2 AREA OF SIGNIFICANT TRANSPORTATION IMPACT

The adjacent road network will readily accommodate the increased traffic generation associated with the subject site. The primary impact will generally be limited to the intersection of the Stuart Highway and Lyndavale Access road. Further discussion of traffic volumes and their associated impacts are provided below.

3.2 STUDY AREA LAND USE

3.2.1 EXISTING LAND USES

The subject parcel of land (NT Portion 3350) is currently used as a pastoral property. The parcels of land bounding the subject parcel (NT Portions 620, 6300, 6301, 680, 3351, 324, 1091, and 326) are also primarily pastoral properties and are as follows:

- North
  - NT Portion 620 ('Angas Downs' – Private ownership);
  - NT Portion 6300 ('Pulkurru Land Aboriginal Corporation' – Aboriginal ownership);
  - NT Portion 6301 ('Umalka Tjintjira Aboriginal Corporation' – Aboriginal ownership);
  - NT Portion 680 ('Mt Ebenezer' – Private ownership);
- East
  - NT Portion 3351 ('Erldunda' – Private ownership);
- South
  - NT Portion 324 ('Victory Downs' – Private ownership);
- West
  - NT Portion 326 ('Curtin Springs' – Private ownership); and
  - NT Portion 1091 ('Mulga Park' – Private ownership).

3.2.2 EXISTING ZONE

The subject wells are not located within a Zone defined by the NTPS.

3.2.3 ANTICIPATED FUTURE DEVELOPMENT

Within the study area, no other development is anticipated in the near future. It is understood that other drilling programs are in the process of being undertaken within the broader area. However, the likelihood of peak traffic movements associated with the various projects aligning is considered low.

3.3 SITE ACCESSIBILITY

3.3.1 AREA ROADWAY SYSTEM

Within the study area, the only public road is the Stuart Highway.

The Stuart Highway is a major rural highway under the care and control of the Northern Territory Government, providing connectivity between Darwin and a number of townships within the NT, including Alice Springs. South of the NT, the

Stuart Highway connects to Adelaide. In the vicinity of the study area, the Stuart Highway is a 9.0 m wide sealed roadway comprising 3.8 m lanes with adjacent 0.7 m sealed shoulders in each direction (further unsealed shoulders are provided in addition). The Sturt Highway (adjacent Horseshoe Bend) is subject to a 130 km/h speed limit.

Traffic data has been obtained from the Northern Territory Government for the closest primary (permanent) counter station on the Stuart Highway (RAVDP003, located 200 m north of Kulgera) for a 10-year period (from 2012 to 2021 inclusive). Table 2 illustrates the Annual Average Daily Traffic (AADT) volumes recorded at the above counter station on the Stuart Highway.

Table 2 – AADT traffic data from the RAVDP003 counter station on the Stuart Highway

Year	RKVDP003
2012	315
2013	304
2014	313
2015	342
2016	344
2017	363
2018	333
2019	334
2020	182
2021	274

As illustrated in Table 2, traffic volumes on the Stuart Highway (a major rural highway) are typically in the order of 330 vpd (noting that COVID-19 would likely have impacted upon recorded traffic volumes in 2020 and 2021).

The Lyndavale Access road is a private access driveway, under the care and control of the station owners/managers (i.e. 'Lyndavale' Station and 'Erldunda' Station). Despite being a private access road, it is consistent with the 'Pastoral 2' Road Class as outlined in the Department of Infrastructure, Planning and Logistics' (DIPL's) "*Performance and Design Standards for Northern Territory Government Roads*". It comprises an unsealed surface along its length, with a typical carriageway width in the order of 12.0 m.

Traffic data for the Lyndavale Access road is not publicly available from the Northern Territory Government (given its function as a private access road). Due to its remote location and low function (i.e. does not provide connectivity

between townships and/or key destinations), it is not expected that daily traffic volumes would be notable.

Given that the Lyndavale Access road provides access only to a single rural property (as well as the existing Jacko Bore 1/Mt Kitty 1 well pad), it is estimated that traffic volumes would be less than 25 vehicles per day (vpd).

3.3.2 TRANSIT SERVICE

No public transport services are provided within the vicinity of the study area.

3.3.3 PEDESTRIANS AND CYCLISTS

Given the site's remote nature, pedestrian and cyclist movements along the Stuart Highway and the Lyndavale Access road would be extremely unlikely and are not expected to occur.

4. PROJECT TRAFFIC

4.1 PROPOSED SITE ACCESS

As noted in Section 2.2.2, access to the well site will be provided via existing private roadways within the subject land parcel. The private roadway intersects with the Lyndavale Access road (also a private roadway) and the Stuart Highway at standard T-intersections (both of which are existing). All turning movements are permitted at each intersection.

The location of the Jacko Bore 2/Mt Kitty 2 well pad in relation to the Stuart Highway is illustrated in Figure 1.

4.2 TRAFFIC GENERATION

Forecast (development-related) vehicle movements have been provided by inGauge Energy for each item of the exploration program schedule. It should be noted that volumes have only been provided for the exploration program and not the operation of the well (albeit it is expected that volumes associated with their operation will be lower than those of the exploration program). The information provided by inGauge Energy is illustrated in Table 3.

Table 3 – Forecast vehicle movements associated with inGauge Energy's proposed exploration program

Activity	Light Vehicle Movements *(per week)*	Truck Movements *(per week)*	Approximate Duration
Water boring/Civil Construction	28	7	8 weeks
Drilling and Completions *(mobilisation and de-mobilisation)*	35	53	6-7 weeks
Drilling and Completions *(operations)*	28	21	8-9 weeks
Extended production testing *(mobilisation and de-mobilisation)*	35	30	2 weeks
Extended production testing *(EPT and monitoring))*	15	4	129 weeks
Total *(for project duration)*	**2,726**	**1,192**	**155 weeks**

On the basis of the information provided by inGauge Energy (in both Table 1 and Table 3), the peak weekly traffic generation associated with the exploration program will (conservatively) occur during the overlap of the de-mobilisation of the 'drilling and completions' phase and the mobilisation of the 'extended production phase'. In reality, it is considered unlikely that the full de-mobilisation

and mobilisation of the two phases will directly coincide with one another, however, for conservatism, this assessment assumes this will occur.

During this week, in the order of 153 vehicles (83 trucks and 70 light vehicles) are anticipated to access the Jacko Bore 2/Mt Kitty 2 well site. This equates to an average of up to 12 truck and 10 light vehicle movements per day during this week.

Given the peak weekly traffic generation will only occur during the overlap of these phases, this assessment has therefore excluded detailed traffic impacts at other times (the average number of traffic movements for the duration of the project will be less than 28 truck movements and 23 light vehicle movements per week). This is considered to be a conservative approach as the assessment outlined below represents the worst-case scenario with regard to traffic volumes using the broader road network.

4.3 TRAFFIC DISTRIBUTION AND MODAL SPLIT

A high-level traffic distribution has been provided by inGauge Energy with regard to the subject exploration program. Based upon the above worst-case forecast, the following vehicle movements are forecast to occur on any given day within the de-mobilisation of the 'drilling and completions' phase and the mobilisation of the 'extended production phase' overlap period:

- 12 truck movements are forecast to occur between the well site and Stuart Highway per day; and
- 10 light vehicle movements are forecast to occur between a well site and Stuart Highway.

All truck movements are assumed to be 53.5 m Road Trains (A-Triples).

Beyond the intersection of the Lyndavale Access road and the Stuart Highway, a detailed traffic distribution is unknown. This is due to being dependent on equipment location, and the availability of alternate equipment if originally unavailable (i.e., equipment already located within the Northern Territory would be utilised if available when needed or, alternatively, equipment would be sourced from South Australia or Queensland).

For the purposes of this assessment, it has therefore been assumed that:

- 50% of equipment will be available from within the Northern Territory (i.e. access to/from the north on the Stuart Highway);
- 25% of equipment will be sourced from South Australian (i.e. access to/from the south on the Stuart Highway); and

- 25% of equipment would be sourced from Queensland (i.e. access to/from the north on the Stuart Highway).

4.4 TRIP ASSIGNMENT

As mentioned above, the largest traffic impact to the Stuart Highway (and Lyndavale Access road) will occur at the end of the de-mobilisation of the 'drilling and completions' phase and the mobilisation of the 'extended production phase' overlap period. During this week, the following (new) daily traffic volumes are forecast on the Lyndavale Access road:

- 12 truck movements are forecast to occur between the well site and Stuart Highway, of which:
  - 9 will be to/from the north on the Stuart Highway;
  - 3 will be to/from the south on the Stuart Highway; and
- 10 light vehicle movements are forecast to occur between a well site and Stuart Highway, of which:
  - 8 will be to/from the north on the Stuart Highway; and
  - 2 will be to/from the south on the Stuart Highway.

It should be reiterated that the above traffic volumes are considered to represent the maximum daily traffic volumes anticipated throughout the exploration program. This is due to higher vehicle movements anticipated during the overlap at the end of the de-mobilisation of the 'drilling and completions' phase and the mobilisation of the 'extended production phase', than what would occur during other phases (including any additional overlap).

4.5 FUTURE TRAFFIC

It is not considered necessary to analyse 'future traffic' volumes along the Lyndavale Access road as part of this assessment. This is due to the following:

- the traffic volumes identified in Section 4.4 are considered to represent the 'worst-case' scenario for the duration of the project;
- existing traffic volumes along the Lyndavale Access road would be very low;
- traffic volumes recorded at the primary counter station on the Stuart Highway) are low and have changed negligibly over the last available 10-year period (excluding potential COVID-related impacts); and
- no significant traffic generating development is expected to occur within the vicinity of the site during the construction phase of the exploration program.

4.6 TOTAL TRAFFIC

Based upon the anticipated existing traffic volume on the Lyndavale Access road (as identified in Section 3.3.1), taking into consideration traffic volumes associated with the subject exploration program of EP 125, the Lyndavale Access road is forecast to have a total daily traffic volume in the order of 47 vpd.

With regard to the existing traffic volume on Lyndavale Access road (as identified in Section 3.3.1), for the purpose of this assessment it has been assumed that all movements will be to/from the north (i.e., Alice Springs).

Taking this into consideration, along with the forecast distribution of movements identified in Section 4.5, total daily traffic volumes have been forecast at the Stuart Highway/Lyndavale Access road intersection. Figure 2 illustrates the total daily traffic volumes forecast.

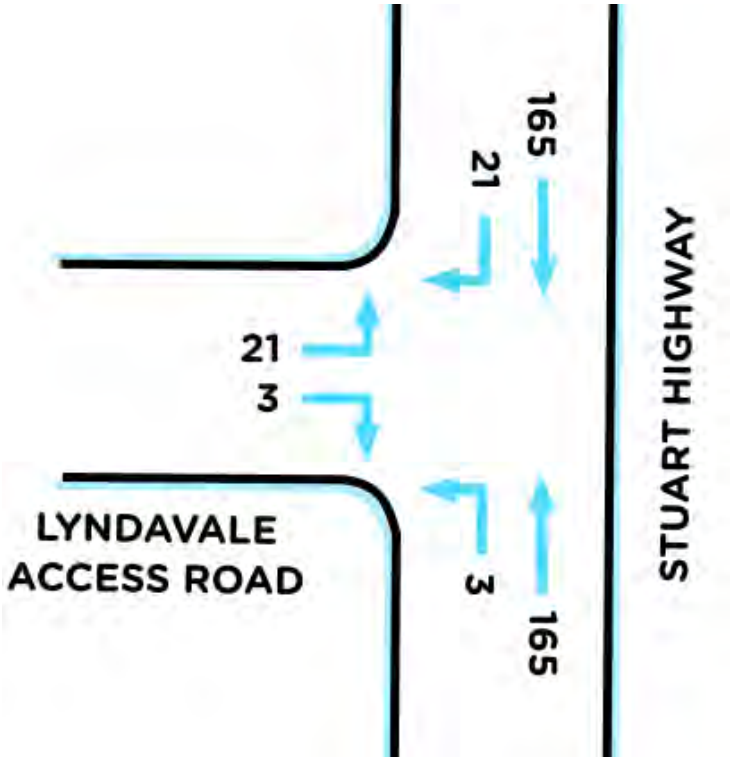

Figure 2 – Forecast daily turning movements at the Stuart Highway/Lyndavale Access road intersection during the overlap period of the de-mobilisation of the 'drilling and completions' phase and the mobilisation of the 'extended production' phase.

5. TRANSPORTATION AND ANALYSIS

5.1 CAPACITY AND LEVEL OF SERVICE

Given the low number of daily traffic movements forecast to occur at the end of the de-mobilisation of the 'drilling and completions' phase and the mobilisation of the 'extended production' phase, the existing access road/Lyndavale Access road, and the Stuart Highway/Lyndavale Access road intersection will operate satisfactorily as standard T-intersections.

However, in order to determine if an intersection treatment is warranted, an assessment has been undertaken against the requirements of the relevant Austroads' Guidelines (Figure 3.25 (a) of the "*Guide to Traffic Management – Part 6: Intersections, Interchanges and Crossings Management*").

Based upon the forecast peak hour traffic volumes (10% of the volumes identified in Figure 3), the Austroads' Guide identifies that only Basic Left-turn (BAL) and Basic Right-turn (BAR) treatments are required (i.e. no separated turn lanes are warranted) at both access road intersections.

It should be noted that the additional traffic volumes forecast to utilise the Lyndavale Access road and Stuart Highway intersection do not trigger a higher-order treatment above that currently required (by existing traffic volumes). As such, it is not considered that an intersection upgrade is warranted as a result of the subject exploration program.

5.2 TRANSPORTATION SAFETY

5.2.1 ROAD GEOMETRY

As identified in Section 3.3.1, the Lyndavale Access road generally comprises an unsealed 12.0 m wide carriageway. The Austroads' "*Guide to Road Design – Part 3: Geometric Design*" identifies that for roads with an AADT of less than 150 vpd (the lowest order roadway identified by Austroads), a minimum carriageway of 8.7 m should be provided in order to accommodate two-way traffic movements.

As identified in Section 4.6, the Lyndavale Access road is forecast to continue to have daily traffic volumes below 150 vpd. The existing geometry of the Lyndavale Access road is therefore considered appropriate based on the recommendations of the Austroads' Guide.

In addition, it is noted that the moving of large rig equipment may require light vehicle escorts to travel in front of and behind oversize vehicles. Given that such vehicles will be travelling in a group (of at least three vehicles) and that oncoming vehicles will have adequate warning to oversize vehicles (via the use of signage and flashing lights), the existing road geometry is considered appropriate.

5.2.2 ACCESS LOCATION

The well pad access road's intersection with the Lyndavale Access road is currently located on a straight section of the Lyndavale Access road. A private stockyard is located approximately 1.7 km southwest of the existing intersection, thereby providing adequate separation to retain the safe operation of the Lyndavale Access road.

With regard to the Lyndavale Access road/Stuart Highway intersection, the intersection is also located on a straight section of the highway. The Ghan Truck Rest Area is located approximately 1.16 km south of the existing intersection. The location of the existing intersection is therefore considered appropriate to retain the safe operation of the Stuart Highway.

5.2.3 SIGHT DISTANCE

A desktop sight distance assessment has been undertaken at the Lyndavale Access road/Stuart Highway intersection, taking into consideration the requirements of Austroads' "*Guide to Road Design – Part 3: Geometric Design*" and "*Guide to Road Design – Part 4A: Unsignalised and Signalised Intersections*" for both light vehicles and type two road trains. This is due to the differing speed environments in which the respective vehicles are permitted to travel.

Specifically, light vehicles are permitted to travel at the speed limit of 130 km/h and, as such, a design speed of 140 km/h has been adopted. However, with regard to road trains, such vehicles are restricted (by law and typically by a governing device installed within the vehicle) to a maximum of 90 km/h. As such, a design speed of 100 km/h has been adopted for such vehicles.

Due to the rural and remote nature of the Lyndavale Access road, an increased driver reaction time of 2.5 seconds (applicable to roads with large distances between towns and isolated features) has been adopted in the assessments. Similarly, applicable to T-intersections on a single carriageway road with a traffic volume of less than 4,000 vehicles per day, an observation time of 1.5 seconds has been adopted.

A standard deceleration coefficient of 0.36 has been adopted for the assessment with the exception of the consideration of sight distance provisions for type-two road trains (such as triple road trains), for which a deceleration coefficient of 0.26 has been adopted.

On the basis of the above, there would be a sight distance requirement of 370 m for light vehicles (based upon a design speed of 140 km/h) and 263 m for type two road trains (based upon a design speed of 100 km/h).

Due to the site's rural location, an on-site review of available sight distances has not been able to be confirmed. However, a review of available imagery indicates a straight horizontal alignment of the Stuart Highway, with relatively flat topography and sparse/small vegetation. Based upon these factors, it is anticipated that satisfactory intervisibility would be able to be achieved the Lyndavale Access road's intersection with the Stuart Highway (between a vehicle exiting from the Lyndavale Access road and a vehicle travelling along the Stuart Highway), in line with the requirements of the Austroads Guidelines.

5.2.4 INTERSECTION SPACING

DIPL's "*Performance and Design Standards for Northern Territory Government Roads*" does not identify minimum access spacings for 'Pastoral 2' roads such as the Lyndavale Access Road. Notwithstanding, the access location on the Stuart Highway will comply with the access spacing requirements (the nearest access being the Ghan Truck Rest Area) for 'National Highway' roads.

5.2.5 OVERSIZE OR OVERMASS VEHICLES

Should Santos QNT intend to operate oversize and/or overmass vehicles along the Stuart Highway, Santos QNT will be required to apply for an 'oversize or overmass permit' from the Northern Territory Government.

A permit will likely require pilot/escort vehicles in front of and behind an oversize vehicle to forewarn vehicles approaching in the opposite direction. Such requirements are common and considered to be acceptable with regard to the moving of oversize loads.

Given that the Lyndavale Access road is a private access road (as is the internal access road to the Jacko Bore 2/Mt Kitty 2 well site), no permit is required to operate oversize and/or overmass vehicles. It would however be in the interest of safety to maintain operation under pilot/escort vehicles until reaching the well site (or immediately upon leaving the well site).

6. IMPROVEMENT ANALYSIS

6.1 IMPROVEMENTS TO ACCOMMODATE EXISTING TRAFFIC

Given the very low number of movements anticipated to currently occur on the Lyndavale Access road, it is not considered that upgrades are warranted to accommodate existing volumes.

Similarly, the Stuart Highway is a formed (sealed) National Highway with low average daily volumes. The geometry and alignment of the highway are considered suitable, with no upgrade considered to be warranted to accommodate existing volumes.

Both the Stuart Highway/Lyndavale Access road intersection, and the Lyndavale Access road/Jacko-Bore 2-Mt Kitty 2 intersection currently accommodate low traffic volumes, whilst also accommodating turning movements by 53.5 m Road Trains. As such, no further upgrade is considered to be warranted to accommodate existing volumes.

6.2 IMPROVEMENTS TO ACCOMMODATE BACKGROUND TRAFFIC

For the reasoning identified in Section 4.5, traffic volumes are not expected to significantly increase within the next 10-year period. As such, no improvements (apart from general road maintenance) are considered to be warranted in order to accommodate 'background traffic'.

6.3 IMPROVEMENTS TO ACCOMMODATE TOTAL TRAFFIC

As identified in Section 4.6, the additional traffic volumes generated by the Jacko Bore 2/Mt Kitty 2 well site are forecast to be readily accommodated at the various intersections, as well as on the surrounding road network.

Given that both the Jacko Bore 2-Mt Kitty 2/Lyndavale Access road intersection, and the Lyndavale Access road/Stuart Highway intersection currently accommodate 53.5 m Road Trains (the largest vehicle anticipated to require access to the well site), it is considered that further upgrades are not warranted to accommodate the various turning movements.

Furthermore, the additional traffic volumes generated by the Jacko Bore 2/Mt Kitty 2 well site are not considered to require upgrade of the Stuart Highway intersection, with existing BAL and BAR treatments considered appropriate.

Notwithstanding, a concept drawing of a generic access (illustrating a compliant BAL/BAR treatment) has been prepared by CIRQA (attached in Appendix A). The drawings also include a plan illustrating associated signage provisions at the proposed access points (to adequately warn drivers associated with the site and through-bound movements on the Stuart Highway). Associated signage

provisions should be incorporated at the Lyndavale Access road/Stuart Highway intersection and the Jacko Bore 2-Mt Kitty 2/Lyndavale Access road intersection if not already provided.

It should be noted that the drawing meets (and generally exceeds) the layouts shown on the Northern Territory Government's *"Guide to Rural Intersections Treatments Sheet 1 – Types 1 & 2"* (drawing no. C(S)1842-0).

6.4 EVALUATION

On the basis of the above, it is considered that the additional vehicle movements generated by Jacko Bore 2/Mt Kitty 2 will be adequately accommodated with the following treatments:

- continued use of the existing access points (given their previous design to accommodate 53.5 m Road Trains and, if required, incorporation of signage in line with the concept drawing attached in Appendix A;
- appropriate work zone traffic management signage in accordance with the Australian Standards' "*Manual of uniform traffic control devices-Traffic control for works on roads*" (AS 1742:3–2019) at each of the three access points; and
- should construction be required during the 'wet season', additional work zone traffic management provisions should be implemented (for instance, reduction in the default speed limit on the Lyndavale Access road). Additional maintenance on the condition of the Jacko Bore 2/Mt Kitty 2 well site access road may also be required.

7. FINDINGS AND RECOMMENDATIONS

7.1 SITE ACCESSIBILITY

Vehicle access to the Jacko Bore 2/Mt Kitty 2 well site will be provided via a standard T-intersection on the Stuart Highway. The access points will accommodate turn paths of heavy vehicles such as 53.5 m Road Trains. The access point shall comply with the requirements of the Austroads' Guidelines in regard to turning warrants and sight distances.

7.2 TRANSPORTATION IMPACTS

The additional number of movements associated with the Jacko Bore 2/Mt Kitty 2 exploration program are forecast to be very low. Based upon expected existing traffic volumes (derived based on location and nearby traffic data) and operational information provided by InGauge Energy, daily traffic volumes along the Lyndavale Access road are forecast to be less than 47 vpd throughout the duration of the exploration program. Accordingly, volumes are expected to remain well below the 150 vpd 'limit' associated with low-volume rural roads as identified in the relevant Austroads' Guide. As such, the traffic volumes associated with the proposed exploration program will be readily accommodated.

Furthermore, the proposed access arrangements will be adequate to accommodate the forecast movements to/from the subject well pad sites.

7.3 ROADWAY IMPROVEMENTS

7.3.1 STUART HIGHWAY/LYNDAVALE ACCESS ROAD INTERSECTION

It is understood that the geometric configuration of the intersection of the Stuart Highway and the Lyndavale Access road is appropriate for use by Road Trains up to 53.5 m in length. Furthermore, the additional traffic volumes generated by the proposal will not require a higher-order treatment above that currently required at the intersection. As such, no additional upgrade is considered to be warranted. The existing intersection should however be supplemented with signage (as per the concept plan in Appendix A) if not already provided.

On-going inspections and maintenance should however be undertaken to ensure that the integrity of intersection is of an appropriate standard.

7.3.2 LYNDAVALE ACCESS ROAD

On-going inspections and maintenance should be undertaken to ensure that the integrity of roadway is of an appropriate standard in the vicinity of the various access points.

7.3.3 WELL SITE ACCESS POINT

As with the Stuart Highway/Lyndavale Access road intersection, the well site access/Lyndavale Access intersection is understood to currently be used by Road Trains up to 53.5 m in length. It is therefore considered that no additional upgrade is warranted.

The existing intersection should however be supplemented with signage (as per the concept plan in Appendix A) if not already provided.

7.4 REPORTING

This report has been prepared in accordance with Austroads' "*Guide to Traffic Management – Part 12: Integrated Transport Assessments for Developments*". Specifically, this report has been prepared based upon the reporting structure outlined in Appendix C of the Austroads' Guide.

APPENDIX A

CONCEPT ACCESS PLAN PREPARED BY CIRQA

INSTALL "SIDE ROAD INTERSECTION - RIGHT" (W2-4C-R) SIGN AND "DISTANCE (80m)" SIGN (W-5C) 80 METRES FROM ACCESS

INSTALL "TRUCKS ENTERING" (T2-25) SIGN 110 METRES FROM ACCESS

EXISTING PRIOTY CARRIAGEWAY

R25

R25

12

INSTALL "TRUCKS ENTERING" (T2-25) SIGN 110 METRES FROM ACCESS

INSTALL "SIDE ROAD INTERSECTION - LEFT" (W2-4C-L) SIGN AND "DISTANCE (80m)" SIGN (W-5C) 80 METRES FROM ACCESS

INDICATIVE EXISTING NON-PRIORITY PRIVATE ACCESS ROADWAY

INSTALL "SIDE ROAD INTERSECTION - LEFT" (W2-4C-L) SIGN AND "DISTANCE (80m)" SIGN (W-5C) 80 METRES FROM ACCESS

NOTES:

CONCEPT ONLY - SUBJECT TO DETAILED DESIGN AND NTG APPROVALS

SIGNAGE TO BE INSTALLED IN ACCORDANCE WITH THE RELEVANT REQUIREMENTS OF AS1742

CIRQA™

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DRAWING AMENDMENTS

REV	DATE	DESCRIPTION	DWN	CHK
A	06/06/2023	CONCEPT ONLY	TAW	TAW

C23161_01.DWG 6/6/2023 3:25 PM

N

NTS @ A3

JACKO BORE 2 (EP 125) EXPLORATION PROGRAM

TRAFFIC CONTROL TREATMENT
CONCEPT DESIGN FOR ACCESS PROVISIONS

PROJECT # 22244 SHEET # 01_SH01