

Environment Plan Summary

Mt Kitty Exploration Well



1 INTRODUCTION

The proposed project comprises the drilling of one exploration well in the Mt Kitty Prospect. The Mt Kitty Well will target the Heavitree Quartzite. The well is designed to broaden understanding of the field extent while balancing the need for developmental production. Construction of the drill pad and associated civil works is scheduled to commence in mid-2013. The well location has been chosen with due consideration given to the impact on natural drainage patterns (creeks and floodplains), vegetation, dune systems and known areas of Indigenous heritage significance.

The nominated liaison person for the project is Ms Kathryn Mitchell, Principal Adviser Community Relations, Santos Limited (kathryn.mitchell@santos.com).

A well will be drilled at the following location:

Location	Mt Kitty Prospect
Permit	EP 125 (Amadeus Basin)
Approximate Surface Hole Coordinates	Latitude: 25° 30' 22.40"S Longitude: 132° 47' 48.31"E

2 PROJECT DESCRIPTION

The well pad will be constructed to avoid large scale levelling and clearance of vegetation, in particular the removal of large trees and larger shrubs will be avoided wherever possible, with clearing to be limited to small trees and shrubs. Where possible, the pruning of branches will be undertaken rather than of removal of the whole tree.

The planned area has also been oriented to minimise the amount of earthworks involved. The well pad will be constructed to allow for the following activities and infrastructure:

- Permanent well head facilities
- Sufficient space for manoeuvrability of the drill rig and associated equipment
- Office building and septic processing associated with the drill rig
- Sump for collection of drilling mud and cuttings from the well hole
- Temporary flare pit for emergency release of hydrocarbons and free gas during drilling activities (if required)

The mud sump will be of sufficient size to contain mud discharges and will be located so as to not impede or pollute surface drainage. No hydrocarbon contaminants will be disposed of to grade or to unlined pits. Septic facilities shall be located and operated to avoid contamination of surface and groundwater.

Surface casing will be set to:

- Protect shallow water zones from contamination by drilling muds or down-hole produced gas and fluids;
- Control caving and washing out of poorly consolidated surface beds;
- Act as a means for well control where the casing bowl is welded or screwed onto the surface casing with Blow Out Preventers (BOPs) are attached to control the well; and
- Act as a secondary barrier against corrosion from corrosive soils or water zones.

Access to the proposed Mt Kitty Well will be via existing roads and one proposed new access road (to be constructed between the camp site and well lease). The drilling plant and equipment, personnel and supplies will be mobilised by road to the well lease and camp site. In order to enable the construction of the new well pad, road and ancillary activities such as laydown areas and the office and camp, material will be extracted from existing and new borrow pits.

Due to the remote location of the project area, accommodation, services and amenities cannot be provided at a nearby town, therefore a temporary supporting camp will be constructed for the duration of the project. The temporary camp site will require small amounts of earthworks to level out the site and remove any vegetation, but large scale levelling and clearance of vegetation will be avoided.

3 EXISTING ENVIRONMENT

Ground truthing determined that two vegetation communities occur in the well site and surrounds, namely Hummock Grassland and Acacia Shrubland. The Hummock Grassland dominated by Spinifex (*Triodia basedowii*) community occurs on sand dunes throughout the area surrounding the proposed well site and access track. Scattered shrubs (approximately 15% cover) occur on the dunes including Mulga, Silver Cassia (*Senna artemisioides* subsp *artemisioides*) and *Eremophila* sp., Blue Bush (*Maireana* sp.), Kerosene Grass (*Aristida* sp) and Sandhill Canegrass (*Zygochloa paradoxa*) were also observed in this community. Vegetation cover is approximately 60% and dominated by the grassy ground layer (approximately 50%).

A review of the NT Fauna Atlas identified that 216 fauna species (including native and pest species) have been recorded within 50 km of the well lease. The majority of these are considered to be common species. No fauna were observed during the survey.

The project area lies within the Amadeus Depression of the Southern Desert Basins, which is dominated by limestone plains and pans and tributary slopes. Karinga Creek runs through Erldunda Station to the north of EP 125, flowing in an east–west direction and draining into a chain of salt lakes / clay pans and eventually into the Finke River. No watercourses are mapped as occurring within the disturbance area however Karinga Creek occurs approximately 20 km to the north of the well lease. Non-perennial water courses feeding in to Karinga Creek occur to the north of the well lease, with the closest located approximately 2 km north of the lease.

4 ENVIRONMENTAL RISKS OF PROPOSED ACTIVITY

Risk	Potential Consequences	Risk Management Measures	Key Santos Standards
Earthworks	<ul style="list-style-type: none"> ▪ Impeded fauna movement through construction zone ▪ Injury or death of fauna in construction zone ▪ Removal of or damage to native vegetation and loss of visual amenity ▪ Introduction and/or spread of weeds ▪ Disturbance to natural drainage patterns ▪ Inversion of soil profile ▪ Soil erosion and siltation of watercourses ▪ Dust generation ▪ Soil compaction ▪ Disturbance to cultural heritage sites 	<ul style="list-style-type: none"> ▪ Personnel access to the facility and any site / area by permit approved by the Central Land Council (CLC) ▪ Commence new works only once regulatory and stakeholder approvals are obtained ▪ Plan activities to minimise new land disturbance and make use of existing disturbance (where possible) ▪ Undertake site selection surveys prior to any on ground disturbance ▪ Obtain permission for activities from CLC and DME where required ▪ Carry out earthworks in accordance with approved Santos standards and procedures ▪ Site, construct and operate borrow pits in accordance with the <i>Schedule of Onshore Petroleum Exploration and Production Requirements 2003</i> ▪ Install erosion and sediment control structures (e.g. berms, sediment fences) where necessary ▪ Avoid vegetation clearance except where consent has been obtained from CLC and 	<ul style="list-style-type: none"> ▪ EHS01 Biodiversity and Land Disturbance ▪ EHS04 Waste ▪ EHS05 Air Emissions ▪ EHS09 Pest Plants and Animals ▪ EHS11 Cultural Heritage
Vegetation clearing	<ul style="list-style-type: none"> ▪ Impeded fauna movement through construction zone ▪ Loss of vegetation and fauna habitat 		

Risk	Potential Consequences	Risk Management Measures	Key Santos Standards
	<ul style="list-style-type: none"> Damage to native vegetation Disturbance to cultural heritage sites Soil erosion and siltation of watercourses Short to medium term loss of visual amenity 	<p>other applicable stakeholders</p> <ul style="list-style-type: none"> Implement fauna management measures for NT and Commonwealth listed species where identified as necessary in planning for new activities Implement weed control measures Implement fuel and chemical handling and storage measures Implement fire prevention and control measures Conduct Job Hazard Analysis for any new task or new use of equipment to ensure appropriate control measures are identified 	
Movement of heavy machinery and vehicles	<ul style="list-style-type: none"> Dust generation Soil compaction Soil erosion Damage to native vegetation Injury or death of native fauna Disturbance to cultural heritage sites Introduction and/or spread of weeds Disruption to land use (e.g. grazing and recreation) Increased public access to remote areas 		
Spills and leaks associated with fuel and chemical storage and handling	<ul style="list-style-type: none"> Localised contamination of soil Contamination of water resources (surface and groundwater) Access to contaminants by fauna 		
Ignition of fire along access	<ul style="list-style-type: none"> Disturbance to cultural heritage sites Loss of vegetation and fauna habitat Release of particulate emissions to the atmosphere Disruption to land use (e.g. feral animal harvesting) 		
Presence of borrow pits	<ul style="list-style-type: none"> Injury to or loss of wildlife Dispersal of watering points and redistribution of stock movements 		
Movement of road construction material	<ul style="list-style-type: none"> Introduction and/or spread of weeds 		
Flooding	<ul style="list-style-type: none"> Contamination of soil, groundwater and/or watercourses Soil erosion and siltation of watercourses Loss of vegetation and topsoil (either stockpiled or in situ) 		
Well blowout or kick	<ul style="list-style-type: none"> Aquifer contamination Aquifer pressure reduction Uncontrolled release of hydrocarbon (liquid or gas) to surface Contamination of soil, groundwater and/or watercourses Injury to or loss of wildlife Atmospheric pollution (gas) Damage to native vegetation 	<ul style="list-style-type: none"> Plan drilling operations to address down-hole pressures / environment Early casing of aquifers during drilling to avoid aquifer contamination Carry out drilling and completions operations in accordance with <i>DMS-M-04 Santos Drilling Operations Manual</i> Install, maintain and routinely test blow-out preventers (BOPs) and related well control equipment on all drilling and workover rigs Implement fauna management measures 	<ul style="list-style-type: none"> EHS01 Biodiversity and Land Disturbance EHSMS18 Sustainability EHS02 Underground Storage Tanks and Bunds EHS04 Waste EHS05 Air Emissions EHS07 Energy Efficiency EHS08 Contaminated Sites EHS09 Pest Plants and Animals
Fluid handling	<ul style="list-style-type: none"> Uncontrolled release or spill of 		

Risk	Potential Consequences	Risk Management Measures	Key Santos Standards
equipment failure	<p>saline workover fluids / chemically treated water, or oil laden fluids</p> <ul style="list-style-type: none"> Contamination of soil, groundwater and/or watercourses Injury to or loss of wildlife 	<p>were identified as necessary in planning</p> <ul style="list-style-type: none"> Implement fuel and chemical handling and storage measures Implement appropriate weed control measures 	<ul style="list-style-type: none"> EHS10 Water Resources EHS12 Noise Emissions
Casing failure (sub-surface)	<ul style="list-style-type: none"> Aquifer contamination by cross-flow of oil or gas from exposed formations Aquifer pressure reduction 	<ul style="list-style-type: none"> Implement fire prevention and control measures Conduct Job Hazard Analysis (JHA) for any new task or new use of equipment to ensure appropriate control measures are identified 	
Explosion or fire on lease (during operations)	<ul style="list-style-type: none"> Atmospheric pollution Loss of vegetation and fauna habitat Uncontrolled release or spill of saline workover fluids / chemically treated water, or oil laden fluids Contamination of soil, groundwater and/or watercourses Loss of vegetation and fauna habitat 		
Cement failure (sub-surface)	<ul style="list-style-type: none"> Aquifer contamination by cross-flow of oil or gas from exposed formations Aquifer pressure reduction and water spill Atmospheric pollution (gas) 		
Tubing or drill pipe failure at drill floor	<ul style="list-style-type: none"> Temporary restricted control over well fluids and circulation system leading to low volume uncontrolled release or spill of saline workover fluids / chemically treated water, or oil laden fluids 		
Loss of containment of gas or oil while testing	<ul style="list-style-type: none"> Contamination of soil, groundwater and/or watercourses Injury to or loss of wildlife Atmospheric pollution 		
Spill or leak of drilling, completion, and workover fluids, diesel, fuel, oils and chemicals (transportation, handling and storage)	<ul style="list-style-type: none"> Contamination of soil, groundwater and /or watercourses Injury to or loss of wildlife 		
Spill or leak of drilling, completion or workover fluids (PFW, hydrocarbon or chemical)	<ul style="list-style-type: none"> Contamination of soil, groundwater and/or watercourses Injury to or loss of wildlife Uncontrolled release or spill of saline workover fluids/ chemically treated water, or oil laden fluids 		
Flaring of gas - propane, butane, methane and ethane during testing	<ul style="list-style-type: none"> Release of atmospheric pollutants and greenhouse gas 		
Release of liquid hydrocarbons to excavated flare pits	<ul style="list-style-type: none"> Contamination of soil and/or groundwater Injury to or loss of wildlife 		

Risk	Potential Consequences	Risk Management Measures	Key Santos Standards
Vehicle and/or rig movement	<ul style="list-style-type: none"> ▪ Dust generation ▪ Damage to native vegetation ▪ Introduction and/or spread of weeds ▪ Collision with wildlife resulting in injury or loss 		
Loss of radioactive source	<ul style="list-style-type: none"> ▪ Aquifer contamination 		
Lubricator failure	<ul style="list-style-type: none"> ▪ Short release of air pollutants and greenhouse gas ▪ Low volume uncontrolled release or spill of saline workover fluids / chemically treated water, oil or oil laden fluids ▪ Soil contamination 		
Casing failure	<ul style="list-style-type: none"> ▪ Aquifer contamination ▪ Aquifer pressure reduction ▪ Uncontrolled release of produced fluids to surface ▪ Contamination of soil, groundwater and/or watercourses ▪ Injury to or loss of wildlife ▪ Loss of reserves and reservoir pressure 	<ul style="list-style-type: none"> ▪ Ongoing monitoring and casing maintenance program to identify where corrosion may be taking place and target well intervention, remedial cementing, or casing repairs ▪ Implement pro-active remedial program for wells where cement or casing is failing to provide containment of gas, oil and formation water from petroleum reservoirs ▪ Conduct Job Hazard Analysis for any new task or new use of equipment to ensure appropriate control measures are identified 	<ul style="list-style-type: none"> ▪ EHS04 Waste ▪ EHS08 Contaminated Sites ▪ EHS10 Water Resources
Poor primary cementing	<ul style="list-style-type: none"> • As above 	<ul style="list-style-type: none"> ▪ In the event of a spill or leak, follow appropriate emergency response procedures ▪ Immediately clean-up and remediate ▪ Maintain register of spills / leaks 	

5 CONSULTATION

To date, consultation has included discussions with the CLC and the Department of Mines and Energy in relation to the project. Santos will continue to engage with stakeholders on an ongoing basis throughout the life of the project as a way of keeping key stakeholders informed about our activities, educating the community, landowners, traditional owners and government about the project, and building and maintaining stakeholder confidence through long-term relationships.

A detailed cultural heritage assessment and clearance process has been undertaken involving representatives of the Traditional Owners including field assessment and development of effective protection measures.