

REPORT OF THE 2019 HAZARD AUDIT OF THE SANTOS OPERATIONS ASSOCIATED WITH THE NARRABRI PEL 238 PROJECT

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Report of the 2019 Hazard Audit of the Santos Operations Associated with the Narrabri PEL 238 Project

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CONTENTS

EXECUTIVE SUMMARY	I
GLOSSARY AND ABBREVIATIONS	III
1 Introduction	1
1.1 Background and Scope.....	1
1.2 Dates, Times and Locations	1
1.3 Objectives and Aim of the Audit	2
1.4 Requirements of the Audit.....	2
1.5 Status of Plant and Facilities and Major Changes Since Last Audit	3
2 METHODOLOGY	4
2.1 Basic Approach	4
2.2 Method of Assessment	5
2.3 Personnel Interviewed	5
3 SITE OVERVIEW	7
3.1 Site Location, Surrounding Land Uses.....	7
3.2 Staffing at Wilga Park Power Station.....	7
3.3 Staffing at Bibbiwindi Compressor Station.....	7
3.4 Access and Security	8
3.4.1 Wilga Park Power Station and Bibbiwindi Compressor Station	8
3.4.2 Road Tanker Unloading and Loading	9
3.5 Site Layout	9
4 STATUS OF IMPLEMENTATION OF ACTIONS FROM THE 2012 HAZARD AUDIT	10
5 HAZARD AUDIT OF PLANT EQUIPMENT AND OPERATIONS	14
5.1 Plant, Materials and Process Systems	14
5.2 Process Safety Information	18

5.3	Plant Monitoring and Process Control	20
6	OPERATIONAL CONTROLS.....	23
6.1	Operating Procedures	23
6.2	Process Operator Training	24
6.3	Safety Training of Staff and Contractors.....	26
7	CONTROL OF SAFE PLANT PERFORMANCE.....	28
7.1	Maintenance Procedures	28
7.2	Work Permit System.....	29
7.3	Electrical Equipment Handling.....	30
7.4	Protective Systems	31
8	CONTROL OF CHANGE	34
8.1	Plant Modification Control.....	34
9	ACCIDENTS AND INJURIES	36
10	EMERGENCIES.....	38
10.1	Fire Protection and Training.....	38
10.2	Emergency Procedures	40
11	SAFETY MANAGEMENT SYSTEM.....	43
11.1	Documentation	43
11.2	Commitment and Leadership	43
11.3	Management and Administration of the Safety Management System	46
11.4	Contractor Management	47
12	SECURITY	48
13	ENVIRONMENTAL PROTECTION	49
13.1	Waste Management	49
13.2	Atmospheric Emissions.....	49
13.3	Control of Incompatible Materials.....	50

13.4 Licence	51
14 REFERENCES	53

LIST OF FIGURES

Figure 1 - Location of Exploration, Assessment and Production Titles.....	8
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LIST OF APPENDICES

Appendix 1 – Approval as lead Auditor

Appendix 2 – Audit Timetable

Appendix 3 – Details of the Topics Covered in the Hazard Audit.

Appendix 4 – Opening Meeting Record

Appendix 5 – Documents Reviewed During the Audit

EXECUTIVE SUMMARY

E1 Introduction

This report constitutes the results of the formal 2019 Hazard Audit, in accordance with the NSW Department of Planning's requirements, for the operations associated with developments which form part of the Narrabri PEL 238 Project, operated by Santos Limited's since November 2011 (Condition 3.6 - MP 07-0023).

The audit was scheduled to coincide with 90 days of exceeding 12MW generation at Wilga Park power station as per the Conditions of Consent for the development.

It updates the Hazard Audit, which was carried out in 2012 with an action implementation verification audit carried out in 2015.

The Hazard Audit was conducted over one full day and two part days (18-20 February 2019). Planning and preparation for the audit was conducted in the weeks leading up to the audit.

Karin Nilsson from Planager Pty Ltd was the Approved Lead Auditor by the NSW Department of Planning (approval in Appendix of this report).

The audit methodology and contents were consistent with the requirements by the NSW Department of Planning's requirements in their Hazardous Industry Planning Advisory Paper (HIPAP) number 5 for Hazard Audit.

The operations included in the audit are the gathering lines from the off-take at the coal seam gas wells, the gas compression facility at Bibbiwindi, the flow line up to the Wilga Park Power Station and the Wilga Park power station itself.

The hazards associated with the operations at PEL238 are characterised flammable nature of the coal seam gas, which is essentially natural gas. The toxic risk of the facilities is very small and managed through use of work permits as coal seam gas is not toxic and combustion products consist of carbon dioxide and water.

The development now includes eight out of ten approved generators which have been installed at the power station. The compressor at Bibbiwindi compressor station has never been commissioned but it is now expected to be put into operation sometime in 2019 following extensive verification work carried out by Santos and reviewed as part of the present audit.

E2 Results

No actions were identified during this Hazard Audit. The facilities operated as part of the PEL238 development appear to be in good repair and operated and maintained as per the requirements under HIPAP5.

Changes are managed using stringent management of change protocols and reviewed and approved by trained and experienced personnel. This is confirmed when tested against two recent changes (the Wilga Park Power Station expansion and the new Dewhurst South flow line).

Training needs of personnel is well managed and controlled and personnel interviewed as part of the present audit are knowledgeable and sufficiently experience to carry out their obligations for the safe operation and maintenance of these facilities.

There are Standard Operating Procedures available and some are of a very good standard. Some Operating Procedures and some drawings (P&IDs) are out of date and to a lower standard but there is a plan in progress to update these, including a Work Order. It is therefore expected that at subsequent audits, all operating procedures and drawings will have been updated and clear.

There is an established Safety Management Plan and other associated management Plans for the Narrabri Operation, and the site is supported by the Santos Safety Management System and procedures. Compliance requirements, including those associated with environmental compliance, are well managed.

The open philosophy of the staff taken during the audit was noted and commendable. A full disclosure attitude was shown which enhanced the purpose and outcomes of the audit.

GLOSSARY AND ABBREVIATIONS

BCS	Bibblewindi Compressor Station
CBT	Competency based training
CCTV	Closed Circuit Television
CFT	Critical Function Testing
CSG	Coal Seam Gas
COMTRACK	, Database used to track regulatory requirements
NSW DP&E	Department of Planning and Environment
DG	Dangerous Goods
E&I	Electrical and Instrument
EHS	Environment, Health and Safety
EHSMS	Environment, Health and Safety Management System
ERP	Emergency Response Procedure
ESD	Emergency Shut Down
EPA	Environment Protection Authority (NSW)
ER number	Internal (Santos) emergency response telephone number
H&S	Health and Safety
HAZOP	Hazard and operability
HIPAP	Hazardous Industry Planning Advisory Paper (DP&E guideline document)
HS	Health and Safety
IMS number	Code identifier number
IBC	Intermediate bulk container
IR	Infra-Red
JHA	Job Hazard Analysis
L1	Level 1
L2	Level 2
LEL	Lower Explosive Limit

LOC	Loss of containment
LTIFR	Lost Time Injury Frequency Rate
MDCR	Master Data Change Request
MW	Mega Watt
NPI	National Environmental Pollutant Inventory
P&IDs	Piping and Instrument Diagrams
PDCR	Santos' change control system
PIDs	Piping and Instrument Diagrams
PAL	Petroleum Assessment Lease
PEL	Petroleum Exploration Licence
PM	Preventative Maintenance
PPE	Personal Protective Equipment
PSV	Pressure Safety Valve (no distinction made between pressure safety and pressure relief valves in this audit)
PV	Pressure Vessel
PTW	Permit To Work
SCADA	Supervisory control and data acquisition
SDS	Safety Data Sheet
SH&E	Safety, Health and Environment
SMS	Safety Management System
SOPs	Standard Operating Procedures
TAFE	Australian education and training provider
TEG	Triethylene glycol, liquid desiccant system for the removal of water from natural gas in the gas stream entering the WPPS site
TRACESS	Database used for training purposes
UPS	Uninterruptible Power Supply
WO	Work Order
WPPS	Wilga Park Power Station Expansion

REPORT

1 Introduction

1.1 Background and Scope

This report constitutes the results of the formal 2019 Hazard Audit, in accordance with the NSW Department of Planning (NSE DP&E) requirements, for the operations associated with developments which form part of the Narrabri PEL 238 Project, operated by Santos Limited's since November 2011 (Condition 3.6 - MP 07-0023).

It updates the Hazard Audit carried out in 2012 which was approved subject to a verification audit carried out in 2015.

The requirement for a hazard audit forms part of the Project Approval, which specifies that the Applicant shall carry out a comprehensive hazard audit of the proposed development and submit a report on the audit to the Director-General.

This Hazard Audit has been scheduled to coincide with the 90 days of exceeding 12MW generation at Wilga Park power station, as per the requirements in the Conditions of Consent for the development.

Karin Nilsson, Principal Risk Consultant with Planager Pty Ltd, lead the audit and prepared this report. The NSW DP&E approval of Karin as Lead Auditor is presented in Appendix 1.

The report is written in accordance with the guidelines used by the Department of Planning for Hazard Audits as set up in their Hazardous Industry Planning Advisory Paper No 5, *Hazard Audit Guidelines* (Ref 1).

1.2 DATES, TIMES AND LOCATIONS

The audit was conducted over one full day and two part days (18-20 February 2019). The timesheet for the audit is presented in Appendix 2.

The audit covered the following locations:

- Operations and maintenance base at Narrabri
- Bibbiwindi Compressor Station (BCS)
- Wilga Park Power Station (WPS)

1.3 OBJECTIVES AND AIM OF THE AUDIT

The objective of the Hazard Audit is to assess the operations associated with Santos Limited (Santos) developments which form part of the Narrabri PEL 238 Project against the requirements for safety management by the NSW DP&E. The fundamental objectives of the hazard audit are:

- To assess whether the operations are being conducted and managed in a manner such that all the terms of the Ministerial Consent document relevant to the safety of the site are being met;
- To identify areas where improvements to operational and organisational safeguards are required with respect to safety, health and the environment;
- To recommend appropriate measures required to improve safety, health and environment deficiencies in the areas identified.

The scope of the audit encompassed:

- The above ground tie-in's located at Bibblewindi, Bohena and Wilga Park Power Station.
- The gas collection plant (and associated emergency flare) located at Bibblewindi Compressor Station (BCS).
- Gathering lines and gas flow lines.
- The Wilga Park Power Station Expansion (WPPS).

The Hazard Audit was undertaken by Karin Nilsson, Principal Risk Consultant with Planager Pty Ltd.

The audit was conducted over one full day and two part days (18-20 February 2019). Planning and preparation for the audit was conducted in the weeks leading up to the audit.

1.4 REQUIREMENTS OF THE AUDIT

The Hazard Audit included both the hardware and management aspects of the development. The term "hardware" covers facility and equipment, instrumentation and control systems, protection systems etc. The term "management" is used to denote people systems and people factors and covers the following items:

- Organisation (formal, emergency, tasks and roles)
- Methods and procedures
- Knowledge and skills (operator and maintenance employee training; ability to recognise faults and take corrective action)

- Attitudes towards tasks (reflecting whether the software systems are functioning effectively).

It is essential that the hardware and software aspects complement each other. For example, elaborate control and protection systems may be built into the installation based on rigorous hazard analysis. However, without regular inspection and testing their performance would deteriorate so that they would be ineffective when a demand is placed upon them. The performance of the management system of safety controls is a key element in effective risk management.

1.5 STATUS OF PLANT AND FACILITIES AND MAJOR CHANGES SINCE LAST AUDIT

At the previous (2012) Hazard Audit, Santos had recently taken over management of PEL238. Since their takeover in 2011, Santos has identified a need to expand on the management systems used for the PEL238 plant and equipment to match the expansion of the operation and Santos' internal health, safety and environmental requirements. During the 2012 Hazard Audit, a major improvement project was underway to upgrade the systems in use for operations and maintenance and the majority of the plants and process associated with PEL238 were shut down in anticipating the implementation of this upgrade project. The Hazard Audit 2012 therefore covered largely shut down plants and the audit focussed both on the systems currently in place and on the systems proposed after implementation of the upgrade project.

In the present 2019 Hazard Audit, the facilities are largely operational, and the management systems used for the PEL238 plant and equipment has been developed to match the expansion of the operation and Santos' internal health, safety and environmental requirements. The compressor station at Bibbiwindi remains however non-operational in anticipation of being put into service sometime in 2019.

The following changes have been made to the facilities which form part of the Hazard Audit scope:

- Two new 3MW generators are being constructed at the WPPS, bringing the total power generation to 22MW.
- A 50ML water tank has been constructed and commissioned. It is used for field water (gravity drain into tank and then from tank into Leewood pond).
- The Dewhurst south flow line was constructed and commissioned in 2018.

The last well associated with the PEL238 was drilled in 2014 and there has been no wells plugged and abandoned in the audit period.

2 METHODOLOGY

The Hazard Audit covers a critical examination of the systems and procedures, which exist in order to operate and maintain the facility for the purpose for which it was designed. This requires a review of the documentation systems at the plant and records of the facility's operational history since the last audit. In particular, it requires a review of the degree and frequency with which operating conditions vary from the design intent.

The audit covered the following topics:

- Plant and Process Systems
- Process Operator Training
- Maintenance Procedures
- Safety Training of Employees
- Plant Modification Control
- Testing of Protection Systems
- Electrical Equipment Handling
- Unusual Incident Reporting
- Injury/Accident Reporting
- Fire Protection and Training
- Emergency Procedures
- Management Safety System
- Security of Premises
- Environmental Protection

Details of the topics covered are listed in Appendix 3.

2.1 BASIC APPROACH

This hazard audit has been conducted in compliance with the guidelines in the NSW DP&E Hazardous Industry Planning Advisory Paper No. 5 (HIPAP5) *Hazard Audit* (Ref 1).

The remit of the audit was discussed with the Santos Narrabri Principal Advisor Compliance prior to the audit, and the outline of the scope of the audit was presented prior to the audit proper.

This outline was then communicated with the people involved in the audit. This allowed the requirements of the audit to be canvassed within the facility, which

in turn allowed planning of the appropriate people to be available during the audit.

The audit proper started with an opening meeting on the first day (refer Appendix 4 for attendance), where the scope and methodology of the audit were discussed.

In broad terms, the methodology used was that of conducting detailed interviews with key operations, safety, engineering and maintenance personnel. A site tour was also conducted. Personnel within a “vertical cross-section” of the operation were interviewed. Documents obtained or sighted, which were deemed to be of particular interest with respect to the present audit, have been listed in Appendix 5.

2.2 METHOD OF ASSESSMENT

For the purposes of this hazard audit the method of the assessment of safety in operation and management, in broad terms, was based on seeking answers to the following questions, applied to each of the topics listed in the scope:

- Were all assumptions made in previous hazard analyses and associated hazard and operability studies incorporated into the final design?
- Do all the assumptions embedded in the facility hardware or software remain effective and are they still relevant to the present operation?
- Do all management policies and procedures set in place regarding plant operation and maintenance remain adequate to ensure compliance with all relevant regulatory authorities (as well as the Conditions of Consent)?
- Are the internal management controls sufficient to ensure policies and procedures are carried out and records kept that demonstrate this performance?
- Have the procedures and controls been operating effectively throughout the period under consideration?

2.3 PERSONNEL INTERVIEWED

The following personnel were interviewed during the hazard audit:

- | | |
|------------------|---|
| ▪ Ron Anderson | Principal Advisor Compliance |
| ▪ Sandeep Bansal | Snr Electrical & Controls Engineer & WPPS Expansion Project |
| ▪ Terry Coker | Field Operator / Maintenance technician |
| ▪ Todd Dunn | Operations Manager |
| ▪ Burt Evans | Field Operator / Maintenance technician |
| ▪ Abby McClure | Operations Coordinator |

- Nathan Melton Team Leader Narrabri Operations
- Michael Hewett Field Risk Advisor
- Brendon Ward Maintenance Planner

3 SITE OVERVIEW

3.1 SITE LOCATION, SURROUNDING LAND USES

The operations at Narrabri involves the collection in a series of CSG gas wells and delivery to the Wilga Park facility.

The PEL238 excludes the operation of the gas wells but includes the following facilities:

- The above ground tie-in's located at Bibbiwindi, Bohena and WPPS;
- The gas collection and compression facility (and associated emergency flare) located at BCS;
- Gas gathering system and gas flow line;
- The WPPS.

The gas gathering system traverses the Pilliga East State Forests incorporating the Bibblewindi State Forest.

The BCS is located at Bibblewindi, within the Pilliga East State Forest incorporating the Bibblewindi State Forest. It has never been commissioned but it is expected to be put into service sometime in 2019.

The gas flowline consists of a 33 km long flowline. The first 15 km from the facility is in the Bibblewindi and Pilliga East State Forest, the balance is in >95% cleared grazing land.

The WPPS is located in >95% cleared grazing land.

A map of the area showing the location of the above development is presented below.

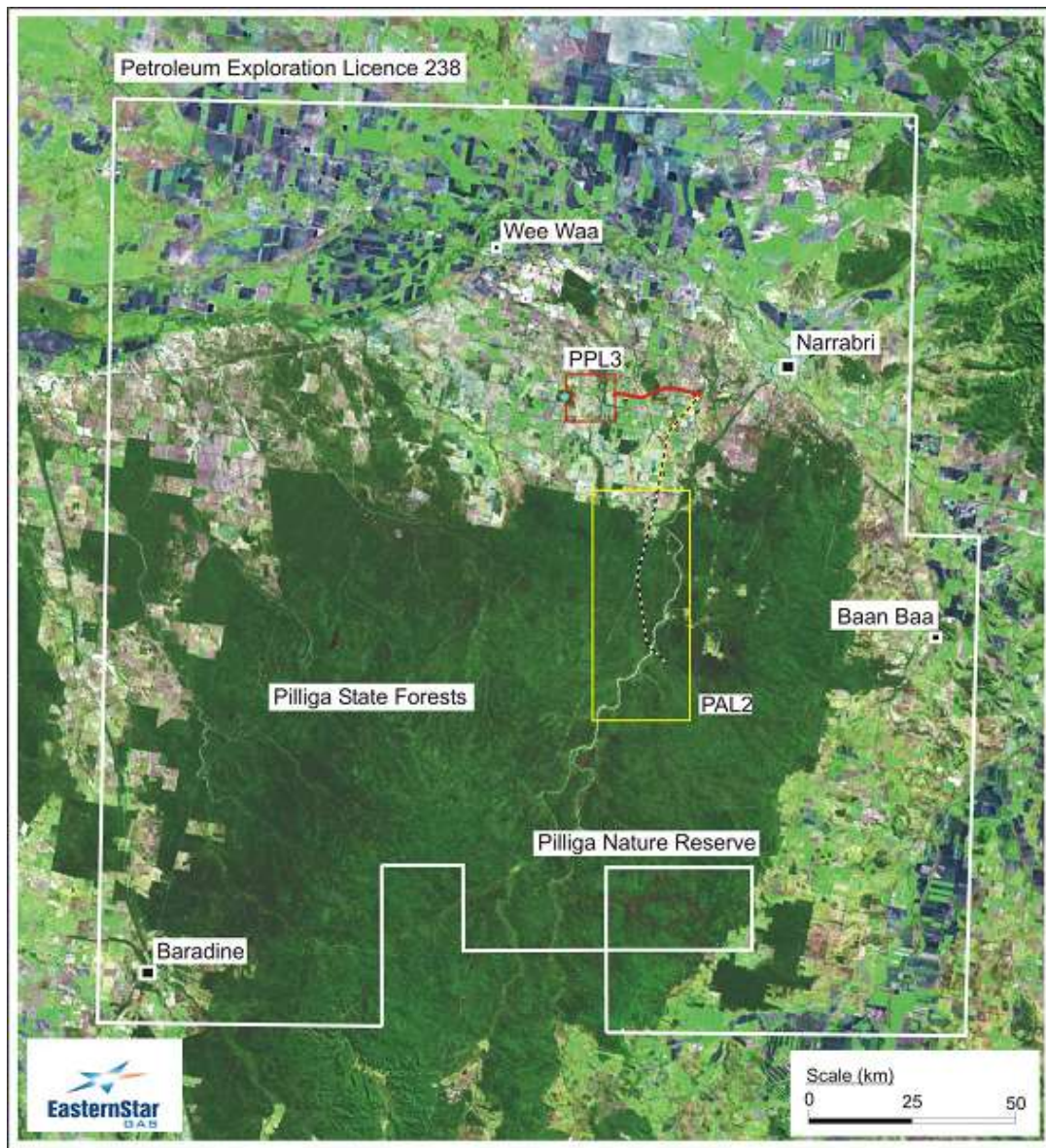
3.2 STAFFING AT WILGA PARK POWER STATION

One to five persons during normal operating hours (7am to 4pm, 7 days) and maximum 2 persons outside operating hours.

3.3 STAFFING AT BIBBIWINDI COMPRESSOR STATION

Normally unmanned.

Figure 1 - Location of Exploration, Assessment and Production Titles



3.4 ACCESS AND SECURITY

3.4.1 Wilga Park Power Station and Bibbiwindi Compressor Station

WPPS and BCS are set up to operate 24 hours/day, 365 days per year.

The facilities are surrounded by a six foot high security fence topped with barbwire.

There are at least two points of entry to each one of the enclosures. The gates are locked.

Closed Circuit Television (CCTV) have been installed at WPPS, BCS and Narrabri offices.

3.4.2 Road Tanker Unloading and Loading

Tanker loading and unloading is limited to the occasional topping up of spent oil and delivery of coolant (actually a corrosion inhibitor) and the removal of either once spent as well as produced oily water from the oily water separator. This happens about quarterly. Any tanker transfer would be supervised by the WPPS or BCS operator.

3.5 SITE LAYOUT

The WPPS site includes the original Power Station A as well as Power Station B. The power station is licenced for 40MW power generation.

Current power generation is 16MW, generated as follows:

- Power Station A: four (4) generators, each of 1MW capacity, to a total of 4MW.
- Power Station B is licenced to have a maximum of ten (10) generators.

Four (4) are currently installed and operational, each of 3MW capacity, to a total of 12MW;

Another two (2) generators, each of 3MW capacity, are being constructed and will be operational in the coming months, bringing the total power generation from site B to 18MW and the total from WPPS to 22MW.

4 STATUS OF IMPLEMENTATION OF ACTIONS FROM THE 2012 HAZARD AUDIT

The Department's approval of the 2012 Hazard Audit report noted that, as a major part of the facility was shut down at the time of the audit, the audit focussed both on the systems in place during the audit and on the systems proposed after implementation of the upgrade project.

The Department consequently approved the 2012 Hazard Audit subject a Verification Audit being conducted. The verification audit was carried out in 2015, focussing on the implementation of the recommendations from the 2012 Hazard Audit.

The 2015 Verification Audit verified the implementation of actions and opportunities of improvement in the 2012 Hazard Audit report. It found that all audit recommendations had been completed and closed out with the exception¹ of Hazard Audit 2012 Action of the spillage containment at the truck loading location at BCS and WPPS.

The table below details the status of implementation of the actions and opportunities for improvements identified and committed to by Eastern Star Gas, former operators of the Narrabri Operations of PEL 238 during the 2009 Hazard Audit.

Table 1: Results of the 2015 Verification Audit, Closeout of 2012 Hazard Audit Actions

2012 Hazard Audit Actions	2015 Verification Audit Results	2018 Hazard Audit Results
Action 1: Determine requirement for Confined Space warning sign inside WPPS (near the oily water separator) and at the tanks outside the WPPS compound (near the entry gate).	Confined Space warning signs have been installed as per requirements. Action CLOSED	No remaining issues relating to confined space management identified in this audit. Action REMAINS CLOSED

¹ An opportunity for improvement for control of corrosion at ground entry and exit locations at gas wells was identified – however it is not discussed in the 2019 Hazard Audit report as it is outside of the scope of the audit

2012 Hazard Audit Actions	2015 Verification Audit Results	2018 Hazard Audit Results
<p>Action 2: Ensure spillage containment is provided at the oily water truck loading location (both BCS and WPPS), in accordance with AS1940 (Para 8.6.2), during removal of oily water from the tanks.</p>	<p>Spillage containment provided in the form of portable spill trays which are positioned during removal of oily water from the tanks. The measure assures containment of minor drips and small spillages.</p> <p>It does not however adhere to requirements in para 8.2.6.2 <i>Capacity of spillage control system</i> (AS1940:2004 <i>Storage and handling of flammable and combustible liquids</i>).</p> <p>The capacity of the spillage control system at the oily water truck loading location (both BCS and WPPS) to be upgraded to adhere to para 8.2.6.2 in AS1940:2004 <i>Storage and handling of flammable and combustible liquids</i>.</p> <p>Action OPEN (spill trays provided do not provide adequate containment)</p>	<p>Spillage containment is now provided at the oily water truck loading location (both BCS and WPPS)</p> <p>Action CLOSED</p>
<p>Action 3: Proceed with the implementation of the agreed roll out of Competency Based Training modules for Operations and Maintenance representatives.</p>	<p>Competency Based Training modules for Operations and Maintenance representatives fully rolled out.</p> <p>Action CLOSED</p>	<p>Training of operators and field personnel audited in 2019 with the results in Section 6.2. No further action identified.</p> <p>Action REMAINS CLOSED</p>
<p>Action 4: Proceed with the implementation of the preventative / corrective maintenance testing and inspection program (MAXIMO).</p> <p>Include contractor managed tests and inspections of critical protective systems (e.g. fire protection equipment).</p>	<p>The preventative / corrective maintenance testing and inspection program is rolled out and includes contractor managed tests and inspections of critical protective systems.</p> <p>Action CLOSED</p>	<p>Inspection and maintenance as well as repairs are managed through preventative maintenance system.</p> <p>Action REMAINS CLOSED</p>

2012 Hazard Audit Actions	2015 Verification Audit Results	2018 Hazard Audit Results
Action 5: Ensure Pressure Vessel and Pressure Safety Valve inspection and testing are carried out as per Legal requirements (minimum) and any Santos requirement.	Pressure Vessel and Pressure Safety Valve inspection and testing schedules established. Action CLOSED	Pressure Vessel and Pressure Safety Valve inspection audited in 2019 and reported in Section 7. Registers remain available and no further action identified in the 2019 audit. Action REMAINS CLOSED
Action 6: Determine whether any spare emergency repair equipment are required in the Gunnedah operations facilities, example may be the flare ignitor.	The flare ignitor at BCS is not classified as emergency equipment and not included as a spare. Action CLOSED	No issues identified in the 2019 audit. Action REMAINS CLOSED
Action 7: Determine whether safety shower/eye wash station and flare ignitor are critical protective systems (and need to be included in the Critical Function Testing Program).	Safety shower/eye wash stations tested in accordance with set regime. Flare ignitor is not classified as emergency equipment. Action CLOSED	No issues identified in the 2019 audit. Action REMAINS CLOSED
Action 8: Proceed with the implementation of the bridge register and implementation procedure (for bypassing of trips during testing).	Bridges would be managed under tight control as per Santos procedure. Action CLOSED	Bridge registers still available as per Section 7.4 in this report. Action REMAINS CLOSED
Action 9: Establish out-of-service equipment protocol for critical items equipment (e.g. gas detectors etc.). Communicate system to technical staff.	Santos operates a formal system to manage any equipment that is taken out of service. Action CLOSED	No issues identified in the 2019 audit. Action REMAINS CLOSED
Action 10: Proceed with implementation of outstanding actions identified during the High Voltage audit.	Actions identified during the High Voltage audit are implemented. Action CLOSED	No issues identified in the 2019 audit. Action REMAINS CLOSED

2012 Hazard Audit Actions	2015 Verification Audit Results	2018 Hazard Audit Results
<p>Opportunity for improvement (OFI) 1: Check corrosion at the gas line at ground entry location at wells (e.g. Bibbiwindi well #25 showed signs of external corrosion and the ground was pushed up over the wrapping).</p>	<p>No corrosion was identified at Bibbiwindi well #25. The ground level was above the wrapping at well #25. Wells are outside of the scope of this audit.</p> <p>Include (e.g. on inspection sheet) need to inspect ground entry and ground exit locations during well inspections for any signs of corrosion, end to check that the wrapping is to be <u>above</u> the ground.</p> <p>Action OPEN (this action is outside of the scope of this audit)</p>	<p>Outside the scope of this Hazard Audit. However, photos supplied for wells at Bibbiwindi (numbers 23, 24 and 25) confirm that this issue is being managed,</p> <p>ACTION CLOSED</p>
<p>OFI 2: Check the external corrosion at BCS (corroded bolts etc.) to ensure that this does not represent a loss of mechanical integrity of the plant.</p>	<p>Integrity (Santos) Engineers and have inspected BCS with no concerns regarding corroded bolts. Further, Santos Operator / Maintenance technician personnel confirm that when the bolts have been removed the corrosion is only on surface, with no loss of integrity.</p> <p>Action CLOSED</p>	<p>No further issue identified in the 2019 audit.</p> <p>Action REMAINS CLOSED</p>
<p>OFI 3: Evaluate requirement for second E-stop button to be located outside of the offices at BCS (currently only one button located inside offices).</p>	<p>BCS has not been started up and hence the E-stop has not been added as yet.</p> <p>Ensure E-stop button is added outside the offices before BCS is started up.</p> <p>Action OPEN</p>	<p>The E-stop has been added to outside of the offices at BCP.</p> <p>ACTION CLOSED</p>

5 HAZARD AUDIT OF PLANT EQUIPMENT AND OPERATIONS

5.1 PLANT, MATERIALS AND PROCESS SYSTEMS

Question	Item OK? (Y / N)	Document/ Person	Status / Description	Recommended Actions
1. The nature and quantity of material stored, handled and processed	Y	Plant tour. Interviews	<ul style="list-style-type: none"> - CSG is transferred from the gas wells to the BCS for gas:water separation and then onwards to WPPS for use as fuel in generators. BCS is currently not in operation but will, from mid 2019, be used to compress the gas. - <i>Diesel</i> is stored at BCS in double containers - <i>Oily water</i> separators at BCS and WPPS located in a lined bund. Oily water also at WWPS inlet into IBC (inside chain fence) - <i>Lube oil</i> and <i>engine oil</i> at WPPS and BCS. - <i>Oily water</i> at WPPS underground tank - <i>DGs</i> (small amounts) in cabinet at BCS. - <i>Glycol</i> used in at WPPS for drying the gas. 	
2. Identify materials harmful to the environment and what controls are installed / needed (materials to include toxics, flammables, explosives, radioactives, oxidisers and biologicals)	Y	-"	<p>Flammable Coal Seam Gas (natural gas) is the predominant component.</p> <p>Environmentally pollutant material (brine, glycol water mix, oil, diesel).</p>	

Question	Item OK? (Y / N)	Document/ Person	Status / Description	Recommended Actions
3. Physical condition of equipment, storage, pipelines, buildings and structures. Standard of maintenance.	Y	Plant tour. Interviews	<ul style="list-style-type: none"> - BCS: Station appears well maintained. No visible signs of spills or leaks. Housekeeping is good. Mechanical impact, corrosion or overstressing of plant equipment not visually detected. Refer 2012 Hazard Audit OFI2 regarding corrosion at bolts. - WPPS: No visible signs of leaks or oil spills; ground is clean and well maintained. The bund (oily water tank) is clean. New tanker loading area is clean with no visible signs of spills. Housekeeping is good. Some corrosion at gas inlet area. - Flow line: Unable to inspect underground line. 	
3. Warehouses – adequacy of the stacking height, aisle spacing, fixed fire protection and equipment	Y	-"	No warehousing at BCS or WPPS.	
5. Labelling and identification of equipment/ valves/instruments/pipes	N	-"	Pipelines and vessels at the WPPS are labelled. Confined space signs available. Signs adequate at fire extinguishers. Signs at generator housing for WPPS. DG sign at DG storage at BCP adequate. No issues identified.	
6. Are all items of equipment and control functioning satisfactorily	Y	-"	<ul style="list-style-type: none"> - BCS: Compressor was never commissioned but is expected to be commissioned mid 2019. The gas:water separation operates satisfactorily. - WPPS: One generator is out for repair 	
7. Is the plant operating as designed	Y	-"	Plant is designed for 10 generators at 3MW each. Currently only four are installed with an additional two being installed. BCS is running at low pressure without the compressor – expected to be commissioned mid 2019.	

Question	Item OK? (Y / N)	Document/ Person	Status / Description	Recommended Actions
8. Is rotating equipment 9. Is it guarded	Y	-"	- BCS compressor is not commissioned but is guarded. Pumps for oily water separator are guarded. - WPPS pre-chamber gas compressor and generators are guarded.	
10. Support structures	Y	-"	Support structures at the WPPS & BCS appear sturdy and in good condition with no visible corrosion.	
11. General housekeeping of premises	Y	-"	Housekeeping is good at WPPS, BCS and the Narrabri Centre (also at the workshop). The small DG store at BCS is in good condition and clean.	
12. Asbestos register	Y	-"	No asbestos.	
13. Adequacy of containment systems	Y	-"	- Spillage containment provided at the oily water truck loading location (both BCS and WPPS). - Oily water separator banded both at WPPS and at BCS. Valve in oily water bunds were closed during the audit. - Diesel storage (x2 tanks) at BCS are "double containment" type. - DG storage appears adequate and to regulatory requirements. - Removal of oily water from the oil:water separator is done on an infrequent schedule using a truck. No spillage containment is provided at the truck loading location (both BCS and WPPS) in accordance with AS1940 (Para 8.6.2).	
14. Siting of storage vessels and storage areas	Y	-"	- BCS: Separation distance between oily water separator and processing areas appears adequate. DG storage cabinet is provided, complete with segregation chart available on the wall of the cabinet. - WPPS: Site is well spaced. Hazardous Area classified site is clearly shown using chain.	

Question	Item OK? (Y / N)	Document/ Person	Status / Description	Recommended Actions
15. Assess effects of fires on control rooms, off-site facilities to determine any layout issues	Y	-"	<ul style="list-style-type: none"> - BCS: A bush fire may affect people working on site and a procedure is included in the emergency response plan. Office area is separated from process plant and equipment.. - WPPS: Generators are separated from the Control Room. An incident at one genset may affect adjacent gensets, causing damage. 	
16. Adequacy of access and egress points, roadways for emergency vehicles	Y	-"	<ul style="list-style-type: none"> - BCS: Access through gates available in opposite directions of the site. Road access is in good condition and sized about 6 m wide, adequate for emergency vehicles (used by County Fire Services). - WPPS: Access through gates in opposite directions. Access to site is via main roads, which is in good condition. - Gas generator enclosure: 2 egress points. 	
17. Adequacy of emergency stop button locations. Fire alarms. Location, audible, visual. 16. Any sirens?	Y	-"	<ul style="list-style-type: none"> - BCS: There is only one E-stop button available on site, located inside the site-office. A second E-stop button located in the open (possibly near the exit) would be useful / recommended in an emergency when people are to evacuate the site as a first step (rather than potentially first having to climb the stairs to the site-office) - E-stops at WPPS (plus several local to equipment) appear to be adequately located and clearly marked with red band. Strobe light inside generator enclosures. Siren out in the yard. Fire panel available outside the generators, showing gas detectors. - Visual evacuation sign at Generator G03B available and working. 	
18. Possible to reduce storage volumes	Y	-"	<ul style="list-style-type: none"> - BCS and WPPS: Very small DG storage volumes at BCS 	
19. Loading/unloading	Y	-"	Refer # 11.	

Question	Item OK? (Y / N)	Document/ Person	Status / Description	Recommended Actions
operations (consider overflow, drive-away and hose rupture etc.)				
2-. Transport routes minimise off-site risk?	Y	-"	Minimal transporting of material to and from the sites (only lube oil, coolant, oily water). Sealed roads.	
21. Number of operators adequate	Y	-"	<ul style="list-style-type: none"> - BCS: During normal operation the site is unmanned. - WPPS: During normal operation the site is manned by two operators. - Both sites: Critical alarms are SMSed (priority escalation). Possible to log onto SCADA remotely using laptops. 	

5.2 PROCESS SAFETY INFORMATION

Question	Item OK? (Y / N)	Document/ Person	Status / Description	Recommended Actions
22. Identification of Hazards and Risk Assessment	Y	Significant Hazard Register	<p>Significant Hazard Register available. Updated every two years. Covers all operations within the Narrabri operations. Reviewed by Operators, Supervisors, Team Leaders, Environment Advisors and H&S Advisors. Hazards and risks identified include H&S, environment, and process safety type incidents.</p> <p>Fire Safety Study redone in 2015 and is now updated again (refer #116).</p>	

Question	Item OK? (Y / N)	Document/ Person	Status / Description	Recommended Actions
20. Assumptions in hazard analysis study incorporated in plant hardware	Y	Appendix S Hazard and risk assessment in EIS Nov 2016 (GHD) for facilities in the scope of this audit	Assumptions included in the risk assessment conducted for the project are incorporated in plant hardware.	
23. Materials inventory system and records	Y	Interviews	Operating conditions and trends available	
24. Pre Start-up Safety Review	Y	Interviews Attendance to pre-start up morning meeting. EHS Toolbox meeting minutes – listing + minutes	Pre-start up meeting conducted each morning 7am-7.20am, attended by all.	
25. Master P&IDs and process flow diagrams available an up-to-date	Y	Master P&ID folder myPlant servicer for all PIDs PIDs 6765-010-PID-0011/0013/0016/0030/0003	A comprehensive set of P&IDs are online (myPlant for WPPS, BCP). P&IDs redpen mark-ups for changes. WorkOrder to update P&IDs.	

5.3 PLANT MONITORING AND PROCESS CONTROL

Question	Item OK? (Y / N)	Document/ Person	Status / Description	Recommended Action
26. Adequacy of control systems in control room, field panels etc.	Y	Interviews. Site visit and SCADA screens. Demonstration of HP tablet	-Control panel at each generator unit and main control panel for WPPS. - BCS transfers alarms to phone. One supervisor with access to a Santos manager on-call 24/7. Possible to shut down wells and compressors from remote. - HP tablet currently available for each operator	
27. Adequacy of protective systems (Alarms and Trips, Need for redundancy)	Y	Plant tour. Interviews	- <i>WPPS and BCP overview</i> : Fully automated system with automatic shutdown in case of exceedance of process parameters (overpressure, high voltage "spikes", essential energy "spikes", over temperature). Pressure relief valves available. - <i>WPPS generator building</i> : 1xgas detector (L1 @ 20% LEL initiates fans; L2 @ LEL=40% ESDs engine & shuts natural gas inlet valve, closure of louvers and shut-down of fan to the affected generator) & 2xIR detectors in generator enclosure. Smoke detector at fire panel (electrical cabling in this area). No blow-out panel available (low pressures, low voltage). ESD on gas inlet pipe. HAZOPs conducted for gathering line, flowline and WPPS; actions closed out. Appears adequate. - <i>Gas gathering / flow lines</i> : Wells critical trips include high/low gas & water pressure, separator level, high water pump torque. Pressure relief on the well heads, separator and manifold gathering line provide 2 nd level of defence. HAZOPs and other appropriate risk assessment techniques used for changes to plant and new plant (refer Section 7). Overall, no issues identified.	
28. Manual control available	Y	Interviews	WPPS BCP are highly automated with critical alarms.	

Question	Item OK? (Y / N)	Document/ Person	Status / Description	Recommended Action
29. Coping with Loss of Utilities	Y	Interviews	<ul style="list-style-type: none"> - Loss of remote control and SCADA: WPPS ESDs (SCADA is still available at Narrabri Admin; also alarms are still coming through on HP tablets); for wells the SCADA is backed up by UPS for DC supply (solar batteries). - Loss of utilities at WPPs (electricity, gas and water (for safety shower / eye wash stations): WPPS ESDs. - Loss of power: Safe shutdown of WPPS and BCP initiated. UPS (Uninterrupted Power Supply) available for critical control functions. BCP has diesel backup generator (auto-start 30 sec – can run everything). - Communication failure: Shutdown mode of plant is not affected. Data-logger (independent from SCADA, hard drive), can hold 30 days of data. 	
30. Process systems monitoring records, e.g. operator logs, alarms and trips – review to determine plant history	Y	Daily morning report Interviews Operator routines at WPPS (daily routine, operator data booklet)	Operators carry mobile phones for all alarms. <ul style="list-style-type: none"> - WPPS daily routines check for trends on each individual generator. - BCP no longer use operator logs. Reliance on historian. 	
31. Maintenance Workers Logs	Y	-"-	Maintenance of plant and equipment is carried out by operators. Operator logs are used.	
32. Response on power failure (UPS available and tested)	Y	Interviews	See item number 29 above.	

Question	Item OK? (Y / N)	Document/ Person	Status / Description	Recommended Action
33. Fail safe response (also on restart)	Y	Interviews	All 3MW Units can be restarted remotely. 1MW require manual, local restart. All generators are AS3814 Type B certified = non hazardous (criteria based on pressure). Start-up sequence includes louvres opening, room fan on, scavenger fan exhausts natural gas from exhaust..	
34. Failure history recorded	Y	Interviews	Electronic historian in SCADA system (data-logger) independent from SCADA, hard drive). Holds 30 days of data. Daily report generated – sent automatically to each operator, Ops Team in Brisbane and to Operations Manager.	
35. Records of spurious and real trips	Y	Interviews	Electronic historian in SCADA system	
36. Operator knowledge (and training) of control systems	Y	Site visit to BCP and WPPS	Operators and Supervisors on plant have many years of experience as operators at BCS and WPPS.	
37. Control system changes documented	Y	Interviews and Interviews P&ID markups Project documentation	Formal control of change to the control system through Santos <i>Management of Change</i> process. Includes requirements for control of changes to hardware, software, procedures, organisational structures, feed / product specifications and legislation / statutory requirements.	
38. Documentation on the installation and testing of both hardware and software systems	Y	-"	Control system set up as per vendor guides. Testing etc. as per vendor guides.	

6 OPERATIONAL CONTROLS

6.1 OPERATING PROCEDURES

Question	Item OK? (Y / N)	Document/ Person	Status / Description	Recommended Actions
39. Do they exist	Y	SharePoint database	- SOPs available on SharePoint database.	
40. How often are they reviewed	Y	SharePoint database for SOPs, List of SOPs, WO #20882717 for updating SOPs	Some are relatively old (2014). There is a WO for updating SOPs (WO #20882717).	
41. Who is authorised to make changes	Y	Interviews. Dewhurst flare MOC	Anyone can recommend a change. Management of change process for SOP changes. Peer review to determine whether change should be made. Approval of change depend on the level of risk.	
42. Do Safe Work Practices exist. Are they different to actual work practices. Are the different to Operating Procedures.	Y	SharePoint database for SOPs, List of SOPs	SOPs include step-by-step explanations, photographs etc.	
43. Method sheets with quick summaries or checklists used / required	N/A	SharePoint database for SOPs, List of SOPs	Refer item number 42.	
44. How does the Supervisor know how well the procedure is working out	Y	H&S critical control verification work inspections forms; register; example CCV for	Critical Control verifications inspections are carried out for tasks and procedures. Register shows 6 done since Jan 2019 (2 per month). Included as requirements in Improvement Plan for Operations Manager and visiting Operations management. Narrabri operations are committed	

Question	Item OK? (Y / N)	Document/ Person	Status / Description	Recommended Actions
		work risk management.	to 2xCritical Control Verifications per month. Reported on scorecards to management.	
45. How do Managers keep informed about satisfactory operation of the procedures	Y	-"	Audits and inspections scheduled and reported on a monthly basis. Refer also item number 44 above	
46. Back-up systems (e.g. trip systems) on procedural failures	Y	Interviews, SCADA	Very little manual operation. Fail-safe response on procedural failure. See also item number 29 above.	
47. Are abnormal situations included, e.g. start-up, shutdown, filling, transferring	Y	SharePoint database for SOPs, List of SOPs Startup and Shut-down SOPs for WPPS; SOP for Manually light Dewhurst flare etc.	SOPs for startup / shut down, lighting flare etc. Closeout instructions, signatures and supervisor signatures.	
48. Are process hazards included in procedures	Y	SharePoint database for SOPs, List of SOPs	Process hazards and required controls included in SOPs. E.g. PPE, equipment, hold-points, prerequisites	

6.2 PROCESS OPERATOR TRAINING

Question	Item OK? (Y / N)	Document/ Person	Status / Description	Recommended Actions
49. Training modules (why and what of operation)	Y	TRACCESS Santos LEARNING Monthly	Database TRACCESS used to manage training. Coordinated by responsible person from Narrabri office. Reporting can be viewed in Excel spreadsheet format, showing	

Question	Item OK? (Y / N)	Document/ Person	Status / Description	Recommended Actions
		qualification grid (monthly report for training) 1/2/2019	<p>all names of technical personnel (field and WPPS operators as well as team leaders). Colour coded for Complete, Elapsed etc. Data shows <i>Achieved Practical</i>: 64% and <i>Achieved Theoretical</i>: 100%.</p> <p>Technical training modules include <i>Plant Equipment Operation (Operate Prime Movers); Pumping Systems; Monitor Remote Production Facilities; Wilga Park Power Station Site Specific; Operate and Monitor Valve Systems; Manage wells and gathering systems; Critical Protection Systems Statutory; and Flange and Pipe Fitting..</i></p> <p>Operators & Maintenance personnel also have Cert 4 training (2 years) through TAFE. This training includes recognised Core competency and Field training for operators, Permit Training, Work Safety etc.</p>	
50. Training methods and records	Y	Certificates for Cert 4 training Interviews	For Cert 4: Some exams in the field with Santos trainer. Operators gather evidence of past training and experience. Certificates sent by TAFE to trainee.	
51. What restrictions on operator who has not completed training	Y	Interviews	Checklist for pre-work commencement. New starter required to complete online induction. Local trainers. Monthly review of training grid, with % score for each training area for review by management.	
52. Methods used to evaluate training	Y	-"	Assessment as a "competency based assessment".	
53. Personal precautions in handling flammable or toxic materials	Y	Interviews Induction	TRACCESS under Core Competencies.	
54. Appreciation of hazards, identification and control	Y	Interviews Inductions	Introduction to EHS Management Modules 12 <i>Hazard Management</i> . Using step-back and JSA	

Question	Item OK? (Y / N)	Document/ Person	Status / Description	Recommended Actions
55. Refresher training	Y	TRACCESS database for training, Santos Permit to Work (PTW) system	Santos Permit to Work (PTW) system requires refresher training. Need for refresher training is determined / documented in the TRACCESS database. TRACCESS system has a re-training flag (about one month before expiry).	

6.3 SAFETY TRAINING OF STAFF AND CONTRACTORS

Question	Item OK? (Y / N)	Document/ Person	Status / Description	Recommended Actions
56. Personal safety training and records	Y	Induction, TRACCESS Grid 1/2/19. Notice of intention form	Personal safety training managed in TRACCESS. Includes <i>Workplace Health and Safety; Work Safely at Heights; Provide CPR; First Aid; Safe-Drive Practical Emergency Response; and Environment Awareness.</i>	
57. Induction training of new employees	Y	Induction training program. Interviews. BMP Induction on WPPS 19/2/19	Induction training includes appreciation of hazards associated with plants and materials used and produced. Level 1 and level 3 required by all persons visiting a site. L3 inductions repeated every 3 years. Notice of Intention filled out before accessing Narrabri – allows preparation of induction requirements.	
58 Work permit procedures	Y		Permit holder training for all operators. <i>Certificate of Competency Permit Authority</i> issued. <i>Unit 2.3 Permit Holder - Santos Work Permit Procedure Statutory</i> in the Competency Internal Training TRACCESS. Assessed based on review of actual permits. Currency of training managed through the database (colour coded). Records 1/2/19 show training up to date for all operators incl. field personnel.	

Question	Item OK? (Y / N)	Document/ Person	Status / Description	Recommended Actions
59. Appreciation of inherent hazards in plant and during maintenance Understanding hazard and risk assessment	Y	Induction training program. Safety Register. Interviews. TRACCESS database and training records 1/2/19. Hazard Management training using Stepback in JHA for N Melton	Induction training includes appreciation of hazards associated with plants and materials used and produced. It is a requirement for staff and contractors to undergo Induction training. Permit To Work training (ref #58) includes JHA training. Hazard Management training using Stepback in JHA. A Hazard Register exists, which is reviewed.	
60. Protective clothing	Y	Induction training. Interviews	Induction training includes PPE requirements. Signs throughout WWPS and BCP.	
61. Equipment to be used (e.g. non sparking tools)	Y	Interviews. Induction training. Site visit	Precautions to take when using hand held equipment in Hazardous Areas is covered in the PTW (including JHA). Induction training includes information and need for Permit To Work in case of work within Hazardous Area zone. Contractor supervision requirements, refer Section 11.4.	
62. Control of electrical equipment in classified hazardous areas	Y	Interviews. Induction training. Site visit	Hazardous Area Classification defined for BCS and WPPS (yellow chain). Operators carry gas detectors. Part of engineering reviews - Hazardous Area compliance standard requires equipment to be designed in accordance with hazardous area requirements.	
63. Procedure for outside contractor working on premises	Y	Induction training	Pre-qualifications requirements. Induction training sets requirements for working outside. Contractor supervision requirements, refer Section 11.4.	

7 CONTROL OF SAFE PLANT PERFORMANCE

7.1 MAINTENANCE PROCEDURES

Question	Item OK? (Y / N)	Document/ Person	Status / Description	Recommended Actions
70. Do formal procedures exist (preventative as well as 71. corrective?)	Y	Interviews. Example Work Instructions Integrity & Reliability Managmt Standard. Principal Control Plan; Well Integrity Control Plan; Mechanical Control Plan	Work Instructions available for maintenance activities; some included in WorkOrder other available on SharePoint website. Very simplistic instructions – a good buddying system is required for new staff to be able to complete required maintenance tasks. Non proceduralised activity are covered under a Permit (including a JHA). A Principal Control Plan and a Mechanical Control Plan provide overview of the requirements to control safe plant performance.	
71. Frequency of maintenance	Y	MDCR Integrity & Reliability ST5 – PD2 Production Managemnt of Change. Oracle database	Frequency of testing determined by integrity engineering team in Brisbane. Possible for field to suggest change by using <i>Master Data Change Request</i> (MDCR) – formal approval required by management. Records kept in the Asset Management System <i>Oracle</i> .	
72. Pressure vessel testing schedule. Relief valve installation and testing schedule., frequency of testing Is there a test schedule and available registers	Y	PSV register (listing) Narrabri – Scheduled	PSV and PV testing set as per statutory requirement. Classified as a critical maintenance task. Registers available. Shows all tests and inspections completed to schedule	

Question	Item OK? (Y / N)	Document/ Person	Status / Description	Recommended Actions
73. List of critical valves checked regularly	Y	Interviews. Inspection report for High Voltage. MAXIMO	Relief valves and ESD valves are defined as critical valves. Safety critical (maintenance) reporting.	

7.2 WORK PERMIT SYSTEM

Question	Item OK? (Y / N)	Document/ Person	Status / Description	Recommended Actions
74. Work permit system – cold work	Y	Cold work permit form. Filled in forms. TRACCESS for PTW training	Permit to Work includes Cold Work, Hot Work. Training managed in TRACCESS. Confined Space permit training not included in Narrabri Operations training register.	
75. Vessel entry (independent sheet per confined space)	Y	Confined space permit form	Confined Space permit system is available but no one from Narrabri Operation is trained as permit authority. Confined space entry is only done infrequently at this site and permit authority would be coming in from external to Narrabri when needed.	
76. Hot work clearance system	Y	Hot work permit form and procedure. Filled in PTW forms (various).	A Hot work permit and procedure exists. Requires gas testing, authorisation & acceptance of permit, sign-offs (both issuer and holder). Used when ignition source may be present, e.g. remove, test & replace PSV. Procedure includes definition of hot work; when a permit is required; and need for stand-by person (evidence that stand-by person is used).	
77. Excavation authority (hand-digging vs. machinery)	Y	Penetration permit form	A Penetration permit exists as part of excavation.	
78. How are correct materials of construction verified	Y	Interviews Management of change system	The control of change procedure requires material of construction to be specified	

Question	Item OK? (Y / N)	Document/ Person	Status / Description	Recommended Actions
79. Emergency repair equipment/spares available	Y	Interviews	Repair equipment and spares are available. Spare equipment is held at the Narrabri Operations Centre. No issues relating to emergency repair equipment/spares have been identified.	
80. Isolation procedures	Y	Site visit Interviews	WPPS and BCS can be double-blocked-and bleed. Positive isolation possible.	
81. Line venting/ depressuring / purging procedures	Y	Interviews	Start-up and shutdown SOPs available, refer Items number 39 and 42.	

7.3 ELECTRICAL EQUIPMENT HANDLING

Question	Item OK? (Y / N)	Document/ Person	Status / Description	Recommended Actions
82. Maintenance procedures	Y	Refer item number 70. Electrical Control Plan	Refer item number 70. An Electrical Control Plan is available, providing an overview of safe electrical plant performance.	
83. Defining areas in plant where portable electrical equipment are prohibited	Y	Hazardous Area Drawings; Interviews	BCS and WPPS: Hazardous Area available online. Use of portable electrical equipment requires Hot Work Permit if work is to be performed inside the Hazardous Area zone. Induction training includes information on precautions to take. Portable electrical equipment is registered, including testing of power lines.	
84. Use of earthing straps	Y	Interviews	Earth grid all around the Power Station; fences are linked in to this grid. All generators (all skids) are earthed and earth stakes were tested at installation.	
85. Hazardous area classification drawings	Y	Hazardous Area Drawings	Hazardous Area Classification drawings available at BCS and WPPS. Zones physically shown through use of chains on the plant.	

Question	Item OK? (Y / N)	Document/ Person	Status / Description	Recommended Actions
86. Calibration and set point testing facilities for instruments	Y	Gas detectors	Gas detectors have online testing and calibration.	
87. SCADA system servicing and maintenance	Y	Interviews	No servicing required for the SCADA system.	

7.4 PROTECTIVE SYSTEMS

Question	Item OK? (Y / N)	Document/ Person	Status / Description	Recommended Action
88. Are all protection systems listed (e.g. PSVs, security, safety showers, BA sets, cathodic protection)	Y	Refer items #70 - 73. Testing records for CFT 14/4/15 and scheduled 14/4/19 Safety Critical Maintenance report	Critical Function Testing (CFT) for all critical protective systems including high pressure switches and ESD systems. Protective systems include gas detectors, pressure relief (/safety) valves, fire detectors, safety shower/eye wash stations, flare ignitor, trips & alarms and SCADA. Safety Critical Maintenance report. Includes KPIs (currently 95%). Graph used. Reported monthly. No backlog and no non compliances on the date of the audit. CFTs, fire, PV, PSV included.	
89. Records (view) for testing of critical equipment (e.g. pressure vessels, pipelines, relief systems)	Y	Asset Manager database. CFT 14/4/15 records	Records are scanned into Asset Manager database	
90. Do the processes fail safe	Y	Interviews	See item #29 above.	
91. Testing of trips/alarms/	Y	Refer items #70 - 73.	Documentation of testing, refer items #70 - 73. Failure of any critical function is monitored by	

Question	Item OK? (Y / N)	Document/ Person	Status / Description	Recommended Action
emergency valves procedures documented			Santos engineering group in Brisbane	
92. Where are records kept (view records)	Y	Asset Manager database	Records are kept in database, refer items #70 - 73	
93. Authority to bypass trips during testing	Y	Interviews	Bridge register and implementation procedure available for extended removals (e.g. if operator needs to leave the site). Must be approved by John Higgins. Brought up in weekly meetings. Register shows both closed and active bridges.	
94. Work permit for testing	Y	PTW system	Permits required for critical functions testing of protective systems inside the restricted areas.	
95. Check whether trip re-activated after testing	Y	Refer item #93.	Refer item #93.	
96. Procedure if protection system taken out of service temporarily (i.e. an override list for hardware, bridges, and software)	Y	-"	Santos operates a formal system to manage any equipment that is taken out of service. Must be approved by manager. Also, refer bridge register.	
97. Ventilation air flows	Y	Plant tour, Interviews	Relevant for the generator enclosure. Ventilation air flow automatically established on initiation of the 20% pre-alarm condition of gas detector. Automatic shut-down of air ventilation in case of initiation of IR detector or initiation of 40% gas detector. Also shut-down of process and ESD of WPPS.	
98. Earthing of equipment and electrical continuity	Y	Interviews Earthing System Analysis Report 2012,	A High Voltage audit of WPPS has been performed by Santos, identifying a number of outstanding requirements. A Corporate EHSMS Audit Report conducted in Nov 2015 (final report	

Question	Item OK? (Y / N)	Document/ Person	Status / Description	Recommended Action
		Essential Energy Corporate EHSMS Audit 17-19 Nov 2015 (report 16/3/16) EHS toolbox record regarding status of implementation of audit actions.	16/3/16), covering the following areas: - Electrical Safety - Ignition Control - Critical Protection Stms The audit gave rise to a number of actions. Check against the status of these actions was carried out Sept 2016, with management sign-off.	
99. Corrosion protection systems tested	Y	Plant tour, Interviews	No corrosion protection system installed. Fibreglas flow line; polythene gathering line; galvanised separator etc. Very little external corrosion at WPPS due to dry climate and distance from sea.	

8 CONTROL OF CHANGE

8.1 PLANT MODIFICATION CONTROL

Question	Item OK? (Y / N)	Document/ Person	Status / Description	Recommended Actions
64. How is this documented (view records)	Y	PDCR Process, PDCR Change Owners Tasks, ST-4 MOC Procedure CITRIX platform myPlant	Plant modification control is managed following the requirements under Santos PDCR process. Sits within <i>myPlant OP</i> & applies to management of change for both physical plant and the associated engineering data. Documented through CITRIX platform. PDCR process requirements include need for well documented system.	
65. Who approves modification	Y	PDCR Process, PDCR Change Owners Tasks. Various PDCR documents from the WWPS Expansion Project	Approval from the PDCR System is required before a proposed change can be implemented. Final approval depends on the risk level. Operations Manager approves a Level 2 modification. Level 3 modification requires NSW Operations Manager approval. Etc. The PDCR process requires the change approver to be an <i>operational supervisor from the Asset being affected, site based wherever possible, and with sufficient competency (DOA) to accept the post-change residual risk level.</i>	
66. Who screens and reviews the proposal	Y	MoC for Dewhurst South to Bibbiwindy East December 2018 PDCR Process, PDCR Change Owners Tasks, Various PDCR documents from the	A change proposal is reviewed by the nominees listed on the Change request, as identified by the change initiator. The nominees use the online checklist to screen the impact of the change. The initiator and the nominees sign and date the change. For example, process safety, environment, electrical mechanical, integrity, operations and maintenance screening for major changes (/project). The PDCR process specifies that: <i>Discipline Reviewers are engineers and other specialists responsible for reviewing the details of the change specific to their area of competency.</i> A list of approved	

Question	Item OK? (Y / N)	Document/ Person	Status / Description	Recommended Actions
		WWPS Expansion Project	reviewers is maintained.	
67. How is updating of drawings and operating/maintenance procedures co-ordinated	Y	PDCR documents for the WWPS expansion. Audit Plan, WWPS 2x3MW Generator Installation. Audit Plan, Dewhurst Southern Gas Installation Project	Checklist in PDCR process for requirements to update documentation including drawings and operating and maintenance procedures.	
68. Are HAZOP techniques employed	Y	PDCR process for the WWPS expansion SQAD Health Check – Project Execution Plan Construction Risk / Hazard Punch lists	WWPS project has scheduled a HAZOP 1 st week March. Risk assessment completed. Each project evaluates need / merit to conduct HAZOP and/or risk assessment.	
69. What documentation exists	Y	CITRIX platform	Control of change request is prepared as a formal document. Documentation produced appear adequate through the CITRIX platform.	

9 ACCIDENTS AND INJURIES

Question	Item OK? (Y / N)	Document/ Person	Status / Description	Recommended Actions
100. Reporting system (view records since previous audit)	Y	EHS Toolbox Incident Management Standard SMS-MSII-ST02	EHS Toolbox includes incident management and auditing tool. Includes report data/time, incident date/time, title, department responsible, site, IMS number, (provided automatically). Daily summary reported and detailed in Toolbox. Investigation report can be attached electronically.	
101. Any recurring types of incidents	Y	Incident register	Damaged sign, vegetation, faulty vehicles, electrical hazard observations.	
102. Any significant incidents	Y	Incident register	Near miss driving, hand injury requiring one stitch. Sabotage at WPPS – driving into live flare.	
103. Investigation procedure. Who chairs the investigation team	Y	Morning meeting attendance	All incidents are discussed at the pre-start meeting (refer #24) (daily) attended by all.	
104. Follow up action	Y	Incident register.	Actions are entered as notifications in EHS Toolbox. If action close-out has not been completed within time specified, escalation starts happening, to higher and higher levels within Santos management. EHS Communication meeting 1/month attended by all at Narrabri.	
105. Record maintenance	Y	Incident database, Interviews	Records are held on the EHS Toolbox.	
106. Is an Unusual Incident defined by management (record the major types)	Y	Incident database, Interviews	Incidents include injury, damage to equipment, near misses, third party complaints. Unusual incidents included. Process safety incident included (LOC / process safety exception) –	

Question	Item OK? (Y / N)	Document/ Person	Status / Description	Recommended Actions
			defined as hazard or an incorrect function. Consequences (both actual and potential) are recorded. A recording of Actual >3 and Potential >4 – incident is classified as <i>Significant</i> and requires formal investigation.	
107. Are transport incidents (include off-site) recorded (view records)	Y	Incident database, Interviews	Yes if they occur as part of work. Some near misses registered in the audit period	
108. Publicity for report and action	Y	Procedure and register.	Every employee receives incident reports Santos wide. Discussed at pre-start meeting (daily), refer #103. Santos head office Adelaide reports to the board on incident trends.	
109. Safety targets set by management	Y	Upstream scorecard and KPI targets 2017/18	Safety targets are set by Santos, refer Interviews #142. Include LTIFR (0); Process Safety Tier ½ (0); Environment Tier 3 (0)	

10 EMERGENCIES

10.1 FIRE PROTECTION AND TRAINING

Question	Item OK? (Y / N)	Document/ Person	Status / Description	Recommended Actions
111. Adequacy of fixed and portable protection systems (view test tags)	Y	Plant tour WWPS and BCP WPPS plant sketch showing location of emergency equipment	Fire extinguishers checked twice yearly by external contractor. Extinguishers in good working order, protected. Metal tags confirm testing schedule. No fire water – strategy is to isolate a leak	
112. Types of extinguishers	Y	Plant tour WWPS and BCP Fire Safety Study	A project was carried out prior to 2012 Hazard Audit by an external contractor (FireTalk) to review the fire protection equipment on site (BCS, WPPS). This review included location, type, number etc. A recent Fire Safety Study was carried out	
113. Number and location	Y	Register for fire protection equipment	Register available.	
114. Labelling	Y	Plant tour Asset Register and inspection	Fire extinguishers checked twice yearly. Labelling appears adequate	
115. Accessibility	Y	Plant tour Asset Register and inspection	Fire extinguishers checked twice yearly. Accessibility appears adequate	
116. Adequacy of fire protection system.	Y	Fire Safety Study 2015, plant tour WWPS and BCP	The philosophy for fire protection is to isolate pipelines and let the fire burn out. Fire protection is limited to extinguishers. The philosophy was accepted by the NSW Fire Brigades (now Fire & Rescue NSW) in their review of the Fire Safety Study. Further, the Fire Safety Study was updated Nov 2015.	

Question	Item OK? (Y / N)	Document/ Person	Status / Description	Recommended Actions
117. Dematching system	Y	Interviews. Plant tour. Induction	Box available at WPPS where matches and lighters are to be placed. Signposting at gate. Smoking permitted outside fence.	
118. Who maintains and repairs fire protection equipment	Y	Plant tour Asset Register and inspection	Outside contractors (Cicada). They initiate the inspections of extinguishers.	
119. Inspection and testing frequency (view records)	Y	Plant tour Asset Register and inspection	Inspection of extinguishers appears adequate.	
120. Adequacy and reliability of firewater	Y	Refer #112.	None	
121. Is all critical equipment protected	Y	Plant tour Asset Register and inspection	Fire Safety Study available Regular inspections by fire systems specialists. Regular attendance by engineers to site. Internal Santos audit. Significant Hazards and Risk Register	
122. Fire training/ drill for employees	Y	TRACCESS Exercise preparedness schedule 2019	Extinguisher training in extinguisher use through TRACCESS. Both theoretical and practical training included in training. All employees.	
123. Fire protection manual (does a FSS exist)	Y	Fire Safety Study <i>Gathering, Gas Plant and Sales Flowline</i> (19 Nov 2008). Bush fire plan.	A fire safety study was compiled in conjunction with the Project Approval stage and has recently been updated	
124. Plan or register of fire protection equipment	Y	Extinguisher register	Refer #112	

10.2 EMERGENCY PROCEDURES

Question	Item OK? (Y / N)	Document/ Person	Status / Description	Recommended Action
125. Is there an emergency plan	Y	WPPS Expansion ERP Emergency Response Standard SMS-MS-...-ST01 Pollution Incident Response Management Plan Bush Fire Plan	ERP available, including information on emergency response, muster points, phone numbers, maps and plans. ERPs are reviewed at PTW issuing. WPPS Expansion ERP prepared. Includes links to Santos WPPS 24 hour ER number 0447 483 995	
126. Who gets copies	Y	-"-	ERP includes distribution register.	
127. Does everyone know who is in charge	Y	Emergency response kits	Overall responsibility for the emergency response is with the Emergency Response Team. Kits are available for Planning officer, Operations Officer, ERP Coordinator, Log keeper, Logistics officer, On Scene Commander, etc. Narrabri Operation: Tabards used to show emergency response roles.	
128. Emergency drills conducted regularly	Y	Emergency exercise schedule Emergency drill 31/1/18	Emergency exercise schedule prepared and managed by Santos Field Risk Advisor. Actions from drills are included in EHS Toolbox. Regular meetings with the Local Emergency Management Committee Meeting provides awareness.	
129. Emergency lighting adequate	Y	Plant tour	External lighting available at WPPS, including flood light in the middle of the site and on light pole at site A. No emergency lightning if power failure (site shuts down). Can use diesel generator if needed.	

Question	Item OK? (Y / N)	Document/ Person	Status / Description	Recommended Action
130. Are the following situations covered: - Fire - Explosion - Loss of utilities (power, water, instrument air, nitrogen) - Bomb threat - Flood - Toxic leaks and spills - Computer systems/transponder failure	Y	Emerg. resp. plan.	The following situations are covered: - Fire / Explosion - Bomb threat - Missing personnel - Protest/Civil unrest - Electric shock - Pipeline integrity compromised - Chemical spill / gas release - Vehicle accident - Injury - Confined space emergency Loss of utilities, flood and computer systems / transponder failure are not considered emergencies.	
131. Are off-site effects included and how to handle them	Y	Emerg. resp. plan. Bush fire management plan	Adequate information on off-site effects included and how to handle them. Bush fire management plan available.	
132. Outside services police/ambulance/fire brigade - pre-arrangements with the above	Y	Interviews Minutes from LEMC 22/11/2018	- Part of Local Emergency Management Committee - Bush fire preparedness with RFS (also included are major mines in the area). Police, Forestry, Ambulance, Fire Brigades, Council)	
133. Are duties clearly defined for: - Fire fighting - Security - Safety - Medical contact - Evacuation and roll call - Communications - Media contact	Y	Kits for Planning officer, Operations Officer, ERP Coordinator, Log keeper, Logistics officer, etc.	Kits are available for various roles in the ERP as per #127.	

Question	Item OK? (Y / N)	Document/ Person	Status / Description	Recommended Action
134. System to update emergency procedures	Y	Emergency Response Standard SMS-MS-...-ST01 Emergency and Crisis Management Procedure	Santos Emergency standard sets the requirements for ERPs to be updated.	
135. Whose telephone numbers listed and where	Y	-"	Emergency contact sheet in case. Kit at front office maintenance and in the main office. Telephone number listing includes off-site emergency contacts, hospitals, Narrabri operations office, Santos operations on-call, Operations Manager and Duty Manager	
136. Procedure to update telephone numbers	Y	-"	Tel numbers are updated. During the exercise the phone numbers are tested.	
137. Updating of the emergency plan.	Y		Refer item #134 above.	
138. Is an area specific ERP needed	Y	-"	The ERP provides information on muster points and local phone numbers.	

11 SAFETY MANAGEMENT SYSTEM

11.1 DOCUMENTATION

Question	Item OK? (Y / N)	Document/ Person	Status / Description	Recommended Actions
139. Quality and availability of documents	Y	Santos Management System NSW Operations Narrabri Gas Project Safety Management Plan	Santos Management System available on the internet (replaced the EHSMS in 2017/18). Divided up into EHS Policies, Management Standards and Procedures / Technical Standards. The available document are of good quality. Accessible to all Santos employees.	

11.2 COMMITMENT AND LEADERSHIP

Question	Item OK? (Y / N)	Document/ Person	Status / Description	Recommended Actions
140. Commitment by senior management (ISO, local resident and industrial groups)	Y	Code of Conduct Meeting minutes Management Plans ST-15 Assurance Procedure	Code of Conduct describes commitment by all. Senior Management Team meetings conducted weekly (from Santos head Office). Site Manager expectations set through approval of all Management Plans. Also through attendance to Toolbox talks (each morning), EH&S committee meetings. Also included in proactive tasks.	
141. Policy Available	Y	EH&S Policy, Risk Management Policy	EH&S Policy and Risk Management Policy set Snr Management expectations for operation at Santos facilities.	

Question	Item OK? (Y / N)	Document/ Person	Status / Description	Recommended Actions
142. Audits (internal/ external)	Y	Well integrity audit. Pipeline and vessel integrity audit Env. Audit for Dewhurst South Pilot Audit Plan for WPPS Expansion Project and Dewhurst South Gas Installation Project. COMTRACK database.	- External audits: Well integrity audit conducted by contractor. Plan is to do 100% of wells over period of 5 years. Integrity review of steel sections of the pipeline including any associated vessels (2018). Env. Audit for Dewhurst South Pilot (submitted to DP&E 18/2/19). Environmental Systems audit planned for Aug 2019. - Internal audits: Audit of BCP as part of expansion project. Audit Plan as part of Dewhurst South Gas Installation Project and WWPS Expansion. SH&E audit Nov and Dec 2018 (against 500 items incl. site safety, security, competency etc.) Quarterly compliance audits covering waste, emissions, noise etc. Compliance obligations from audits, regulatory requirements etc. tracked using COMTRACK database.	
143. Process operator training	Y	CBT training packages Training and Competency (ST-14-...-ST09)	Standard available for Competency and Training. Competency based training (CBT) system implemented, refer #49-55.	
144. Contractor personnel training (safety)	Y	Induction Standard for Contractor Induction Training Contractor Supply Chain Procedure (ST--ST01) Form – Contractor Work Commencement Checklist	Standard available for Contractor Induction Training. Includes L1 and L3 for all contractors. Notification of Intent used as a panning tool for visitor training needs. Where relevant, Santos copies high risk licences. Form available <i>Contractor Work Commencement Checklist</i> to allow preparation for contractors accessing site.	

Question	Item OK? (Y / N)	Document/ Person	Status / Description	Recommended Actions
145. Safety organisation and meetings (including minutes)	Y	Morning meetings Weekly Snr Management meetings	Daily toolbox (am) meetings for all Narrabri personnel and contractors (7.00 to 7.20 am approx.). Safety, incidents etc. are included in the topics. Lists training needs for the day. Also Hazard Protocol, e.g. No Tow Protocol on the day of the audit due to high fire danger. On the day of the audit there were 17 people in the room, including the BMA contractors. Incident logs and Work Orders are also discussed.	
146. Who is responsible for safety organisation	Y	Standard – Assurance Framework Code of Conduct	Standard – Assurance Framework available and sets requirements. Code of Conduct describes commitment by all of Santos. Operations Manager has overall responsibility of the safety organisation at Narrabri operations.	
147. Hazard Identification, Risk Assessment and Control	Y	Significant Hazard Register ST-18 for risk management. Also ST-1 for General Risk Management NSW Operations - Narrabri Gas Project – Principal Hazard Management Plan	Standard ST-18 available for Procedures Work Activity Risk Management Procedure. Requires Significant Hazard Register available. Updated every two years, refer #22	
148. System to monitor safe work practices and loss prevention methods	Y	Principal Hazard Plan and Principal Control Plan. Control Plans for Health, Mech. Eng, Electrical & Well Integrity	A series of Management Plans are used to manage and control safe work practices. Prepared in conformance with WHS Mines and Petroleum Legislation which requires Principal Hazard Plan and Principal Control Plan. Narrabri operations operate under Health Control Plan, Mech. Engineering Control Plan, Electrical Control plan and Well Integrity Control plan	

Question	Item OK? (Y / N)	Document/ Person	Status / Description	Recommended Actions
149. Protective equipment provided	Y	Inductions	Covered in Onshore Induction L2 and L3 Induction. Also pre-engagement with contractors.	
150. First aid facilities/ training	Y	EHS Resource page on Discover database ST-4 First Aid & Medical Facilities procedure	EHS Resource page on Discover database show ST-4 First Aid & Medical Facilities procedure. Includes commitment to have first aid trained personnel on site. First aid training at Narrabri includes CPR training (annual) with all personnel included.	
151. List of core procedures	Y		Santos Narrabri folder available and includes Safety Management Plan outlines; Standard requirements to be met; Principal Hazard management Plan and Bush Fire Management Plan. Also heat Stress Management Plan and Security management Plan	
152. Drugs and Alcohol	Y		Drugs and alcohol testing carried out during the audit. About 4 t/year. Not scheduled.	

11.3 MANAGEMENT AND ADMINISTRATION OF THE SAFETY MANAGEMENT SYSTEM

Question	Item OK? (Y / N)	Document/ Person	Status / Description	Recommended Action
153. Letter of Assurance to management	Y	Interviews	Monthly reporting of status of scorecards, including tracking of personnel, process safety, environmental performance against expectations. Possible to see 12-month look back on Compliance (in the form of traffic lights). Sent to Snr Leadership Forum. This then forms part of the information submitted to Santos Executive Vice President.	

11.4 CONTRACTOR MANAGEMENT

Question	Item OK? (Y / N)	Document/ Person	Status / Description	Recommended Actions
154. Managing On-Site Contractors	Y	Inductions NOI Interviews Form – Contractor Work Commencement Checklist	Contractor supply chain management includes pre-qualifications requirements. Induction training sets requirements for working outside. Notice of Intention required to prepare for contractor arriving on site, including training needs. A <i>Contractor Work Commencement Checklist</i> is used to verify compliance to major Santos requirements prior to commencing work	

12 SECURITY

Question	Item OK? (Y / N)	Document/ Person	Status / Description	Recommended Actions
155. Security of Premises	Y	Site visits Outputs from CCTVs Security Management Plan	Sites are fenced (1.8m chain fence with 3 strand barb wire at WPPS & BCP) and gates. Locked doors on buildings. Locked gates on sites. CCTVs at WPPS, CP, some well sites. Data available for 1 month. Retrospective review only (though alert on phone if door is opened). WPPS locked gate 800m up the road from the Station. Field Risk Manager checks and acknowledges all CCTV recordings on the database.	
156. Full time security staff provided	Y	Interviews	No security staff touring the premises. 2012 Hazard Audit notes that the level of security formed part of a Risk Assessment	
157. Employees or contractors	Y	Interviews	N/A	
158. Level of authority	Y	Interviews	N/A	
159. Control of access to facility	Y	Site tour	Refer #155	
160. Are security personnel trained in emergency procedures	Y	Interviews	N/A	
161. What restrictions on access during emergency	Y	Site tour	Fence and locked gates at WPPS and BCS. No entry allowed. Emergency plan for staff to exit and close down site.	
162. Any special restrictions on visitors	Y	Site tour	L3 site induction when accessing the BCS and WPPS. Sign-in sheet used at both sites. Gates are securely locked.	
163. Do security officers tour the premises	Y	Interviews	No	

13 ENVIRONMENTAL PROTECTION

13.1 WASTE MANAGEMENT

Question	Item OK? (Y / N)	Document/ Person	Status / Description	Recommended Actions
164. Solid waste control and disposal (sludges, empty drums, carbon etc.)	Y	Interviews	Solid waste - paper, cardboard. Goes to waste contractor. Regulated waste - oily rags, filter, batteries, waste oil, managed as per liquid waste (refer #165 below).	
165. Liquid waste control and disposal - containment, storage, processing and spill management	Y	Interviews. Folder available with receipts for licenced contractor removal of liquid waste. Comtrack database for compliance	All liquid waste removed from site by licenced contractor. Folder available with receipts. Waste oils, waste coolant (TEG) captured in fixed bunded tanks. Transferred to truck (curbed loading station). Waste water in underground tank outside fence - Transferred to truck. Also in IBC at gas inlet during pigging. Waste water goes to Leewood or Tinsfield Ponds (outside scope of this Hazard Audit).	

13.2 ATMOSPHERIC EMISSIONS

Question	Item OK? (Y / N)	Document/ Person	Status / Description	Recommended Actions
166. Control of atmospheric emissions (smoke, gases, fumes and dust)	Y	EPA annual leak detection report Annual Env. Mgt Report for DP&E 11/2/2019	Natural gas is flared, not vented, reducing greenhouse emissions. Natural Greenhouse reporting for flares. Leak detection for natural gas wells and plant carried out four (4) times per year plus if any change. Reported to EPA annually. Report 2017/18 shows no % LEL leaks (did find ppm leaks). EPA has set response time for any leaks (Class 3 within <14 days for 2-10% of LEL leaks; Class 1 within 48hrs for 10-99% of LEL leaks; and Class 1 ASAP, (reportable – Significant) for 100% of LEL leak.	

Question	Item OK? (Y / N)	Document/ Person	Status / Description	Recommended Actions
			Emissions testing of stacks at WPPS scheduled for March 2019 as part of expansion project.	
167. Soil or groundwater contamination (testing required, e.g. monitoring wells for underground tanks)	Y		Eastern Star Gas contamination next to BCP. Rigorous process employed to remove contamination and improve soil. Included pH stabilising, applying mulch etc. 2012-16. Revegetation 2016-17.	
168. Containment and disposal of spillages and contaminated firewater	Y	Interviews Site visit WWPS and BCP	No firewater on site.	
169. Fugitive emissions program (if required by the EPA licence)	Y	Refer #166	Refer #166	

13.3 CONTROL OF INCOMPATIBLE MATERIALS

Question	Item OK? (Y / N)	Document/ Person	Status / Description	Recommended Actions
170. Likelihood of mixing incompatible liquids in drainage system	Y	Interviews	Not applicable as no incompatible materials on site.	

13.4 LICENCE

Question	Item OK? (Y / N)	Document/ Person	Status / Description	Recommended Actions
171. EPA and DG licence conformance	Y	Annual Env. Mgt Report Compliance obligation management database EHSMS Audit Approval of Environmental Representative PAL Annual Environmental Management Report	WPPS not covered by Env. Protection Licence (Licence required at 30MW). Annual Env. Mgt Report for DP&E as part of Statement of Commitment. PAL subject to annual report. No DG Notification required. No Gas Production Licence required. Flowline not required to be licenced.	
172. Effluent treatment and disposal (e.g. Trade Waste to Sydney Water)	Y		Waste goes to underground tanks and disposed of by trucks	
173. Where are records kept (view records)	Y	-"	N/A	
174. Are incidents recorded (e.g. flare releases)	Y	Incident management database	Small flare discharges would not constitute a recordable incident. Emissions from WPPS are recorded as per the NPI scheme. Large flaring incidents, initiated from a process upset, would be investigated and recorded in accordance with Santos' Incident Management procedure.	

Question	Item OK? (Y / N)	Document/ Person	Status / Description	Recommended Actions
<p>175. Other safety studies carried out on the facility. Status of outstanding recommendations from these studies to be reviewed. Obtain full references for the Hazard Audit report.</p>	Y	--	<p>Fire Safety Study update and HAZOP study for Expansion project at WPPS. Also a Risk Assessment.</p>	

Appendix 1

Approval as Lead Auditor

Report of the 2019 Hazard Audit of the Santos Operations Associated with the Narrabri PEL 238 Project

Appendix 1 – Approval as lead Auditor



Ms Karin Nilsson
Director
Planager Pty Ltd
PO Box 1497
Lane Cove NSW 2066

Contact: Irene Martin
Phone: (02) 9373 2882
E-mail: irene.martin@planning.nsw.gov.au

Dear Ms Nilsson

Santos Narrabri Coal Seam Gas Utilisation Project (MP07-0023), Wilga Park Power Station – Approval of Independent Auditor for Hazard Audit

I refer to your email dated 3 February 2019 requesting the Secretary's approval to carry out the Hazard Audit at the facility.

Having considered your qualifications and experience, approval is granted for you to carry out the Hazard Audit, in accordance with Condition 3.6 (b) of the Major Project development consent MP 07-0023.

Please ensure that the Hazard Audit is carried out in accordance with the Department of Planning's *Hazardous Industry Planning Advisory Paper No. 5, 'Hazard Audit'* guideline.

Please note that this approval is only applicable for the 2019 Hazard Audit and further approval must be sought for any Hazard Audit in future.

If you have any questions, please do not hesitate to contact Irene Martin on the above details.

Yours sincerely


Chris Ritchie
Director
Industry Assessments
As the Secretary's nominee

4/2/19

Appendix 2

Audit Timetable

**Report of the 2019 Hazard Audit of the Santos
Operations Associated with the Narrabri PEL 238
Project**

Appendix 2 – Audit Timetable
Hazard Audit – Santos Narrabri
Interview Timetable, 18th to 20th February 2019
(Ref. NSW DP&I's Hazard Audit Guidelines, Advisory Paper No. 5)
DAY 1

HAZARD AUDIT INTERVIEW TIMETABLE					
Day 1 of 3 (Monday, 18 th February 2019)					
0815-1400hrs	1400-1430hrs	1430-1500hrs	1500-1600	1600-1630	1630-1700hrs
Travel		Administration	Operator Procedures and Training	Safety Training	Security
Fly to Narrabri	Get car and drive to depot	KICK OFF MEETING Introductions; High-level audit objectives / scope; Audit process / time line; Communications, reporting, and follow-up activities	OPERATOR AND VISITOR TRAINING Induction Safety training Records, Permit To Work, Control of change, fire training, first aid training etc.	OPERATOR AND VISITOR TRAINING Induction Safety training Records, Permit To Work training, Control of change training, fire training, first aid etc.	CONTROL SYSTEMS Physical security system, control and management
			Training documentation	Training documentation	Security Management Plan or procedure (power station, compressor station, gas wells)

Hazard Audit - Santos

Interview Timetable, 18th to 20th February 2019

(Ref. NSW DP&I's Hazard Audit Guidelines, Advisory Paper No. 5)

DAY 2

HAZARD AUDIT INTERVIEW TIMETABLE								
Day 2 of 3 (Tuesday, 19 th February 2019)								
0730-1100hrs	1100-1200hrs	1200-1230hrs	1230-1330hrs	1330-1400hrs	1400-1430hrs	1430-1500hrs	1500-1530	1530-1630
Plant Equipment & Operation	Plant Modification Control		Control of Safe Plant Performance	Incidents and Accidents	Emergency management	Environmental Protection	Previous Actions	Management Safety System
SITE TOUR Site visit; interviews with operator(s), Operator interface, Log sheets, Process monitoring	PROCEDURE & DOCUMENTATION Availability of procedures; Review / approval, Updating; etc. Includes starting up compressor station after long shut down	Lunch	MECH & EL. MAINTENANCE Planning & preparation; Protection systems; Ventilation; Electr. eq. management; Earthing/bonding; PTW	PROCEDURES & DOCUMENTATION Reporting, investigation, follow-up; Any significant / recurring incidents	SYSTEMS, PROCEDURE & TRAINING Fire prevention / protection / inspection and testing; Registers & plan ERP/ Training	PROCEDURES AND DOCUMENTATION Management of and emissions; Licence & Reporting	SYSTEMS AND MANAGEMENT Status of implementation of Audit recommendations & actions	SYSTEM & DOCUMENT Organisation; Policy; Audits & inspections; Housekeeping/inspection; PPE, first aid; Hazard id; SDS; Contractor management
Map, sketches, listing of location of hazardous materials; Flowsheets & PIDs	Procedures/SOPs		Procedures & tasks; registers; proof of maintenance / calibration etc. Hazardous Area Dossier	Incident and accident records and management system	Emergency procedure & plan, training, SOPs, evacuation	Waste management; Atmospheric emissions; Licence & Reporting	Action management system / databass	SHEMS

Hazard Audit - Santos
Interview Timetable, 18th to 20th February 2019
(Ref. NSW DP&I's Hazard Audit Guidelines, Advisory Paper No. 5)

DAY 3

HAZARD AUDIT INTERVIEW TIMETABLE	
Day 3 of 3 (Wednesday, 20 th February 2019)	
0700-0945hrs	
<p>Backup time to pick up any missing info or discuss way forward</p> <p>Exit meeting if needed (or can be done at later date via phone call)</p>	

Appendix 3

Details of the Topics Covered in the Hazard Audit

Report of the 2019 Hazard Audit of the Santos Operations Associated with the Narrabri PEL 238 Project

Appendix 3 – Details of the Topics Covered in the Hazard Audit.

1 Scope

The hazard audit is a requirement of the consent document associated with new plant or significant modifications. Formal guidelines are available (Advisory Paper No. 5). The main review areas of software and technical controls that have been targeted by the Department in past reports still form the basis of the proposed audit.

The key areas to be covered by the Audit are listed below. The audit comprises:

- Review of documents and procedures
- Inspection of facility
- Observation of operations
- Interviews with employees at all levels, i.e. operators, maintenance employees, supervisors, managers, security officers, safety officer.

2 Plant and Process Systems

- Physical condition of equipment and storage
- Labelling and identification of equipment/valves/instruments/pipes
- Assumptions in hazard analysis study incorporated in plant hardware
- Are all items of equipment and control functioning satisfactorily
- P&ID's and process flow diagrams
- Process systems monitoring e.g. operator logs, alarms, trips
- General housekeeping of premises
- Materials inventory system and records
- Loading/unloading operations and transport records

3 Review of Operating Procedures

- Who writes them
- How often are they reviewed
- Who is authorised to make changes
- Are they up-to-date
- Method sheets with quick summaries
- How does the Supervisor know how well the procedure is working out
- How do Managers keep informed about satisfactory operation of the procedures
- Back-up systems (e.g. trip systems) on procedural failures

4 Process Operator Training

- Training modules (why and what of operation)
- Training methods and records
- What restrictions on operator who has not completed training
- Evaluation of training
- Personal precautions in handling flammable or toxic materials
- Appreciation of hazards, identification and control

5 Maintenance Procedures

- Do formal procedures exist (preventative?)
- Are the aims of procedures clearly outlined
- How do supervisors keep informed about how well the procedures are working
- How and where are records kept

- Frequency of maintenance
- Relief valve installation and testing schedule
- Pressure vessel testing schedule
- Work permit system
- Vessel entry
- Hot work clearance system
- How are correct materials of construction verified
- Emergency repair equipment/spares available
- Line venting/depressuring/purging procedures
- List of critical valves checked regularly
- Calibration and set point testing facilities for instruments
- Computer servicing and maintenance

6 Safety Training of Employees

- Personal safety training and records
- Induction training of new employees
- Appreciation of inherent hazards in plant and during maintenance
- Work permit procedures
- Equipment to be used (e.g. non sparking tools)
- Protective clothing
- Control of electrical equipment in classified hazardous areas
- Procedures for outside contractors working on premises

7 Plant Modification Control

- How is this documented
- Who approves modification
- Who screens and reviews the proposal
- How is updating of drawings and operating/maintenance procedures co-ordinated
- Are HAZOP techniques employed
- What documentation exists

8 Testing of Protection Systems

- Are all protection systems listed
- Testing of trips/alarms/emergency valves procedures documented
- Where are records kept
- Relief valves, bursting discs
- Frequency of testing
- Is there a test schedule
- Authority to bypass trips during testing
- Work permit for testing
- Check whether trip re-activated after testing
- Procedure if protection system taken out of service temporarily
- Ventilation air flows
- Earthing of equipment
- Other preventative maintenance checks

9 Electrical Equipment Handling

- Maintenance procedures
- Isolation procedures
- Defining areas in plant where portable electrical equipment prohibited
- Hazardous area classification drawings

10 Unusual Incident Reporting

- Reporting system
- Investigation procedure. Who chairs the investigation team
- Follow up action
- Record maintenance
- Is an Unusual Incident defined by management
- Publicity for report and action

11 Injury/Accident Reporting

- **Reporting system**
- Investigation procedure
- Follow up action
- Safety targets set by management
- Re-training program

12 Fire Protection and Training

- Fixed protection systems

- Types of extinguishers
- Number and location
- Labelling
- Accessibility
- Dematching system
- Who maintains and repairs fire protection equipment
- Inspection and testing frequency
- Adequacy of firewater
- Is all critical equipment protected
- Fire training/drill for employees
- Fire protection manual
- Plan or register of fire protection equipment

13 Emergency Procedures

- Is there an emergency plan
- Who gets copies
- Does everyone know who is in charge
- Emergency drills conducted regularly
- Emergency lighting adequate
- Are the following situations covered:
 - Fire
 - Explosion

- Loss of utilities (power, water, instrument air, nitrogen)
- Bomb threat
- Flood
- Toxic leaks and spills
- Computer systems/transponder failure
- Outside services police/ambulance/fire brigade - pre-arrangements with the above
- Are duties clearly defined for:
 - Fire fighting
 - Security
 - Safety
 - Medical contact
 - Evacuation and roll call
 - Communications
 - Media contact
- System to update emergency procedures
- Whose telephone numbers listed and where
- Procedure to update telephone numbers
- Management Safety System
- Internal audits
- Safety policy
- Process operator training

- Safety organisation and meetings (including minutes)
- Hazard identification, risk assessment and control
- System to monitor safe work practices and loss prevention methods
- Who is responsible for safety organisation
- Protective equipment provided
- First aid facilities/training
- Workplace Hazardous Substances compliance and training

15 Security of Premises

- Full time security staff provided
- Employees or contractors
- Level of authority
- Control of access to facility
- Are security men trained in emergency procedures
- What restrictions on access during emergency
- Any special restrictions on visitors
- Do security officers tour the premises

16 Environmental Protection

- Solid and liquid waste disposal
- Control of atmospheric emissions
- Soil or groundwater contamination
- Containment and disposal of spillages
- EPA licences

- Effluent disposal (Sydney Water)
- Where are records kept

17 Additional Requirements

The Department's Advisory Paper No. 5 requires the following:






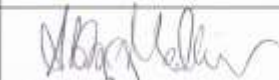
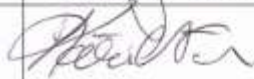
- Maps and sketches of the facility and of surrounding land uses
- Listing of hazardous materials being handled, stored or processed at the site, with an indication of variations in quantities held
- Locations of significant quantities of hazardous materials to be marked up on a site map
- Specific Material Safety Data Sheets may be included as attachments
- A map showing the layout of fire fighting services should be included as an attachment to the report (or reference the Fire Safety Study)
- Process description
- Other safety studies carried out on the facility. Recommendations made in these studies to be reviewed.

Appendix 4

Opening Meeting Record

Report of the 2019 Hazard Audit of the Santos Operations Associated with the Narrabri PEL 238 Project

Appendix 4 – Opening Meeting Record

		Hazard Audit Opening Meeting Attendance Record	
Meeting Description	Santos Narrabri PEL 238 (MP 07_0023) – Hazard Audit		
Location:	Narrabri	Date:	18 February 2019
Attendance:		Time:	
Name	Organisation	Position	Signature
Brendon Ward	SANTOS	MAINTENANCE PLANNER	
Ron Anderson	SANTOS	Principal Advisor Compliance	
Michael Hewitt	SANTOS	Field Risk Advisor	
Nathan Melfon	Santos	operator/Maintenance	
Abbey McElure	SANTOS	OPS COORDINATOR	
Karin Nilsson	Planager	Lead Auditor	

Appendix 5

Documents Reviewed During the Audit

Report of the 2019 Hazard Audit of the Santos Operations Associated with the Narrabri PEL 238 Project

Appendix 5 – Documents Reviewed During the Audit

TITLE	AUTHOR / DATABASE	DATE / REVISION
<i>Plant and Equipment</i>		
myPlant servicer for all PIDs	myPlant	Online database
PIDs 6765-010-PID-0011/0013/0016/ 0030/0003	Santos	Rev 0/ 2/0 /0 /3
Notice of Intention to visit form	BMA Energy (B Atlee & R Webb)	Preparing for visit during the Hazard Audit
WWPS Daily Routine	WPPS Operator	18/2/2019
Operator data booklet for individual generator	WPPS Operator	11/2/19 to 18/2/19
<i>Operational Controls</i>		
Start-up & Shutdown for Wilga Park Power Station	J Higgins	30/8/2016
Manually light Dewhurst flare	Santos	19/7/18
Free flowing water from Bibbiwindi 5ML tank to Leewood	J Higgins	Unknown
Manage wells and gathering systems	Santos	
EHS Toolbox meeting minutes	Santos Discovery database	11/1/2019
EHS Toolbox meeting minutes – listing	Santos Discovery database	Various
Health and Safety critical control verification work inspection	T Dunn	24/1/19
Register of Critical Control Verification audits Santos Narrabri	M Hewett	15/3/2019
H&S Critical Control Verification Work Activity Risk Management (example)	Unknown	Unknown
H&S Critical Control Verification Excavation (example)	Unknown	Unknown

TITLE	AUTHOR / DATABASE	DATE / REVISION
H&S Critical Control Verification (so support MS12-ST5-PD4 forms: <ul style="list-style-type: none"> • Equipment Isolations • Excavation • Falls and Falling Objects • Lifting • Plant Safety • Work Activity Risk Management • Working in Heat • LUEZ – Critical Control Verification 	Santos	Form only
<i>Process Operator Training and Safety Training</i>		
Monthly qualification grid (monthly report for training)	Traccess	1/2/19
Cold work permit authority Units 3.10 &3.11 for N Melton	J Higgins	Unknown
Certificate of Competency Permit Authority for N Melton	J Higgins	12/6/14
Induction EHS Risk Management Module 1 / 2 for N Melton	Santos Learning Management Training	Online
Hazard Management training using Stepback in JHA for N Melton	Santos Learning Management Training	Online
<i>Control of Safe Plant Performance</i>		
Integrity & Reliability Management Standard	Kevin Gallagher - CEO and Managing Director	2 February 2017
Integrity and Reliability ST5 – PD2 Production Management of Change	David Ross, General Manager Production Technical	20 July 2017
WorkOrder #20882717 WPPS PIDs and Ops Procedure Update	Nathan Melton	11/1/2019
WorkOrder #20889620 Tinsfield 5 separator skid PSV-0200	Callidus	3/11/18

TITLE	AUTHOR / DATABASE	DATE / REVISION
WorkOrder details (report) on pressure vessels and pressure safety valve (status of inspections)	Asset Manager Oracle EAM	Date of audit
Work Instruction WI-AS700C – 750 hour service	Santos	Unknown
Safety critical (maintenance) reporting	Unknown	November 2018
Critical Function Testing Pressure Switch 24 monthly PHH-0004	Asset Manager	Scheduled 14/4/2019
Audits and Inspection manager	Santos Discover database	-
MDCR Change Request for CFTT ESD at WWPS (kept at 12 monthly) - email	A Mooney	22/11/2018
PSV register (listing) Narrabri – Scheduled	Asset Manager	Date of audit
Hot Work Permit 0073152	A Frew and N Melton	13/11/2018
Hot Work Permit 0073151 Internal and external PV inspection PVs 5, 6, 7, inlet separator, flare drum at WPPS	S Hwang and N Melton	16/11/2018
Pressure equipment inspection report, knockout pot	STORK	4/6/2014
Bridge Register	Santos	Last updated 18/2/2019
Corporate EHSMS Audit Report	Internal Auditor: (Lead) Andy Petersen	Audit date: 17th to 19th November 2015; Report date 16/03/2016
EHS Toolbox Record – EHSMS Audit against Santos H&S – <i>Electrical Safety Onshore Australia</i>	Andy Petersen	16/11/2016
<i>Control of Change</i>		
PDCR Process – Change Owner’s Tasks - 1508-002-WPR-0011	Santos Ltd	18-Jun-2014 Rev D

TITLE	AUTHOR / DATABASE	DATE / REVISION
ST-4 Management of Change Procedure	Naomi James – Executive Vice President EHS & Governance	2 February 2017
ST1 Project Management Process	-“-	30 September 2017
WWPS Expansion Project Management Plan	Clark Energy	14/2/19 Rev 3
WWPS Expansion Project Emergency Response Plan	Clark Energy	6/2/2019
Email actions for Santos	Sandeep Bansal	7/2/2019
WWPS Expansion Project Safety Management Plan	Clark Energy	6/2/2019
PDCR Process – Change Owner Tasks	Santos	online
PDCR Process – System Manual	Santos	online
SQAD Health Check – Project Execution Plan	Santos	Online
Construction Risk / Hazard	Clark Energy	7/2/2019
Punch list Compressor Electrical (for BCP)	Santos	27/11/2018
Punch list Compressor Mechanical (for BCP)	Santos	27/11/2018
Santos Narrabri electrical punch list for office equipment	Santos	27/11/2018
Management of change for WPPS Expansion project	Santos	19/2/2019
MOC-NS-004760 Change Owner’s Package: PDCR Title <i>Silencer installation on WPPS GO3B 3MW unit</i>	Santos PDCR	Unknown
MOC-NS-004760 <i>Silencer installation on WPPS GO3B 3MW unit Risk Assessment - Post Change Risk Level Evaluation</i>	L Novoseltseva J Higgins	24/10/2018

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Management of change report for Dewhurst South Gas Line Tie-in MOC-NS-004594	Lixiaoyi (Xiao) and James Hutchison	29/10/18; 30/10/18
Audit Plan, WPPS 2x3MW Generator Installation	M Hewett and R Anderson	14/2/2019
Audit Plan, Dewhurst Southern Gas Installation Project	M Hewett and R Anderson	14/2/2019
<i>Incidents and Accidents</i>		
Incident Management Standard SMS-MSII-ST02 <i>Incident Reporting Investigation Learning Procedure</i>	Santos SMS	30/11/2017
All incidents for Narrabri Operations 1/11/2017 to 19/2/2019	EHS Toolbox IMS	1/11/2017 to 19/2/2019
<i>Emergency Response and Management</i>		
Emergency Response Standard SMS-MS-...-ST01 <i>Emergency and Crisis Management Procedure</i>	Naomi James – Executive Vice President EHS and Governance	30 November 2017
Exercise preparedness schedule (Narrabri operation) file name 2019 ER Exercise Preparedness Schedule - NSW Operations (002)	M Hewett	28/8/2018
Emergency drill – WPPS Pollution Incident Response	M Hewett	31/1/2018
Bush Fire Management Plan	M Hewett	Unknown
Asset Register and inspection – fire equipment, Wilga Park Power Station Narrabri	Sicada Fire and Safety (NSW) Pty Ltd - NW	20/12/2018
Fire Safety Study	R4Risk, N Johnston	17/11/2015
<i>Security</i>		
Security Management Plan	M Hewett	31/1/2018
Management of CCTVs online system, including closeout of CCTV recordings	M Hewett	Date of audit

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<i>Safety Management System</i>		
Environment, Health and Safety Policy	K Gallagher (MD & CEO)	Rev 2, Nov 2018
Risk Management Policy	K Gallagher (MD & CEO)	Rev 1, Oct 2016
NSW Business Monthly Review	Santos	Dec 2018
Santos Code of Conduct	Santos	Unknown
NSW Monthly Business Review	Santos	Jan 2019
ST-04 EHS Induction Procedure	Stephenie De Nichilo – Head of Safety & Security	4/10/17
ST-15 Assurance Procedure	Naomi James – EVP EHS & Governance	23 November 2017
ST-01 Risk Management Standard (General)	Stephenie De Nichilo – Head of Safety and Security	
ST2 – Process Operations Risk	Santos, David Ross, General Manager Production Technical	30 November 2017
ST-3 Work Activity Risk Management Procedure (for work activities)	Santos	30 May 2017
ST-4 First Aid and Medical Facilities	Stephenie De Nichilo – Head of Safety and Security	30 November 2017
ST-7 Falls and falling objects procedure	Santos	-
Training and Competency (ST-14-...-ST09)	Santos	Online
Contractor Supply Chain Procedure (ST--ST01)	Santos	Online
Form – Contractor Work Commencement Checklist	Santos	Online

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NSW Operations Narrabri Gas Project Safety Management Plan	M Hewett	31/1/2018
NSW Operations - Narrabri Gas Project – Principal Hazard Management Plan	M Hewett	31/01/2018
Pollution Incident Response Management Plan	R Anderson	31/1/18
NSW Operations - Narrabri Gas Project –Principal Control Plan	M Hewett	31/1/18
NSW Operations - Narrabri Gas Project –Health Control Plan	M Hewett	31/1/18
NSW Operations - Narrabri Gas Project –Well Integrity Control Plan	Santos	31/1/18
NSW Operations - Narrabri Gas Project – Mechanical Control Plan	Santos	31/1/18
NSW Operations - Narrabri Gas Project –Electrical Control Plan	Santos	31/1/18
Minutes of EHS Committee	Abby (minutes) Hewett (chair)	3/4/17
Listing of EHS Committee Minutes	Santos	Aug '18-Jan '19 monthly
Significant Hazards and Risk Register	Santos	17/5/2018
Narrabri Gas Project Environmental Impact Statement – Appendix S, Hazard and Risk Assessment	GHD	November 2016
Module 50 W.P. procedure	Santos	13/1/2017
Local Emergency Management Committee Meeting	NARRABRI SHIRE COUNCIL	22 November 2018
<i>Environment</i>		
Annual Env. Mgt Report WWPS Approval 07-0023	Santos	1/1/18-21/12/18
Email to DP&E regarding lodgement of Annual Env. Mgt Report WWPS Approval 07-0023	R Anderson	11/2/2019

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Compliance obligation management database	Comtrack	Online
EHSMS Audit – Environmental Statutory (WPPS)	S Riley	14/2/18; 1/6/18; 28/12/17 Scheduled 1/7/19
Approval of Environmental Representative: Mike Young	Santos	14/5/18
Dewhurst South flowline water / gas audit	M Hewett and R Anderson	22/11, 30/11, 7/12 2018
EPL20350 Leak detection and repair program (for Annual Return 2017/18)	Santos	June 2018
PAL Annual Environmental Management Report 1/1-31/12/18	Santos	28/2/18
Folder with receipts from waste removal companies and waste data	Receipts from Namoi Waste Corp	Various

14 REFERENCES

- 1 Department of Urban Affairs and Planning, *Hazardous Industry Planning Advisory Paper No. 5: Hazard Audit Guidelines*; NSW Government, Sydney, 2011 Edition