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Energy NSW

Dewhurst Gas Exploration Pilot Wells Program and the Exploration Pilot Expansion Project

PROJECT ENVIRONMENTAL MANAGEMENT PLAN

Revision 01 October 2014

Document Control

This Project Environmental Management Plan (PEMP) for Santos' Dewhurst Gas Exploration activities conducted by Energy New South Wales (ENSW) Operations is a "controlled document". Should the recipient (user) become aware of any changes or corrections that are required please photocopy this page with relevant page(s) to be changed, note the corrections and send them to:

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Document Revisions

The ENSW EHS&S Team Leader is responsible for controlling and ensuring any revision of this PEMP is appropriately distributed. Responsibility for managing change in this document is detailed within the Santos *EHSMS08 Document and Records Management*.

It is proposed that the PEMP is a living document, which can be revised on an ongoing basis.
Note: Changes to the PEMP are to be undertaken by using the feedback form located in EHSMS 08 - Appendix C.

Document History

DOCUMENT REFERENCE	REVISION NO.	REVISION DATE	COMMENT
	DRAFT	30/9/14	Final draft for comment by DPE
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Endorsement and Approvals
This PEMP has been reviewed and endorsed by Santos and is approved for use by Energy NSW Operations.

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CONTENTS

ABBREVIATIONS AND DEFINITIONS

APPEA	Australian Petroleum Production & Exploration Association
Council	Narrabri Shire Council
Development	The operation of the Dewhurst 13-18H Pilot and the Dewhurst 26-29 Pilot, including the Dewhurst 13-18H Extension and Dewhurst 30 and 31 Extension
Dewhurst 13-18H Extension	The drilling and operation of an additional two horizontal wells at each of the Dewhurst 16H, Dewhurst 17H and Dewhurst 18H pilot wells
Dewhurst 30 and 31 Extension	The drilling and operation of two additional wells at the development, namely Dewhurst 30 and Dewhurst 31.
DA	Development Application
DP	Deposited Plan
DPE	Department of Planning and Environment
DRE	NSW Trade and Investment Resources and Energy
EHS	Environmental Hazard Standard
EHSMS	Environment Health and Safety Management System
EIS	Environmental Impact Statement
EMS	Environmental Management System
ENSW	Santos Energy New South Wales
EPA	Environment Protection Agency
EP&A Act	Environmental Planning and Assessment Act 1979
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999
EPL	Environmental Protection Licence 570
Fracture stimulation, (hydraulic fracturing or fracking)	Means the process by which a well is "stimulated" when fluids are forced at high pressure into hydrocarbon-bearing formations to create a conductive flow path into the target formation resulting in enhanced flow of hydrocarbons to the wellhead.
Incident	An incident causing or threatening material harm to the environment, and/or an exceedance of the limits or performance criteria in the consent (as defined in the Conditions of Consent)
Material harm to the environment	Actual or potential harm to the health or safety of human beings or to ecosystems that is not trivial
MRE-DA	Development Approval for pilot wells 26-29 by the Minister for Resources and Energy dated 16 August 2013
NOW	NSW Office of Water
Non-conformance	Non-fulfilment of a requirement of the PEMP or sub plan
NSW	New South Wales
OEH	NSW Office of Environment and Heritage
Office of CSG	NSW Office of Coal Seam Gas
OP	Occupation Permit
PAL	Petroleum Assessment Lease
PEL	Petroleum Exploration Licence
PEMP	Project Environmental Management Plan
PIRMP	Pollution Incident Response Management Plan
POEO Act	Protection of the Environment Operations Act 1997
Produced Water	Means water that is taken in the course of prospecting operation that is part of or incidental to that prospecting operation, including water that is encountered within and extracted from boreholes, petroleum wells or excavations
Reasonable	Reasonable relates to the application of judgment in arriving at a decision, taking into account: mitigation benefits, costs of mitigation versus benefits provided, community views, and the nature and extent of potential improvements.
REF	Review of Environmental Factors
Rehabilitation	The treatment or management of land disturbed by the development for the purpose of establishing a safe, stable and non-polluting environment
RMS	Roads and Maritime Services
Secretary	Secretary of the Department of Planning and Environment
SSD-6038	Development Consent of Application SSD-6038 by the DPE dated 18 July 2014
SoC	Statement of Commitments set out in the EIS and included in the SSD-6038 Development Consent
Sub Plans	Environmental Sub Management Plans
WIC	NSW Code of Practice for Well Integrity

1. INTRODUCTION

1.1 Background

Santos NSW (Eastern) Pty Ltd (Santos) as the coal seam gas (CSG) operator of Petroleum Exploration Licence (PEL) 238 received consent for the Dewhurst Gas Exploration Pilot Expansion at two pilot sites:

- The existing Dewhurst 13-18H Pilot, located on freehold land and Crown Land road reserve, approximately 25 kilometres south of Narrabri in NSW.
- The new Dewhurst 26-31 Pilot, located in the Pilliga East State Forest, approximately 44 kilometres south of Narrabri.

The project involves the expansion of operations at the Dewhurst 13-18H and Dewhurst 26-31 pilots. Works at Dewhurst 13-18H involve re-entering three existing wells to convert single horizontal wells to triple-stacked horizontal wells. Works at Dewhurst 26-31 involve the construction of two additional wells on new lease areas to expand the pilot from four to six wells.

Activities include drilling the wells, installing surface infrastructure and gathering system, installing a flare on the Dewhurst 28 lease area and operating the pilot well set for up to three years.

1.2 Purpose of the PEMP

This PEMP and the associated Sub Plans have been developed to outline the measures and tools that enable the effective management of the environmental issues and risks associated with the construction and operation of the Dewhurst Gas Exploration Pilot Wells Program and the Exploration Pilot Expansion Project (the Project). It also details the interaction between the site specific requirements associated with the Project and Santos' existing Environment, Health and Safety Management System (EHSMS).

Further discussion of how this PEMP aligns with Santos' EHSMS and informs the Environmental Management Strategy for the project is provided in **Section 2.3**

1.3 Planning Approvals

The PEMP will cover the requirements associated with the two planning Approvals:

- Dewhurst 26-29 Pilot Wells Program –Minister for Resources and Energy Approval on the 16 August 2013 (MRE-DA) covering new wells 26-29.
- Dewhurst Gas Exploration Pilot Expansion – Department of Planning and Environment (DPE) Development Consent on the 18 July 2014 (SSD-6038) covering the re-entry for triple stacked wells for 16H – 18H and new wells at 30 and 31.

And will take into consideration where relevant the following planning approval:

- Narrabri Coal Seam Gas Project, Dewhurst – 8 Lateral Production Pilot – Department of Primary Industries Approval 21 July 2009 (DPI-PA) covering wells 13 to 18H.

DPI-PA (21/7/2009)

Dewhurst 8 Lateral Production Pilot was established for the installation of production pilot wells 13-18H pilot around Dewhurst 8 Exploration well. The project was approved under the Petroleum (Onshore) Act 1991 and was therefore assessed under Part 5 of the Environmental Planning and Assessment Act 1979 (EP&A Act).

A Review of Environmental Factors (REF) Dewhurst-8 Lateral Production Pilot, PEL 238, Gunnedah Basin, NSW (Eastern Star Gas Limited 2009) was prepared to support the application. The REF identified and described environmental impacts associated with the project as well as mitigation measures to be implemented for reducing and managing these impacts. A representative for the Minister for Primary Industries approved the scope of works on the 21 July 2009.

The requirements associated with the approval and the statement of commitments associated with the REF is addressed within the existing Operational Environmental Management Plan (OEMP) for Dewhurst 13-18H.

MRE-DA (16/8/2013)

Dewhurst 26-29 Pilot Wells Program was approved under the Petroleum (Onshore) Act 1991 and was therefore assessed under Part 5 of the Environmental Planning and Assessment Act 1979 (EP&A Act).

A Review of Environmental Factors (REF) Dewhurst 26-29 petroleum wells PEL 238, Gunnedah Basin, NSW (RPS 2013) was prepared to support Santos' application. The REF identified and described environmental impacts associated with the project as well as mitigation measures to be implemented for reducing and managing these impacts. A representative for the Minister for Resources and Energy approved the scope of works on the 16 August 2013.

It should be noted that while the Department for Resources and Energy is still relevant the administrating authority associated with the management of coal seam gas under the Petroleum (Onshore) Act 1991 is now the Office of Coal Seam Gas (OCSG). Both DRE and OCSG sit within NSW Trade and Investment, however it should be understood that any approval condition referring to DRE will be interpreted as the OCSG in practice.

SSD-6038 (18 July 2014)

The Dewhurst Gas Exploration Expansion Project was classified as State Significant Development under the State Environmental Planning Policy (State and Regional Development) 2011 and was therefore assessed under Part 4 of the Environmental Planning and Assessment Act 1979 (EP&A Act).

An Environmental Impact Statement (EIS) Dewhurst Gas Exploration Pilot Expansion (RPS 2013) was prepared to support Santos' Development Application. The EIS identified and described environmental impacts associated with the project as well as a suite of mitigation measures to be implemented for reducing and managing these impacts.

The Planning and Assessment Commission (as delegate for the Minister for Planning) granted consent for the development on the 18 July 2014, subject to a number of conditions.

Other Approvals

In addition to the Planning Approvals, the Project is subject to a number of other approvals / licences, these are discussed further in Section 2.5.

1.4 Site Description

Activities will take place at two pilot sites within the Narrabri Shire Local Government Area – Dewhurst 13-18H and Dewhurst 26-31 as shown in **Appendix C Figure C1 and C2.**

The Dewhurst 13-18H Pilot is located off an unnamed road to the north of the Pilliga forest. The land has been mostly cleared for low intensity stock grazing activities. Access to the site is via the Newell Highway, X-Line Road, Garlands Road, Westport Road and Killara Road.

The Dewhurst 26-31 Pilot is located off Beehive Road (refer to Figure 3-2) in the Pilliga East State Forest which forms part of a large tract of bushland referred to as the Pilliga scrub. Access to the site will be via the Newell Highway, X-Line Road, Tighes Gully Road and Beehive Road.

Coordinates for the Dewhurst 16H, 17H, 18H, 26 to 31 pilot wells, at which works will be undertaken, are listed in Table 1-1.

Table 1-1 Approximate well locations – MGA 94 Zone 55 (From EIS, RPS 2013 and REF, RPS 2013)

Well	Easting	Northing	Lot description
Dewhurst 16H	765592	6616503	Lot 32 DP 757104
Dewhurst 17H	765681	6616690	Lot 32 DP 757104

Well	Easting	Northing	Lot description
Dewhurst 18H	765766	6616870	Lot 32 DP 757104
Dewhurst 26	754984	6600730.17	Crown Land State Forest
Dewhurst 27	754336.17	6599895.59	Crown Land State Forest
Dewhurst 28	755170.29	6600565.91	Crown Land State Forest
Dewhurst 29	754553.86	6599734.24	Crown Land State Forest
Dewhurst 30	755385	6600331	Crown Land State Forest
Dewhurst 31	754759	6599547	Crown Land State Forest

The closest sensitive receiver to Dewhurst 13-18H (not including a Santos leased vacant residence) is a residence situated approximately 1.8 kilometres south-west of the Dewhurst 13 lease area. The nearest residences to Dewhurst 26-31 are located approximately 11 kilometres north, outside of the Pilliga East State Forest.

1.5 Description of Activities

The activity can be described in terms of five stages:

- Pre-construction.
- Construction.
- Drilling.
- Operation.
- Rehabilitation Onwards.

The works associated with each stage and the approximate duration is summarised in Table 1-2.

Table 1-2 Summary of activities by stage and approximate duration

Stage	Works	Duration
Pre-construction	Development of management strategies and processes to ensure compliance with regulatory approvals including the preparation of: • This Project Environmental Management Plan (PEMP) and sub plans. • The Groundwater Monitoring and Modelling Plan. • The Biodiversity Management Plan. • The Traffic and Transport Code of Conduct. • The Revised Rehabilitation Management Plan. Negotiations and stakeholder management including: • Negotiation with RMS regarding the sealing of the first 30m of X line road and the placement of traffic signs. • Agreement with NSW EPA on the use of Narrabri Airport for meteorological monitoring.	Dewhurst 13-18H: 30 days Dewhurst 30-31: 20 days Dewhurst 26 -29 (works completed)
Construction	• establishing two 10 metre wide service corridors between	Dewhurst 13-

Stage	Works	Duration
	Beehive Road and the Dewhurst 30 and 31 lease areas (including clearing of approximately 0.2 hectares of vegetation) • constructing access roads within the two service corridors at Dewhurst 30 and 31 • establishing the Dewhurst 30 and Dewhurst 31 lease areas each up to approximately one hectare in size (including approximately two hectares of vegetation clearing) • removing the existing water gathering system and electrical cable connecting Dewhurst 13, 14 and Dewhurst 15 wells • preparing the sites and establishing necessary equipment, temporary structures and facilities on the existing well leases Dewhurst 16H, 17H and 18H and on the new lease areas Dewhurst 30 and 31 to enable drilling. • preparing the site on the existing well lease Dewhurst 14 to enable installation of a gas flare and water balance tank • constructing a new gas and water gathering system connecting all the wells within the Dewhurst 13-18H Pilot to the existing Dewhurst 14 well lease area (including clearing of approximately 0.24 hectares of disturbed vegetation) • extending the existing water and gas gathering system for Dewhurst 26-29 within the service corridors to Dewhurst 30 and 31	18H: 65 days Dewhurst 30-31: 60 days Dewhurst 26 -29 (works completed)
Drilling	• drilling an additional two horizontals from existing casing within Dewhurst 16H, 17H and 18H to convert each well from a single horizontal to a triple-stacked horizontal well targeting the Bohena, Namoi and Rutley coal seams • drilling one vertical (Dewhurst 30) and one triple-stacked horizontal (Dewhurst 31) well to target coal seams within the Maules Creek Formation.	Dewhurst 13-18H: 65 days Dewhurst 30-31: 60 days Dewhurst 26 -29 (works completed)
Operation	• installing surface and sub-surface infrastructure within the lease areas to connect the wells to the Dewhurst 13-18H and Dewhurst 26-31 gas and water gathering system • installing a gas flare and water balance tank at the existing Dewhurst 14 lease area and a gas flare at the Dewhurst 28 lease area. • operating the Dewhurst 13-18H Pilot and Dewhurst 26-31 Pilot for up to three years from the commencement of operations at each pilot respectively • managing the water and gas produced during operation • undertaking occasional maintenance of the pilots.	Up to 3 years
Rehabilitation	• on completion of operations, suspending the wells and ancillary infrastructure or decommissioning them and rehabilitating the well leases.	approximately six months after well abandonment where practicable and considering external factors such as weather

In accordance with Santos' Approval Category 3 Exploration Approval and the Development Consent, Fracture stimulation (fracking) will not be undertaken as part of the above works.

1.5.1 Construction Hours

The Development Consent (SSD-6038) approves works to be undertaken 24 hours a day, seven days a week.

The EPL (Condition L4.1) requires that construction hours are restricted to between:

a) *7:00am and 6:00pm Monday to Friday;*
b) *8:00am and 1:00pm Saturday; and*
c) *not be undertaken on Sundays or Public Holidays*

However the following activities may be carried out outside of the above hours:

a) *Construction work that causes $L_{Aeq(15minute)}$ noise levels that are no more than 5dB above rating background level at any residence not subject to a private negotiated agreement, in accordance with the Interim Construction Noise Guideline (DECC, 2009);*
b) *The delivery of plant, equipment and materials which is required to be delivered outside of the standard construction hours by Police and/or other authorised authorities; and*
c) *Emergency work to avoid loss of life, damage to property and/or environmental harm.*

Construction works are not expected to cause noise levels more than 5dB above the background level at any residence and therefore works will take place 24 hours a day, seven days per week. Noise mitigation and monitoring is discussed further in the Noise Management Sub Plan included as **Appendix A.**

1.5.2 Operational Hours

The EPL Condition L3.1 to L3.7 details requirements for operational noise and neither the EPL (20350) or DPE Approval (SSD-6038) sets no restrictions on the hours of operation.

2. ENVIRONMENTAL MANAGEMENT

2.1 Environmental Policy

Santos has developed Environment, Health and Safety (EHS) Policies including:

- Santos Environment Vision, Commitment and Policy (Refer to **Appendix B**).
- Santos Climate Change Policy (Refer to **Appendix B**).

The above Policies (*EHSMS01 EHS Policies*) make commitments relating to environmental responsibilities and greenhouse gas emission reduction and are available to all employees on the Santos intranet sit, *The Well*.

2.2 Environment, Health and Safety Management System (EHSMS)

The company-wide EHSMS provides a structured framework for environmental and safety practices across Santos' activities and operations and is based on the ISO14001 and AS 4801 standards.

The EHSMS comprises two parts that underpin the EHS framework and describe requirements such as organisation structure, planning activities, responsibilities, resources, practices, procedures and processes for meeting the objectives of Santos' EHS policies. These are:

- Management Standards - documents that define the requirements necessary to ensure that environment, health and safety risk is systematically managed.
- Hazard Standards - documents that detail the controls required to manage the risks of specific hazards to as low as reasonably practicable.

The standards are further supported by Business Unit/Function and asset/activity procedures, tools, guides and practices specific to work being undertaken.

This PEMP for the Project has been developed to align with the EHSMS. The structure of the EHSMS standards and relationship to other system elements and this PEMP is depicted in Figure 2-1 and the structure of EHSMS is detailed in Figure 2-2.

The sub-plans to the PEMP have been developed to assist in compliance to statutory instruments as they apply to the project. It is recognised that some of the conditions do not directly relate to the planning approval requirements but are included to provide a holistic and best practice approach to environmental management and the compliance obligations. The sub plans are dynamic documents and will be amended from time to time to reflect emerging technologies and any amended or additional obligations by various government agencies. The sub plans along with the PEMP will be submitted to DPE for acceptance, however no additional agency sign off will be sought for these documents.

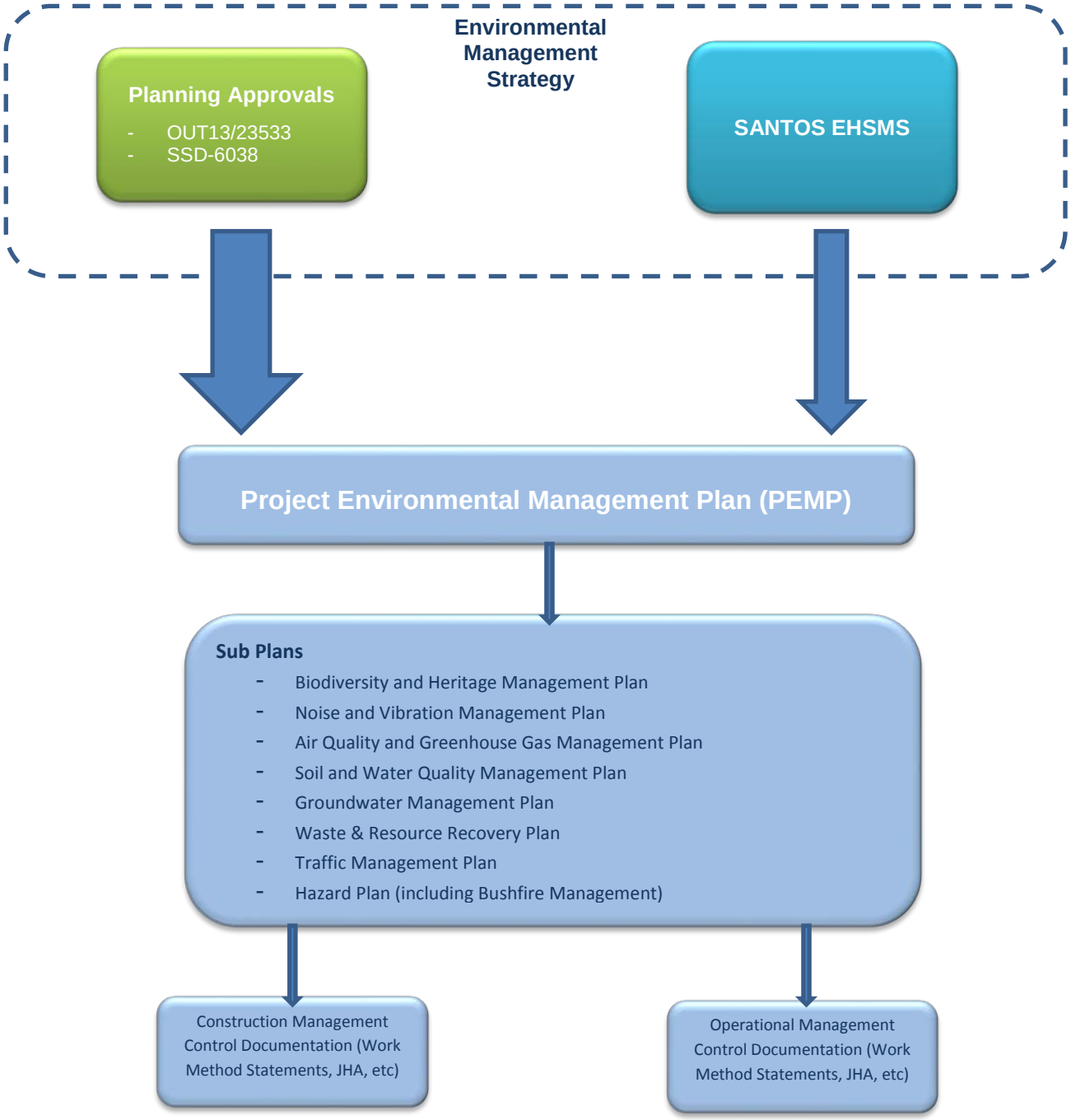

Figure 2-1 Environmental Management Strategy for Compliance

Figure 2-2 Santos EHSMS Process

2.3 Environmental Management Strategy

SSD-6038 Schedule (Sch) 5, 1 requires the preparation and implementation of an Environmental Management Strategy to the satisfaction of the Secretary of the Department of Planning and Environment (DPE). SSD-6038 Sch 5, 2 sets out the requirements for the management plans required under the consent. This PEMP and Sub Plans have been developed to address these requirements.

A summary of the requirements of the SSD-6038 Sch 5,1 and where in this document they have been addressed is provided in Table 2-1.

Table 2-1 Summary of SSD-6038 requirements for Environmental Management Strategy and where they have been addressed

Condition	Requirement	Where addressed
Sch 5, 1	The Applicant shall prepare and implement an Environmental Management Strategy for the development to the satisfaction of the Secretary. This strategy must:	Section 2.3
(a)	be submitted to the Secretary for approval prior to the commencement of the construction of the Dewhurst 13-18H Extension or the Dewhurst 30 and 31 Extension	Section 2.3
(b)	provide the strategic framework for environmental management of the development;	Entire document
(c)	identify the statutory approvals that apply to the development;	Section 2.5
(d)	describe the role, responsibility, authority and accountability of all key personnel involved in the environmental management of the development;	Section 3.1
(e)	describe the procedures that would be implemented to: (i) keep the local community and relevant agencies informed about the operation and environmental performance of the development; (ii) receive, handle, respond to, and record complaints; (iii) resolve any disputes that may arise during the course of the development; (iv) respond to any non-compliance; (v) respond to emergencies;	 Section 3.4 Section 3.5 Section 3.9 Section 4.4 Section 3.3

Condition	Requirement	Where addressed
(f)	include: (i) copies of any strategies, plans and programs approved under the conditions of this consent; and (ii) a clear plan depicting all the monitoring required to be carried out under the conditions of this consent.	Appendix A Section 4.1

2.4 Objectives, Targets and Performance Indicators

Santos' Management Standard *EHSMS03 – Objectives and Targets* and Improvement Plans requires that annual EHS objectives and targets are set to measure and drive continuous improvement in EHS, and process safety, performance across Santos.

Santos has developed lead and lag indicators for both environment and safety performance across all its assets. This enables Santos to set improvement goals and targets for continual improvement in environmental and safety performance.

Project specific objectives and performance indicators have been developed and are included in each of the Sub Plans.

2.5 Approvals, Licences and Legislative Requirements

Santos' Management Standard *EHSMS02 Legal Obligations and Other Requirements* defines the requirements to ensure that EHS legal obligations and other requirements are identified, communicated, accessible and kept up to date to achieve compliance. ENSW has its own Compliance Management Plan which outlines the approach by which ENSW manages significant compliance obligations resulting from business activities, so as to comply with the Santos Compliance Policy.

Santos has developed a Compliance Register for the Dewhurst Exploration Pilot Expansion Project which lists the requirements of all of the relevant approvals, licences and key legislation along with the obligation source, phase of work it applies to, responsible manager, completion status and comments. The Compliance Matrix incudes all obligations, not only environmental. For the environmental obligations, a flag has been included to the PEMP or Sub Plan that addresses the requirement.

The Compliance Register is an important tool for managing compliance with all of the Project's obligations and forms part of the overall Environmental Management Strategy for the project.

At the completion of each phase of the development, the business unit responsible for the phase reports against the applicable compliance obligations. This is stored in the Santos compliance database ComTrack.

A summary of some of the key Project Approvals and Licences is provided in Table 2-2.

Table 2-2 Summary of Key Project Approvals and Licences

Approving / Licensing Authority	Description	Approval process	Date Approved
DPE	Dewhurst 13-18H Extension and Dewhurst 30 and 31 Extension	EIS Assessment Part 4 EP&A Act	18 July 2014
NSW Department of Trade and Investment, Regional Infrastructure and Services (DTIRIS)	Dewhurst 26-29 four well pilot	REF Assessment Part 5 EP&A Act	16 August 2013

Approving / Licensing Authority	Description	Approval process	Date Approved
NSW Department of Primary Industries (DPI)	Dewhurst 13-18H pilot well set	REF Assessment Part 5 EP&A Act	21 July 2009
DTIRIS	PEL 238	Petroleum (Onshore) Act 1991	Renewed on 15 February 2013
EPA	Environmental Protection Licence (EPL) No. 20350 Scheduled Activity: Coal Seam Gas exploration, assessment production	POEO Act 1997	Licence review date: 1 May 2019
NSW Department of Primary Industries: Office of Water (NOW)	Water Supply Works	Water Management Act 2000	6 February 2014
Forestry Commission of NSW (Forests NSW) & DPI	Occupation permit	Forestry Act 1916	23 February 2011
Federal Department of Environment	EPBC Approval	Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)	1 October 2013

The key Approval, Licence and legislative requirements have also been incorporated into each of the Sub-Plans detailed in **Appendix A**.

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3. IMPLEMENTATION

3.1 Roles and Responsibilities

Santos is responsible for the implementation of environmental management procedures and mitigation measures contained in this PEMP. All employees and Contractors will meet the requirements of this PEMP and Sub-Plans.

Responsibility for a lease site depends on the activities being undertaken at the time. Ownership of the lease is subject to a formal handover process.

The Santos Management Standard *EHSMS05 – Responsibility and Accountability* requires that EHS responsibilities be defined in position descriptions and that organisational structure be documented by an organisational diagram to provide clarity on reporting and communication channels. The organisational structure diagram for Energy NSW is provided in Figure 3-1.

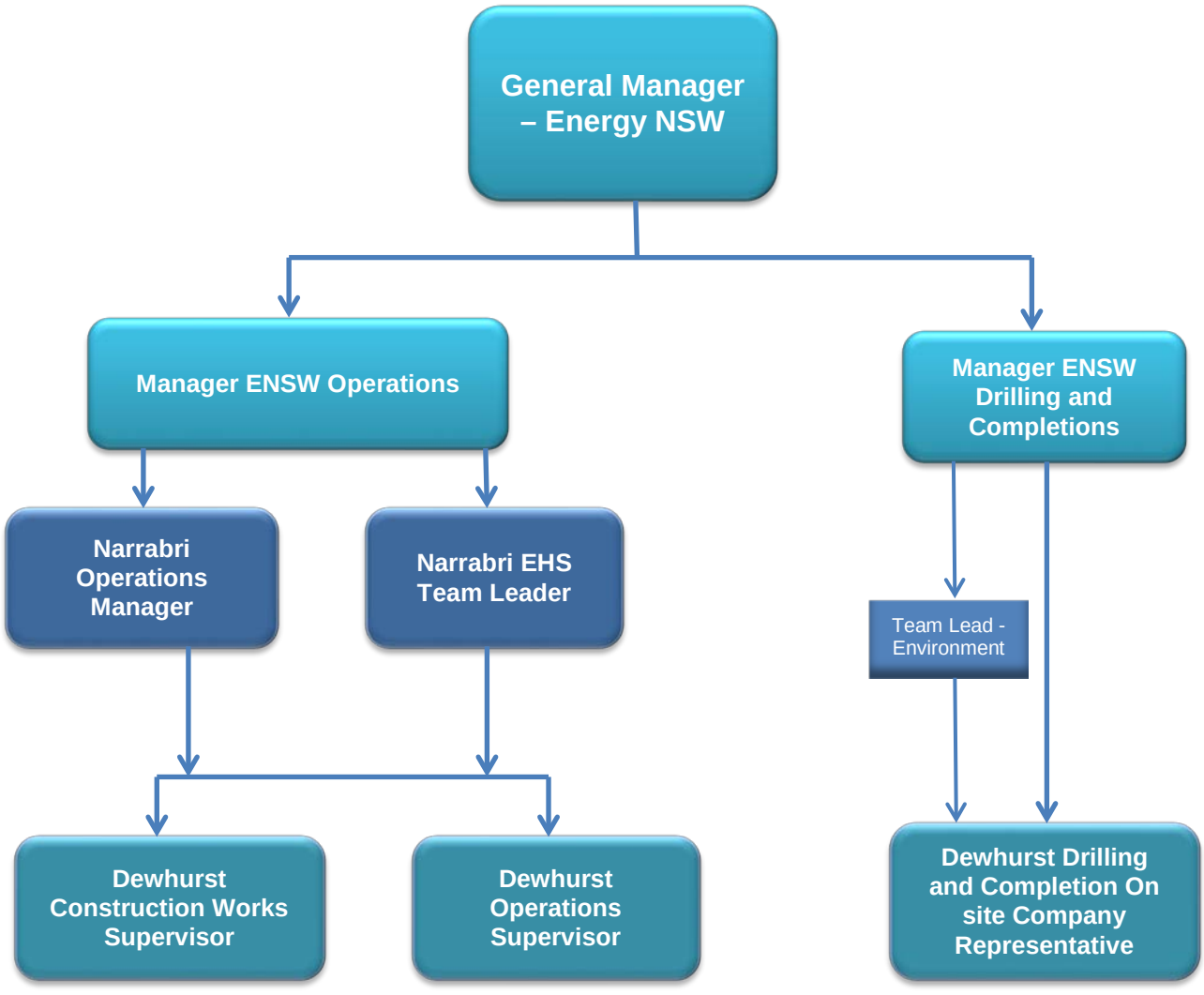


Figure 3-1 Santos ENSW Organisational Chart

Key roles and their general responsibilities in relation to environmental management and compliance for the Project are described in Table 3-1. Personnel and contact details are provided in **Appendix D**.

Table 3-1 Roles and Responsibilities

Position	Responsibility
Manager, Operations ENSW	Ultimate responsibility for the operation of all gas transmission and electricity generation infrastructure. Ensure the environmental performance of the project is consistent with the conditions of approval Santos EHSMS. Responsible for legislative compliance, observation of contractual obligations and the maintenance of resources to achieve the main objectives of the PEMP.
Manager ENSW Drilling and Completions	Ultimate responsibility for the drilling and development of the well to operational status. Ensure the environmental performance of the project is consistent with the conditions of approval Santos EHSMS. Responsible for legislative compliance, observation of contractual obligations and the maintenance of resources to achieve the main objectives of the PEMP.
Narrabri Operations Manager	Reports to the Manager Operations ENSW, Maintains accountability, either directly or by delegation, for the overall management of the project site and the operation of project components. Retains responsibility for the conveyance of this PEMP and its objectives to all employees and contractors entering site.
EHS Team Leader	Reports to the Manager Operations ENSW. Maintains accountability for the implementation, maintenance and monitoring of compliance with the PEMP. Advises operations management on environmental issues. Reviews contractor HSE and EMP documentation (where applicable).
Environmental Advisor	Reports to EHS Team Leader and Operations Manager ENSW. Maintains accountability for the monitoring of compliance with the PEMP. Advises operations field staff on environmental issues. Responsible for assessing, developing and validating the implementation of erosion and sediment plans. Undertakes site inspections.
Dewhurst Construction Field Supervisor	Reports to Narrabri Operations Manager. Responsible for ensuring implementation of PEMP during construction phase Communicates PEMP compliance during construction phase
Dewhurst Operations Supervisor	Reports to Narrabri Operations Manager. Responsible for ensuring implementation of PEMP during construction phase Communicates PEMP compliance during operational phase
Dewhurst Drilling and Completion On site Company Representative	Reports to Manager ENSW Drilling and Completions Responsible for implementation of PEMP during drilling & completions phase Communicates PEMP compliance during drilling phase
Team Lead - Environment	Reports to Environment Manager. Communicates PEMP requirements during drilling & completions phase Provides Drilling & Completions with advice on environmental issues
Field Services Officer, Operations (Field Supervisor)	Reports to the Operations Manager ENSW Maintains accountability for the monitoring of compliance with the PEMP for the construction period. Responsible for implementation of erosion and sediment control plan Communicates PEMP compliance construction phase obligations
Operator Maintainer, Operations	Reports to the Supervisor, Operations ENSW Maintains accountability for the monitoring of compliance with the PEMP during the life of the operation.

Position	Responsibility
	Undertakes site inspections
Santos personnel and contractors	Undertake all activates in accordance with the PEMP

3.2 Environmental Training and Inductions

The Santos Management Standard *EHSMS06 Training and Competence* defines the expectations in place to ensure employees, contractors and visitors have the necessary knowledge and skills to conduct their activities safely, in an environmentally responsible manner and without damaging plant and equipment.

3.2.1 Inductions

All personnel working or visiting a Santos site or premise must complete the appropriate EHS inductions. The following levels of induction are required

- Level One – general Santos induction.
- Level Two – site /premise specific induction.
- Level Three - activity / location specific induction.
- Ecological induction.
- Visitor – specific to each site / premise.

The Level One induction is maintained by Santos' Corporate EHS and provides information on the Santos EHSMS and the major generic hazards and controls implemented to minimise risk. The Level One induction is available on-line.

Level Two inductions are maintained by a delegate of the sites / premises and provide information on the location's significant EHS hazards and controls implemented to minimise risk as well as the location's generic emergency response protocols. The Level Two induction is available on-line.

Level Three inductions are maintained by a delegate of the location / activity and provide information on significant EHS hazards and controls implemented to minimise risk as well as site specific emergency response protocols. The Level Three Induction is specific to the Narrabri Gas field and will include the requirement for mandatory compliance with this PEMP and Sub-Plans by all personnel involved in the Project. The induction will also include emergency procedures for the Project.

In accordance with the Project's EPBC Referral Decision, prior to commencement, all site staff and contractors involved in construction in the project area will attend a project induction presented by a suitably qualified ecologist. This is discussed further in the Biodiversity Management Plan.

3.2.2 Environmental Training

In addition to the EHS Inductions, the following training will be undertaken:

- Icebreaker meetings - conducted prior to commencing a drilling program for all personnel involved in the program, and include:
  - Familiarisation with this PEMP and its requirements.
  - Policies and procedures.
  - Reporting structures.
  - In-vehicle-monitoring system and other land transportation requirements.
  - Site specific requirements and significant hazards.
  - Specific approval conditions and government requirements applicable to the work scope.
  - Emergency preparedness procedures.
  - EHS topics as appropriate for the work scope.
- Toolbox training.
- Environmental awareness training as required in relation to specific areas of concern.

3.2.3 Training Records

Santos Corporate Human Resources maintains the system of recording successful completion of Level One and Two EHS inductions. The Project will maintain a system to record successful completion of Level Three inductions.

Santos contractors will maintain a system that records all contractor personnel inductions and training competencies to demonstrate relevant EHS competencies, including those required by legislation.

3.3 Emergency and Incident Management

Santos has developed the following key documents relating to emergency and incident management:

- Management Standard *EHSMS13 Emergency Preparedness and Response.*
- Management Standard *EHSMS15 Incident Investigation and Response.*
- NSW Incident Management Plan.
- NSW Emergency Response Plan.
- Narrabri Gas Project Pollution Incident Response Management Plan (PIRMP).

Santos’ system of emergency response is detailed in Figure 3-2 Emergency Response Framework Figure 3-2.

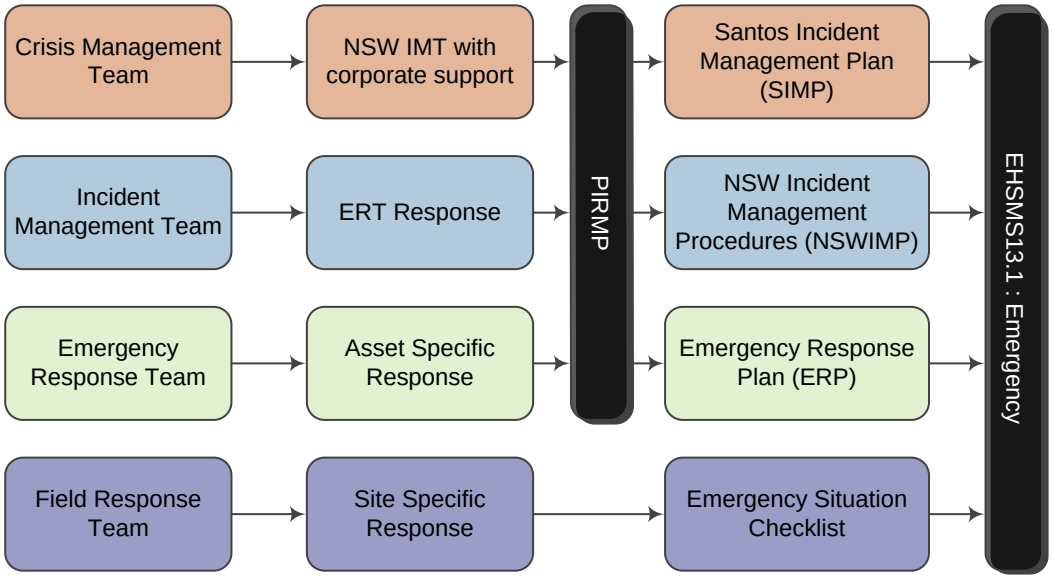


Figure 3-2 Emergency Response Framework

The above documents are located on *The Well* and electronically in centrally located files.

All incidents including environmental incidents, near misses, non conformance events and complaints are recorded electronically and managed through the Santos Incident Management System (IMS) in *EHS Toolbox*.

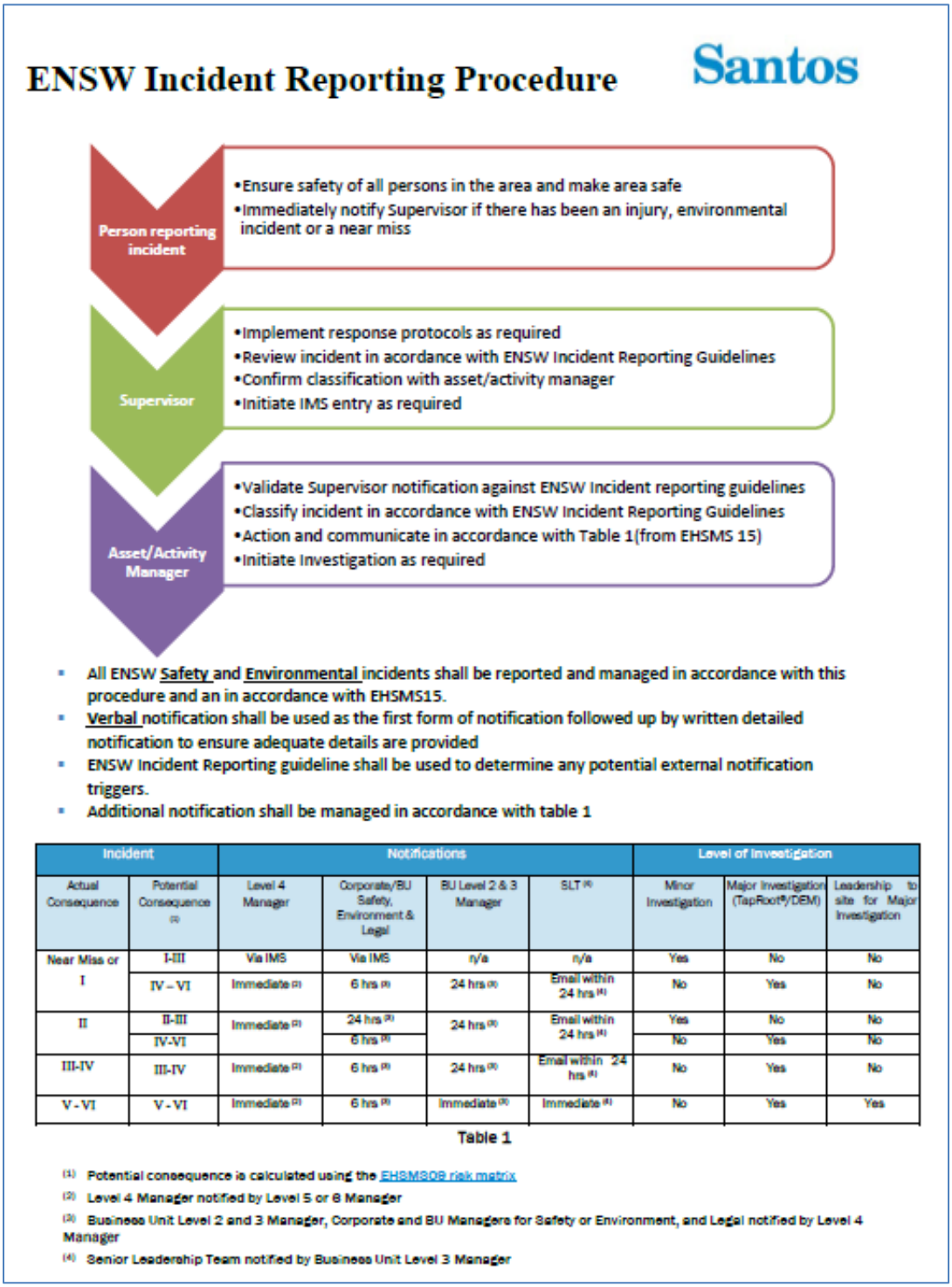
EHS Incident and near misses are investigated in order to identify the causal factors and associated underlying systemic weaknesses (root causes). *EHSMS 15 - Incident Investigation and Response*; outlines the process in which to determine the correct level of incident investigation. For significant incidents the *TapRoot* investigation process is used.

3.3.1 Incident Reporting

Obligations for incident reporting are included within:

- The Planning Approvals.
- EPL 20350.
- PEL 238.
- POEO Act.

Santos’s internal EHSMS management system provides the mechanism for managing incidents. All incidents, hazards / near misses are categorized according to Santos’ EHSMS requirements, with immediate internal notification to respective management levels commensurate with severity. This process is illustrated in Figure 3-3.



ENSW Incident Reporting Procedure Santos

Person reporting incident
- Ensure safety of all persons in the area and make area safe
- Immediately notify Supervisor if there has been an injury, environmental incident or a near miss

Supervisor
- Implement response protocols as required
- Review incident in acordance with ENSW Incident Reporting Guidelines
- Confirm classification with asset/activity manager
- Initiate IMS entry as required

Asset/Activity Manager
- Validate Supervisor notification against ENSW Incident reporting guidelines
- Classify incident in accordance with ENSW Incident Reporting Guidelines
- Action and communicate in accordance with Table 1(from EHSMS 15)
- Initiate Investigation as required

- All ENSW Safety and Environmental incidents shall be reported and managed in accordance with this procedure and an in accordance with EHSMS15.
- Verbal notification shall be used as the first form of notification followed up by written detailed notification to ensure adequate details are provided
- ENSW Incident Reporting guideline shall be used to determine any potential external notification triggers.
- Additional notification shall be managed in accordance with table 1

Incident		Notifications				Level of Investigation		
Actual Consequence	Potential Consequence (1)	Level 4 Manager	Corporate/BU Safety, Environment & Legal	BU Level 2 & 3 Manager	SLT (4)	Minor Investigation	Major Investigation (TapRoot®/DEM)	Leadership to site for Major Investigation
Near Miss or I	I-III	Via IMS	Via IMS	n/a	n/a	Yes	No	No
	IV – VI	Immediate (2)	6 hrs (3)	24 hrs (3)	Email within 24 hrs (4)	No	Yes	No
II	II-III	Immediate (2)	24 hrs (3)	24 hrs (3)	Email within 24 hrs (4)	Yes	No	No
	IV-VI		6 hrs (3)			No	Yes	No
III-IV	III-IV	Immediate (2)	6 hrs (3)	24 hrs (3)	Email within 24 hrs (4)	No	Yes	No
V - VI	V - VI	Immediate (2)	6 hrs (3)	Immediate (3)	Immediate (4)	No	Yes	Yes

Table 1

(1) Potential consequence is calculated using the EHSMS09 risk matrix
(2) Level 4 Manager notified by Level 5 or 6 Manager
(3) Business Unit Level 2 and 3 Manager, Corporate and BU Managers for Safety or Environment, and Legal notified by Level 4 Manager
(4) Senior Leadership Team notified by Business Unit Level 3 Manager

Figure 3-3 ENSW Incident Reporting Procedure

Further information on the notification process for pollution incidents is detailed in the PIRMP. The PIRMP outlines which agencies to notify, what information to provide, the location of the Emergency Contact List, how to communicate with neighbours and the local community.

3.3.2 Incidents causing material harm

For incidents causing or threatening to cause material harm, Santos is required by its Development Consent, EPL, PEL and the POEO Act to immediately notify the respective agencies (DPE, EPA, OCSG as well as NSW Health, WorkCover NSW, Local Council and Fire and Rescue NSW). EPL Condition R2.1 requires that the notification must be made by the telephoning the Environment Line service on 131 555.

In accordance with Section 147 of the POEO Act, harm to the environment is material harm if:

- it involves actual or potential harm to the health or safety of human beings or to ecosystems, that is not trivial, or
- it results in actual or potential loss or property damage of an amount, or amounts in aggregate, exceeding $10,000 (including the reasonable costs and expenses that would be incurred to prevent, mitigate or make good harm to the environment).

The SSD-6038, PEL and EPL all require that a written report on the incident is provided to the relevant agencies within 7 days of the date of the incident.

3.3.3 Other incidents and breaches

SSD-6038 Sch 5, 6 requires that any other incident is reported to the DPE and other relevant agencies as soon as practicable after becoming aware of the incident (where, based on the definition of incident provided in the Consent, other is taken to mean a breach or exceedance of the limits or performance measures/criteria in the Consent). The requirement to provide a written report within 7 days of the incident is considered to extend to other incidents.

In addition SSD-6038 Sch 5, 3 requires that where an exceedance of the Sch 3 criteria and/or performance measures has occurred, Santos will, at the earliest opportunity:

- *take all reasonable and feasible steps to ensure that the exceedance ceases and does not reoccur;*
- *consider all reasonable and feasible options for remediation (where relevant) and submit a report to the DPE describing those options and any preferred remediation measures or other course of action; and*
- *implement remediation measures as directed by the Secretary of the DPE.*

PEL Condition 54 requires that the DRE is immediately notified of all:

- *breaches of the conditions of the PEL; and*
- *breaches of environmental protection legislation (as defined in the Protection of the Environment Administration Act 1991), arising in connection with prospecting operations under the PEL.*

An Environmental Incident and Complaints Report is required to be provided to the Department within 7 days of the above and any complaints from landholders or the public the Environmental Incident and Complaints Report must include:

- The details of the exploration licence.
- Contact details for the licence holder, complainant and landholder.
- A map showing the area of concern.
- A description of the nature of the incident or complaint, likely causes and consequences.
- A timetable showing actions taken or planned to address the incident or complaint.
- A summary of all previous incidents or complaints relating to prospecting operations under this exploration licence.

3.3.4 Blowouts

In addition to the general incident notification requirements outlined above, PEL 238 Condition 35 requires that any blowout associated with prospecting operations is reported to the OCSG immediately and a written report provided within 24 hours.

3.4 Consultation and Communication

The Santos Management Standard *EHSMS07 - Consultation and Communication* provides the framework for carrying out consultation and communication with workers, contractors and external stakeholders. The Standard details the requirements to enable:

- Consultation for effective EHS decision making.
- Compliance with legal EHS consultation requirements.
- Effective EHS communication with workers, contractors and external stakeholders.
- Effective management of EHS related complaints.

3.4.1 Internal Communication

Santos communicates internally through the following forums:

- Ice breakers.
- Weekly EHS meetings.
- Daily management/rig meetings.
- Daily Toolbox meetings.
- Notice boards.
- EHS Bulletins.
- '*The Well'* – Santos intranet site.

In accordance with PEL 238 Approval Condition 9 and EPL Condition G1.2 the following information is accessible and made available to all supervisors or other persons concerned in the day to day management of operations via the Santos compliance database ComTrack. Electronic copies are available on centrally located files and hard copies of some of the key documents are also provided to the worksite:

- Licences and permits, including PEL 238 and EPL 20350.
- Approvals, including Development Consent, PEL Approval.
- Approval supporting documents such as the EIS Dewhurst Gas Exploration Pilot Expansion and REF Dewhurst 26-29 Petroleum Wells PEL 238.
- Access arrangements required under Part 4A of the Petroleum Onshore Act 1991.
- Exempted area consents required under section 70 of the Petroleum Onshore Act 1991.
- Management plans including Groundwater Monitoring and Modelling, Produced Water Management Plan and this PEMP and associated Sub Plans.
- The approved Work Program.
- Any approval, plan, program or similar document required to comply with the NSW Code of Practice for Coal Seam Gas Exploration and the NSW Code of Practice for Coal Seam Gas Well Integrity.

3.4.2 Stakeholder consultation

In accordance with the EIS Statement of Commitments (SSD-6038 Appendix 4), the following consultation will be undertaken with relevant stakeholders:

- Narrabri Shire Council will be consulted on a monthly basis where appropriate.
- Updates on the proposed activity will be provided to the Narrabri Community Consultation Committee.
- Advertisements will be placed in the local media of the up-coming exploration and drilling activities.
- Advice will be provide to the relevant landowners that may be impacted by the activity 14 days prior to the proposed activity commencing.
- The local police will be notified of the proposed drilling activities and provided with a road traffic plan specifying the route time and location of the drilling rig 14 days prior to the drilling rig mobilising to site.
- The NSW Office of Water (NOW) will be notified 28 days prior to the commencement of drilling operations (PEL 238 Condition 32a).

In accordance with PEL 238 Condition 8, an annual report on Community Consultation will be submitted to NSW Trade & Investment Resources and Energy (DRE) within 28 days of the anniversary of the PEL licence being granted (15 February 2013). The report will include evidence that community consultation has been undertaken in accordance with the Guideline for community consultation requirements for the exploration of coal and petroleum, including coal seam gas (NSW Trade & Investment, 2012). The annual report will follow the template A guide for reporting on community consultation for coal and petroleum exploration activities in New South Wales provided by DRE and include records of:

- Consultation with relevant government agencies (including local councils).
- Consultation with impacted landholders and community groups.
- Issues identified and actions taken.
- Outcomes of the consultation.
- Proposed future consultation.
- Summary of complaints and actions taken to address these complaints.

3.4.3 Website

In accordance with SSD-6038 Sch 5, 10, the following information will be made publically available on the Santos website and be kept up to date:

- Dewhurst Gas Exploration Pilot Expansion EIS and Statement of Commitments.
- Development Consent and all other current statutory approvals for the project.
- All approved strategies, plans and programs required under the SSD-6038.
- A comprehensive summary of the monitoring results of the project, reported in accordance with the specifications in any SSD-6038, or any approved plans and programs.
- A complaints register, updated monthly.
- The annual reviews of the project.
- Any independent environmental audit of the development, and Santos' response to the recommendations in any audit.

3.4.4 Communication of exceedances

In accordance with SSD-6038 Sch 4,1, where monitoring results indicate an exceedance of any relevant criteria in Sch 3 of the SSD-6038, Santos will notify affected landowners in writing of the exceedance as soon as practicable after obtaining the results, and provide regular monitoring results to each affected landowner until the project is again complying with the relevant criteria.

If the exceedance relates to the air quality criteria, a copy of the current NSW Health fact sheet entitled "Mine Dust and You" will be sent to the affected landowners and/or existing tenants of the land (including the tenants of any mine-owned land).

3.5 Management of Complaints

In accordance with EPL Condition M6, Santos operates a 1800 telephone complaints line for the purpose of receiving complaints from members of the public in relation to its activities. The public are notified of the complaints line telephone number via the Santos Ltd website.

Complaints can also be received via email, post or in person at the Narrabri shopfront.

Complaints received via the 1800 number are answered initially by an external agency and the details passed on to the Operations Manager who then delegates it to the relevant personnel for investigation, follow up and recording. Follow-up with the person/s reporting the complaint is to occur initially within 48 hours of receipt and then finally within 2 weeks of receipt of the complaint.

Santos manages all community complaints in accordance with the requirements of EPL Condition M6 including:

- Reporting complaints in the Annual Return.
- Keeping a legible record of all complaints made to Santos and its contractors, including:
  - The date and time of the complaint.
  - The method by which the complaint was made.
  - Any personal details of the complainant which were provided by the complainant or, if no such details were provided, a note to that effect.
  - The nature of the complaint.
  - The action taken by Santos in relation to the complaint, including any follow-up contact with the complainant.
  - If no action was taken by Santos, the reasons why no action was taken.
- The complaints record must be produced to any authorised officer of the EPA who asks to see it.
- The complaints record must be kept for at least four years after the complaint was made.

Santos uses the Consultation Manager system as the central repository for all complaints received relating to department activities. Complaints may also be reported in the EHS Toolbox portal as an incident, in which case a reference will be included in the respective Consultation Manager entry.

Apart from the complaint management requirements of the EPL, Santos is required under the conditions of PEL 238 to provide a written report to the Office of Coal Seam Gas for all complaints alleging environmental harm or a breach of the conditions of the exploration licence or of environmental protection legislation. This is to be provided within 7 days of receipt of the complaint

3.6 Record keeping

In accordance with EPL Condition M1.2 all records required to be kept by the EPL will be:

- In a legible form, or in a form that can readily be reduced to a legible form.
- Kept for at least 4 years after the monitoring or event to which they relate took place.
- Produced in a legible form to any authorised officer of the EPA who asks to see them.

3.7 Risk Assessment

Santos' approach to managing risk is outlined Management Standard *EHSMS09 – Managing EHS Risks*. The Standard outlines the requirements to:

- Identify EHS hazards, assess their risk and control them to as low as reasonably practicable.
- Identify significant EHS hazards and document how they are being managed to as low as reasonably practical.
- Have a system to escalate EHS significant hazards to management approval of continued operation and for management to sign off on EHS significant hazards, controls and how critical controls will be checked.
- Meet legislative requirements that require certain EHS hazards and risks be managed.

EHSMS09 dictates that hazard identification must include environment hazards required by legislation including:

- Air emissions.
- Generation of greenhouse gases.
- Unauthorized land disturbance.
- Unauthorised disturbance to flora and fauna.
- Wastewater discharges.
- A hazardous material spills (hydrocarbon and other chemicals).
- Contamination of soil and groundwater.
- Spread of pest plants and animals.
- Disturbance to cultural heritage.
- Generation of noise.
- Community complaints.
- Generation, transportation and disposal of wastes.

EHS hazards with potential to cause unwanted events with an inherent risk level of three (3) or higher on the Santos risk assessment matrix are defined as Significant, and are entered into the Significant Hazard Risk Register (SHRR).

Outputs from the SHRR include:

- Determining if the residual risk is as low as reasonably practicable.
- Identifying and assigning action/s to further reduce the residual risk to as low as reasonably practicable and then having the appropriate level of management sign-off on the reduced residual risk level.
- Identifying the major EHS hazards to be included in EHS inductions.
- Prioritising resources for the auditing/monitoring of key controls.
- Assisting with the development of site/function EHS inspection, monitoring and audit programs.
- Assisting with the development of annual EHS and process safety Improvement Plans.
- Providing guidance for developing contractors' EHS Management Plans.
- Developing pre-start and checklists for regular use to ensure appropriate risk controls are in place.

The Manager CSG D&C is responsible for the development of the SHRR and will appoint an SHRR Custodian who is responsible for the maintenance of the SHRR. The SHRR will undergo a cyclic review at least every three years to validate the content reflect the current risk profile of the D&C activity.

The SHRR will be periodically updated when new significant hazards/incidents are identified or the residual risk of a significant hazard/incident is altered (e.g. the effective implementation of a new risk reduction control, an audit identifies a key control is not effective). A copy of the SHRR is recommended to be kept on site as well as on *The Well*.

3.8 Environmental Reporting

Santos has a number of environmental reporting requirements specified by its SSD-6038, Licences

and other approvals and internal practices. A summary of reporting requirements is provided in Table 3-2. Issue specific reporting requirements are included within each of the Sub Plans.

Table 3-2 Key environmental reporting requirements

Reporting requirement	To who	Condition / Licence No.	Timing
Prepare and submit an Environmental Management Report	DRE	PEL 238 Condition 53	Prior to expiry where a renewal of the PEL is sought; or Immediately following the expiry or earlier cancellation of the PEL
Prepare and submit an Annual Community Consultation Report	DRE	PEL 238 Condition 8	15 March Annually (within 28 days of PEL licence date 15.02.13)
Regular reporting on the environmental performance of the development	Publicly available on website	SSD-6038 Sch 5, 7	Regular
Complete and submit an Annual Return comprising Statement of Compliance and Monitoring and Complaints Summary in form provided by EPA.	EPA	EPL Condition R1	Annually
Submit updated spatial information when there have been infrastructure changes to the licence as identified in condition A2.1	EPA	EPL Condition R4.1	Annually with the Annual Return
Submit a Groundwater Monitoring Report for the licensed monitoring points which provides an analysis and interpretation of monitoring results and actions to correct any identified adverse trends	EPA	EPL Condition R4.2	Annually with the Annual Return
Submit a brief summary report of the Leak Detection and Repair (LDAR) program (refer R4.3 for information to include)	EPA	EPL Condition R4.3	Annually with the Annual Return
Conduct an Annual Review of the environmental performance of the project to the satisfaction of the	DPE and publicly available on	SSD-6038 Sch 5, 4	March Annually

Reporting requirement	To who	Condition / Licence No.	Timing
Secretary of the DPE (refer to Section 4.2)	website		
Submit Independent Environmental Audit Report (refer to Section 4.2.4) together with response to any recommendations contained in the audit report	DPE and publicly available on website	SSD-6038 Sch 5, 8	Within 6 weeks of completion of audit
Notify all relevant authorities of any incident that has caused or threatens to cause material harm to the environment immediately after becoming aware of the incident. Provide written report within 7 days of the date of the incident (refer Section 3.3.1)	EPA via Environment Line (131 555) DPE and any other relevant agencies DRE	EPL Condition R2 SSD-6038 Sch 5, 6 PEL 238 Condition 54	Notify immediately Written report within 7 days
Notify the DRE of all breaches of the conditions of the PEL and breaches of environmental protection legislation and complaints from landholders or the public alleging environmental harm or a breach of conditions of the PEL or environmental legislation (refer Section 3.3.1)	DRE	PEL 238 Condition 54	Notify immediately Written report within 7 days
Notify the DPE of any other incident associated with the project (defined as a set of circumstances that breaches or exceeds the limits or criteria of the Consent) (refer Section 3.3.1)	DPE	SSD-6038 Sch 5, 6	As soon as practical after becoming aware of the incident Written report within 7 days
Provide the EPA with a written report upon request by an authorised officer on suspicion that an event has occurred and is causing or likely to cause material harm to the environment	EPA	EPL Condition R3	Upon request of EPA
Report any blowout associated with prospecting operations to the DRE immediately and provide a written report within 24 hours (refer Section 3.3.1).	DRE	PEL 238 Condition 35	Notify immediately Written report within 24 hours

In addition, Santos undertakes the following internal EHS reporting as outlined in its Management Standard *EHSMS14 Monitoring, Measurement and Reporting*:

- Quarterly EHS reports for the Environment and Safety Committee of the Board.
- Quarterly EHS report to the ENSW General Manager.
- Monthly EHS management report.

- Quarterly report to Australian Petroleum Production & Exploration Association (APPEA) for inclusion in its industry report.
- Company Annual Report which includes details of EHS performance including compliance with environmental regulations and licences.

3.9 Dispute Resolution

Santos' aim is always to avoid the need for dispute resolution through the effective management of information and the stakeholder and community engagement. It is Santos policy to not undertake coal seam gas exploration activities on any land unless it has the agreement of the landholder. Santos has designated land access personnel whose role is to maintain sound working relationships with each landholder. Any items of concern are escalated, so that the person with the authority to make changes is brought into discussions at the earliest opportunity. For the Dewhurst 30&31 wells, the landholder is FCNSW. Santos meets frequently with FCNSW to ensure issues are addressed promptly and that they are kept appraised of planned and current activities. For the Dewhurst 13-18 wells, Santos leases the land on which the wells are located, along with the surrounding parcel of land. With regard to disputes with non landholders, Santos will resolve any disputes that may arise during the course of the project through its complaint management process.

In the event that a dispute cannot be resolved, the matter will be escalated to involve the ENSW Manager Public Affairs as required, and may involve consultation with the relevant government agency to assist in reaching a determination on the matter.

4. MONITORING AND REVIEW

4.1 Environmental Monitoring

A summary of the project’s monitoring and surveillance is provided in Table 4-1 to meet the requirements of SSD-6038 Sch 5, 1 to include in the Environmental Management Strategy for the development:

- Copies of any strategies, plans and programs approved under the conditions of this consent.
- A clear plan depicting all the monitoring required to be carried out under the conditions of this consent.”

This summary has been extracted from the Sub Plans included in **Appendix A**. Further detail is provided in the relevant sub plans.

All environmental monitoring equipment such as noise meters, water quality meters, will be maintained and calibrated according to manufacturer’s specifications. All monitoring equipment used will be documented. A register will be kept of this information.

All analyses of environmental media will be undertaken by NATA-accredited laboratories.

The results of all monitoring conducted will be used to identify potential or actual problems arising from the demolition or construction phases. A register will be kept of this information.

Inspections and audits are discussed in Section 4.2.

Table 4-1 Overview of monitoring and surveillance

Issue	Monitoring Description	Frequency
Air Quality Construction and Operational Activities	**Ambient Air Quality Monitoring:** Ambient air quality monitoring will be undertaken in accordance with the detail provided in **Table A, B and C** below	As per **Table B**

Table A: Air Quality Monitoring Locations

Monitoring Point[1]	*Location (MGA94, Zone 55)*		*Parameters Monitored*
	Easting (mE)	*Northing (mN)*	
RR3	149° 45' 05"	30° 34' 20"	PM_{10}, TSP, Deposited Dust
RR6/7	149° 44' 00"	30° 31' 00"	PM_{10}, TSP, Deposited Dust

Table B: Air Quality Monitoring Frequency

Monitoring Type	*Construction Phase*	*Operational Phase*
Deposited dust	Monthly	Monthly
PM_{10}	1 in 6 days	Quarterly for first year, then reviewed thereafter
TSP	1 in 6 days	Quarterly for first year, then reviewed thereafter

Table C: Air Quality Monitoring Methods

Sample Parameter	*PM_{10}*	*TSP*	*Deposited Dust*
Monitoring Apparatus	HVAS	HVAS	DDG
Monitored Parameters	PM_{10}	TSP	Deposited dust & Ash Content
Reporting Units	µg/m³	µg/m³	g/m2/month, %
Averaging Period	24 hour	24 hour	Monthly
Relevant Standards	• AS 3580.9.6: 2005 • AS 3580.1.1: 2007	• AS 3580.9.3: 2003 • AS 3580.1.1: 2007	• AS 3580.10.1:2003 • AS 3580.1.1: 2007

[1] Coordinates to be refined/confirmed upon establishment of monitoring location and confirmation of landholder agreement

Issue	Monitoring Description	Frequency
Air Quality Equipment Maintenance	Plant and equipment will be inspected daily to ensure these are properly maintained. This will include piping to assist in identification of any leaks of fugitive emissions. Maintenance Programs will be undertaken using Santos' Maintenance Management System (Oracle EAM)	Daily
Air Quality Equipment Operation	The licensee must operate a Leak Detection And Repair Program for all relevant components of plant and equipment in order to detect gas leaks.	Continuous
Air Quality Equipment Operation	Santos will implement a Leak Detection and Repair Program as agreed with NSW EPA A fugitive emissions monitoring program will be implemented in the Energy NSW CSG Exploration and Appraisal Program (E&A Program) area, incorporating a leak detection and repair program using the Picarro Cavity Ring Down Spectrometer.	TBC
Air Quality Equipment Operation	A flow meter will monitor the gas flow rate from the gathering system prior to safe ignition.	Continuous
Air Quality Statutory	Appropriate monitoring of emissions and consumables will be undertaken for legislative reporting requirements (such as to inform National Greenhouse and Energy Reporting Scheme (NGERS) calculations).	As required
Hazards & Risks Explosives Management	A record of amounts any types of explosives held in the magazines shall be maintained at all times and such record shall be accessible to an Inspector on request.	During Drilling
Hazards & Risks Chemical, Fuel and Oil Handling and Storage	An SDS register of all chemicals used or stored onsite will be maintained.	At all times
Hazards & Risks Chemical, Fuel and Oil Handling and Storage	WorkCover NSW is required to be notified when Dangerous Goods are stored above 'Manifest' quantities specified in the WHS Regulations.	At all times
Noise Complaints monitoring	Attended noise monitoring ($LA_{eq(15mins)}$) will be undertaken at sensitive receivers based on assessment of noise complaints	As Required
Noise Out of hours monitoring	Attended noise monitoring ($LA_{eq(15mins)}$) will be undertaken at sensitive locations should construction works be required to be undertaken outside normal construction hours. The frequency of the noise monitoring will be determined to assess that the noise impacts are in accordance with NMP-1 and NMP-2. Appropriate actions will be undertaken should noise levels exceed the criteria for the Project.	As Required

Issue	Monitoring Description	Frequency
Surface Water Statutory	When directed by the minister by notice in writing, Santos will install metering equipment (complying with Australian technical specifications) to measure and record the flow of water taken through the water supply work (wells). The metering equipment would be sited and installed at a place in the pipe, channel or conduit between the groundwater source and the first discharge outlet and be operated and maintained in a proper and efficient manner. Santos would keep a logbook or data logger to record the following information: i. Each date and period of time on which water was taken using the water supply work. ii. The volume of water taken on that date. iii. The access licence number of the access licence under which water was taken on that date, or, if water was taken under some other authority (such as basic landholder rights entitlement), the authority under which water was taken. iv. The purpose or purposes for which the water taken on that date was used. v. Details of any cropping carried out using the water taken through the water supply work including the type of crop, area cropped, and dates of planting and harvesting. vi. Where metering equipment has been installed for use in connection with the water supply work, the meter reading before water is taken. vii. Where metering equipment has not been installed for use in connection with the water supply work. viii. details of all pumping activities for the water supply work including pump running hours, pump power usage or pump fuel usage, pump start and stop times for water taken and pump capacity per unit of time. The logbook would be produced to the Minister for inspection when requested and be retained for five years from the date to which the information relates.	As Required
Traffic Damage to roads	Damage to roads caused by construction activities will be monitored to satisfy a number of Project specific requirements/conditions including the Condition of Consent (Appendix 4 – SOC 69) and the Occupation Permit, and for confirming damages caused by the Project during construction. Monitoring damage will be via Dilapidation Surveys conducted prior to commencement of construction and following completion of construction.	Before Construction After Construction
Traffic Induction	An Induction Records register indicating the induction of all site staff and delivery drivers will be maintained to satisfy the Condition of Consent (Appendix 4 – SOC 65).	During Construction, Drilling and Operations
General Inspections	Field Superintendent to assess potential air/dust, noise, soil and water and waste issues during construction and drilling	Daily during construction and drilling
General Inspections	Environmental Advisor inspection of activities to determine if all reasonable and feasible air/dust emission, noise, soil and water, waste mitigation measures are in place	6 monthly during operation
General Inspections	Well Operator to undertake 'Well Runs' during operation to assess any potential air/dust, noise, soil and water and waste issues	Daily during operation

4.2 Inspections and Audits

The Santos Management Standard *EHSMS16 EHS Audit and Inspection* outlines the requirements to provide assurance that EHS systems and processes are effectively implemented, fit for purpose and are meeting relevant statutory requirements. The key components of the Standard are outline in Figure 4-1.

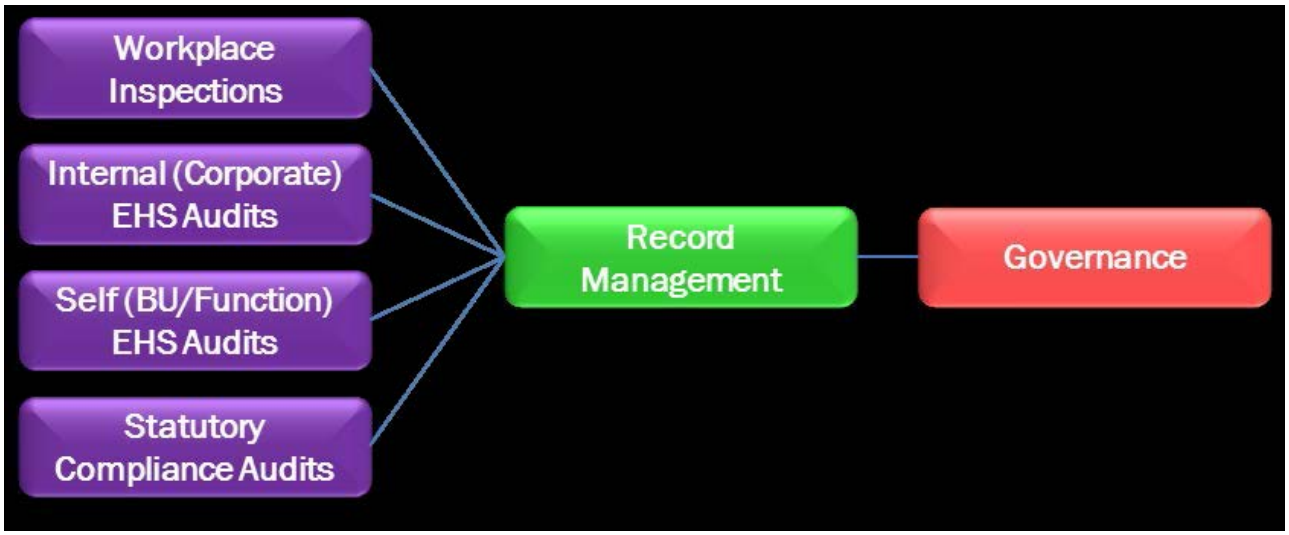


Figure 4-1 Key components of EHSMS16 Audit and Inspection

4.2.1 Workplace inspections

An inspection schedule has been developed for all pilot wells in the Narrabri Gas field (which includes the Dewhurst wells). The frequency of workplace inspections has been determined using a risk based approach and for this project involves bi-annual inspections. The inspections are carried out by the Environmental Advisor using the Compliance Checklist. The inspections are stored in ComTrack and any works required as a result of these inspections are tracked through IMS.

In addition to the above, daily inspections will be undertaken by the Field Supervisors. These inspections will include checks of the following:

- Effectiveness of erosion and sediment controls
- Chemical / fuel / waste storage
- Potential noise issues during construction and drilling
- Potential air / dust issues during construction and drilling
- Plant and equipment to ensure they are working efficiently

The daily inspection will be recorded using a Santos' Field Checklist. Minor issues will be rectified immediately. Issues requiring further management will be tracked through IMS.

4.2.2 Internal (Corporate) EHS audits

Santos' Corporate Safety and Environment Managers are responsible for developing and implementing an annual internal EHS Management and Hazard Standard audit schedule. The frequency of the EHSMS audits is determined using a risk based approach.

4.2.3 Self (BU/Function EHS Audits

A Self EHS Audit Schedule has been developed for the Narrabri gas field (which includes the Dewhurst wells). Under the Self EHS Audit Schedule, the Dewhurst Exploration Pilot Expansion Project would be audited six monthly. This is scheduled in ComTrack, which generates reminders and contains an escalation process when activities are not complete by a due date.

4.2.4 Statutory Compliance Audits

The Development Consent for the project requires that an Independent Environmental Audit is undertaken within 12 months of the commencement of the construction of the Dewhurst 13-18H Extension or the Dewhurst 30 and 31 Extension, and every 3 years thereafter. In accordance with

SSD-6038 Sch 5, 8 the audit must:

a) *be conducted by a suitably qualified, experienced and independent team of experts whose appointment has been endorsed by the Secretary of DPE;*
b) *include consultation with the relevant agencies;*
c) *assess the environmental performance of the development and assess whether it is complying with the requirements in this consent and any relevant EPL or petroleum title (including any assessment, plan or program required under these approvals);*
d) *review the adequacy of strategies, plans or programs required under the abovementioned approvals; and*
e) *recommend appropriate measures or actions to improve the environmental performance of the development, and/or any assessment, plan or program required under the abovementioned approvals.*

Within 6 weeks of the completion of the audit, Santos is required by SSD-6038 Sch 5, 9 to submit a copy of the audit report to the DPE, together with its response to any recommendations contained in the audit report.

The above audit would be included in the Self EHS Audit Schedule.

4.3 Reviews

4.3.1 Annual Review

As required by SSD-6038 Sch 5, 4, Santos will conduct a review by the end of March each year of the environmental performance of the development.

The review will:

a) *describe the development (including any rehabilitation) that was carried out in the past calendar year, and the development that is proposed to be carried out over the next year;*
b) *include a comprehensive review of the monitoring results and complaints records of the development over the past calendar year, including a comparison of these results against the:*
    i. *relevant statutory requirements, limits or performance measures/criteria;*
    ii. *requirements of any plan or program required under the Consent;*
    iii. *monitoring results of previous years; and*
    iv. *relevant predictions in the EIS;*
c) *identify any non-compliance over the past calendar year, and describe what actions were (or are being) taken to ensure compliance;*
d) *identify any trends in the monitoring data over the life of the development;*
e) *identify any discrepancies between the predicted and actual impacts of the development, and analyse the potential cause of any significant discrepancies; and*
f) *describe what measures will be implemented over the current calendar year to improve the environmental performance of the development.*

The review will be submitted to the DPE to ensure it is to the satisfaction of the Secretary.

4.3.2 PEMP Review

This PEMP and Sub Plans will be formally reviewed and revised if necessary when the following occur as required by SSD-6038 Sch 5, 5:

- Within 3 months of the submission of the Annual Review under SSD-6038 Sch 5, 4.
- Within 3 months of the submission of an incident report under SSD-6038 Sch 5, 7.
- Within 3 months of the submission of an Independent Environmental Audit Report under SSD-6038 Sch5, 9.
- Within 3 months of any modification to the SSD-6038, (unless the conditions require otherwise).

A summary of changes will be recorded in the document history table and the PEMP will be distributed to personnel on the control copy distribution list.

4.3.3 Independent Review

SSD-6038 Sch 4, 2 states that:

> *if an owner of privately-owned land considers the development to be exceeding the relevant criteria in Schedule 3, then he/she may ask the Secretary of DPE in writing for an independent review of the impacts of the development on his/her land. If the Secretary is satisfied that an independent review is warranted, then within 2 months of the Secretary's decision Santos shall:*
>
> a) *commission a suitably qualified, experienced and independent person, whose appointment has been approved by the Secretary, to:*
> i. *consult with the landowner to determine his/her concerns;*
> ii. *conduct monitoring to determine whether the development is complying with the relevant criteria in Schedule 3; and*
> iii. *if the development is not complying with these criteria then identify the measures that could be implemented to ensure compliance with the relevant criteria; and*
> b) *give the Secretary and landowner a copy of the independent review.*

4.4 Non conformance and Corrective Action

Non-conformity is defined by ISO 14001 as "a non-fulfilment of a requirement". In relation to this PEMP non-conformance may be:

- Santos or contractors not fulfilling a requirement of the PEMP or sub plan.
- Breaches and/or exceedances of SSD-6038 or licence requirements.

Non conformance may be identified by:

- Monitoring results.
- Complaints.
- Internal inspections and audits.
- Independent Environmental Audit.
- Other external audit by government agency.

Where a non-conformance is detected or monitoring results are outside of the expected range:

- The results will be analysed by the Environmental Advisor in more detail to determine possible causes for non-conformance.
- A site inspection will be undertaken by the Environmental Advisor.
- Relevant personnel will be contacted and advised of the problem.
- An agreed action will be identified. or
- Action will be implemented to rectify the problem.

Where the non conformance is in relation to a breach or exceedance of SSD-6038 or PEL performance criteria, the incident notification requirements outlined in Section 3.3.1 will apply.

4.4.1 Corrective Actions

Actions arising from audits and inspections are recorded and managed within Santos' EHS Toolbox Audit and Inspection Manager (AIM). The lead auditor or workplace inspector must ensure:

- The AIM Record Number is recorded on all documentation associated with each audit or inspection.
- The final (endorsed) audit report or inspection report is attached to the AIM record in EHS Toolbox.

The auditee or relevant manager must ensure:

- Corrective actions are assigned to address non-conformances or hazards, and where appropriate opportunities for improvement, identified by EHS audits and inspections using

AIM.

- A process is in place to verify completion of corrective actions. Santos has developed a form (Form - Tracking Internal EHS Audit Action Progress) to provide guidance.

4.5 EMERGENCY CONTACTS

The ENSW Emergency Contact List can be accessed via:

- ‘Emergency Response’ then ‘Key Contacts Link’ on The Well, titled ‘Energy NSW Operations Emergency Contact List’.

4.6 REFERENCE DOCUMENTS

- SSD-6038 Development Consent Conditions
- MRE-DA Approval Conditions
- Renewal Petroleum Exploration Licence 238
- Environment Protection Licence 20350
- EPBC Referral Decision 1 October 2013
- Occupation Permit for Land Use for Access and Activities Associated with Petroleum Titles between Forests NSW and State of NSW and Eastern Star Gas
- Dewhurst Gas Exploration Pilot Expansion Environmental Impact Statement (RPS 2013)
- Dewhurst 26-29 Petroleum wells PEL 238 Review of Environmental Factors (RPS 2013
- Narrabri Gas Project Pollution Incident Response Management Plan
- EHSMS01 EHS Policies
- EHSMS03 – Objectives and Targets
- EHSMS05 – Responsibility and Accountability
- EHSMS06 Training and Competence
- EHSMS07 - Consultation and Communication
- EHSMS08 Document and Records Management.
- EHSMS09 – Managing EHS Risks.
- EHSMS13 Emergency Preparedness and Response
- EHSMS14 Monitoring, Measurement and Reporting
- EHSMS15 Incident Investigation and Response
- EHSMS16 EHS Audit and Inspection

APPENDIX A ENVIRONMENTAL MANAGEMENT SUB PLANS

Air Quality Management Sub Plan

1.1 Background

This Air Quality Management Plan (AQMP) is one of the Environmental Sub-Plans under the Project Environmental Management Plan (PEMP) for the Dewhurst Gas Exploration Pilot Expansion. This AQMP addresses mitigation measures and monitoring and reporting requirements associated with the management of air quality and greenhouse gas impacts of the Project.

Project-related emissions have been identified to include the following:

- Dust emissions associated with:
    - Vehicles travelling on unsealed roads;
    - Wind erosion from material stockpiles;
    - Excavation and drilling activities;
- Combustion emissions from:
    - Vehicle use;
    - Diesel use in mobile plant (e.g. excavators, graders);
    - On-site power generation.
- Greenhouse gas emissions associated with:
    - Fugitive methane from drilling operations and well development;
    - Fugitive leaks from gas production infrastructure; and
    - Flaring of produced gas;
    - Combustion of liquid and gaseous fuels.

This AQMP provides a framework for the monitoring and management of these emissions during the course of the Project.

1.2 Key Statutory Requirements

1.2.1 General

The *Protection of the Environment Act 1997* (POEO Act) provides the statutory framework for the management of air emissions in NSW. *Part 5.4 Division 1* of the POEO Act addresses air pollution, of which the following are considered directly relevant to the management of air emissions from the Project:

- **Section 124: Operation of Plant (other than domestic plant);**

    The occupier of any premises who operates any plant in or on those premises in such a manner as to cause air pollution from those premises is guilty of an offence if the air pollution so caused, or any part of the air pollution so caused, is caused by the occupier's failure:

    (a) to maintain the plant in an efficient condition, or

    (b) to operate the plant in a proper and efficient manner.

- **Section 126: Dealing with Materials**

  The occupier of any premises who deals with materials in or on those premises in such a manner as to cause air pollution from those premises is guilty of an offence if the air pollution so caused, or any part of the air pollution so caused, is caused by the occupier's failure to deal with those materials in a proper and efficient manner.

- **Section 129: Emission of Odours from Premises Licenced for Scheduled Activities**

  (1) The occupier of any premises at which scheduled activities are carried on under the authority conferred by a licence must not cause or permit the emission of any offensive odour from the premises to which the licence applies.

  (2) It is a defence in proceedings against a person for an offence against this section if the person establishes that:

  (a) the emission is identified in the relevant environment protection licence as a potentially offensive odour and the odour was emitted in accordance with the conditions of the licence directed at minimising the odour, or

  (b) the only persons affected by the odour were persons engaged in the management or operation of the premises.

  (3) A person who contravenes this section is guilty of an offence.

1.2.2 Project Specific

- Planning Approvals:
  - Department of Primary Industries (DPI) Project Approval for production pilots covering wells 13 to 18H – 21 July 2009 (DPI-PA)[1].
  - Department of Trade and Investment (DT&I) Development Approval for pilot wells 26-29 under Minister for Resources and Energy – 16/8/2013 (MRE-DA).
  - Department of Planning and Environment (DPE) Approval – 18 July 2014 (SSD-6038).
- Renewal Petroleum Exploration Licence 238 (PEL 238).
- Environment Protection Licence 20350 (EPL 20350).
- Schedule of Onshore Petroleum Exploration and Production Safety Requirements (SOPEPSR).
- Review of Environmental Factors (REF (3/13)).
- Review of Environmental Factors - Statement of Commitments (REF – SoC (3/13)).
- NSW Forests Occupation Permit (OP).

[1] Note the operational conditions of consent and REF statement of commitments under this approval are addressed within the approved Operational Environmental Management Plan (OEMP). This OEMP forms part of the EHSMS process for the Project.

- NSW Office of Water (NOW) Water Supply Works Approval (90WA832266).

Air Quality Criteria

Air Quality Criteria established within the approvals is listed in Tables 1, 2 and 3 for any residence on privately-owned land.

Table 1 - Long term criteria for particulate matter

Pollutant	*Averaging Period*	*[d]Criterion*
Total Suspended Particulate (TSP) matter	Annual	[a]90 µg/m³
Particulate matter < 10 µm (PM_{10})	Annual	[a]30 µg/m³

Table 2 - Short term criterion for particulate matter

Pollutant	*Averaging Period*	*[d]Criterion*
Particulate matter < 10 µm (PM_{10})	24 hour	[a]50 µg/m³

Table 3 - Long term criteria for deposited dust

Pollutant	*Averaging Period*	*Maximum increase in deposited dust level*	*Maximum total deposited dust level*
[c]Deposited dust	Annual	[b]2 g/m^2/month	[a]4g/m^2/month

Notes for Tables 1-3: [a]Total impact (ie incremental increase in concentrations due to the development plus background concentrations due to other sources); [b]Incremental impact (ie incremental increase in concentrations due to the development on its own); [c]Deposited dust is to be assessed as insoluble solids as defined by Standards Australia, AS/NZS 3580.10.1:2003:Methods for Sampling and Analysis of Ambient Air - Determination of Particulate Matter - Deposited Matter - Gravimetric Method; and [d]Excludes extraordinary events such as bushfires, prescribed burning, dust storms, sea fog, fire incidents, illegal activities or any other activity agreed to by the Secretary in consultation with EPA.

1.2.3 Santos Environmental, Health and Safety Management System (EHSMS)

This AQMP has been developed in accordance with relevant legislative and regulatory requirements and conditions in Santos' **Environment Health and Safety Management System** (EHSMS):

- EHS05 Air Emissions, Environmental Hazard Standard;
- EHSMS16 Climate Change, Management Standard; and
- EHSMS 14 Monitoring, Measurement and Reporting (including Appendix A Environmental Monitoring Overview).

1.3 Objectives

Objectives relating to the Air Quality and Greenhouse Gas Management Plan are described below:

- Minimise the potential impact of air pollutant and greenhouse gas emissions on the receiving environment;

- Address community expectations concerning air quality and greenhouse gas-related issues;
- Achieve compliance with Environmental Protection Licence 20350;
- Address the Review of Environmental Factors (REF) Mitigation Strategy (Chapter 2.8 of the REF, March, 2013);
- Achieve compliance with the Minister's Conditions of Approval and relevant regulatory requirements; and
- Prevent adverse air quality impacts on the amenity of local communities and environment.

1.4 Performance Indicators

Performance indicators relating to this Noise Management Plan are outlined below:

- Zero complaints received from landowners or government agencies concerning dust and odour issues; and
- Zero reportable leak/venting incidents from construction and operational activities.

1.5 Mitigation Measures

Plan Ref.	*Actions*	*Timing*	*Reference*
General			
AQMP-1	• Vehicles. plant and equipment will be regularly maintained to ensure they are in good operating condition. • The use of energy efficient equipment and processes will be undertaken, where possible. • Vehicles, plant and machinery will be turned off when not in use rather than left idling unless used to mitigate other identified hazards (such as heat stress). • Vehicles will maintain site speed limits to minimise dust generation.	At all times	REF SoC 44, 45, 50, 51 & 56, 81 SSD-6038 SoC 54
AQMP-2	Dust will be suppressed by a combination of methods: Speed reduction and other Traffic Management Plan controls, surface stabilisation methods, and where necessary spraying water along the access tracks and lease areas.	As required	REF SoC 54 and 55
AQMP-3	Loose, dust generating materials will be covered when transported to and from site.	At all times	SSD-6038 SoC 49
AQMP-4	Rehabilitation works, including landform establishment, will occur within six months of abandonment.	Post Operation	SSD-6038 SoC 52
Mitigation of Greenhouse Gas Emissions			
AQMP-5	All wells to be drilled using water based mud that will minimise venting and flaring requirements	During Drilling	REF SoC 51
AQMP-6	The titleholder must ensure that all vessels and equipment from which flammable vapours may issue are safely vented to the atmosphere, and any significant volume of gas that is vented is burnt through a flare system. Except in an emergency this venting or flaring will be approved by the OCSG Environmental Manager	During Drilling	SOP. 520, 728
AQMP-7	• A portion of the produced CSG will be diverted for on-site power generation, reducing the need to use diesel on the site, and reducing gas to flare. • Any gas surplus to the requirements for onsite electricity generation will be flared onsite through a skid mounted or equivalent flare system, which will ignite automatically to ensure that all gas is burnt rather than vented to the atmosphere.	During Operation	REF. 2.7.5.3 & 2.7.5.8 REF SoC 53
AQMP-8	Well or drill hole to be abandoned to be sealed and filled such that there is no leak of gas and/or water	Post Operation	WIC. 83
AQMP-9	In performing the Activity, Santos will endeavour to minimise: a) the use of power-consuming equipment; b) water and energy consumption; and c) the generation of waste.	At all times	OP.15
AQMP-10	Timber and woody debris cleared during site preparation will be retained (excluding merchantable timber identified by Forestry NSW) for use in rehabilitation to assist re-establishing the carbon sink.	During Construction and Operation	SSD-6038 SoC 53

1.6 Monitoring Requirements

<table>
<tr><th>Aspect</th><th>Description</th><th>Frequency</th></tr>
<tr><td>Equipment Maintenance</td><td>Plant and equipment will be inspected daily to ensure these are properly maintained. This will include piping to assist in identification of any leaks of fugitive emissions. Maintenance Programs will be undertaken using Santos' Maintenance Management System (Oracle EAM)</td><td>Daily</td></tr>
<tr><td>Equipment Operation</td><td>The licensee must operate a Leak Detection And Repair Program for all relevant components of plant and equipment in order to detect gas leaks.</td><td>Continuous</td></tr>
<tr><td>Equipment Operation</td><td>Santos will implement a Leak Detection and Repair Program as agreed with NSW EPA
A fugitive emissions monitoring program will be implemented in the Energy NSW CSG Exploration and Appraisal Program (E&A Program) area, incorporating a leak detection and repair program using the Picarro Cavity Ring Down Spectrometer.</td><td>TBC</td></tr>
<tr><td>Equipment Operation</td><td>A flow meter will monitor the gas flow rate from the gathering system prior to safe ignition.</td><td>Continuous</td></tr>
<tr><td>Construction and Operational Activities</td><td>Ambient Air Quality Monitoring:
Ambient air quality monitoring will be undertaken in accordance with the detail provided in Table A, B and C below

Table A: Air Quality Monitoring Locations
<table>
<tr><th rowspan="2">Monitoring Point[2]</th><th colspan="2">Location (MGA94, Zone 55)</th><th rowspan="2">Parameters Monitored</th></tr>
<tr><th>Easting (mE)</th><th>Northing (mN)</th></tr>
<tr><td>AQ1</td><td>765241.9596</td><td>6617031.209</td><td>PM_{10}, TSP, Deposited Dust</td></tr>
<tr><td>AQ2</td><td>753910.0164</td><td>6601440.989</td><td>PM_{10}, TSP, Deposited Dust</td></tr>
</table>
Table B: Air Quality Monitoring Frequency
<table>
<tr><th>Monitoring Type</th><th>Construction Phase</th><th>Operational Phase</th></tr>
<tr><td>Deposited dust</td><td>Monthly</td><td>Monthly</td></tr>
<tr><td>PM_{10}</td><td>1 in 6 days</td><td>Quarterly for first year, then reviewed thereafter</td></tr>
<tr><td>TSP</td><td>1 in 6 days</td><td>Quarterly for first year, then reviewed thereafter</td></tr>
</table></td><td>As per Table B</td></tr>
</table>

[2] Coordinates to be refined/confirmed upon establishment of monitoring location and confirmation of landholder agreement

<table>
<tr><th>Aspect</th><th>Description</th><th>Frequency</th></tr>
<tr><td></td><td>Table C: Air Quality Monitoring Methods
<table>
<tr><th>Sample Parameter</th><th>PM_{10}</th><th>TSP</th><th>Deposited Dust</th></tr>
<tr><td>Monitoring Apparatus</td><td>HVAS</td><td>HVAS</td><td>DDG</td></tr>
<tr><td>Monitored Parameters</td><td>PM_{10}</td><td>TSP</td><td>Deposited dust & Ash Content</td></tr>
<tr><td>Reporting Units</td><td>µg/m³</td><td>µg/m³</td><td>g/m2/month, %</td></tr>
<tr><td>Averaging Period</td><td>24 hour</td><td>24 hour</td><td>Monthly</td></tr>
<tr><td>Relevant Standards</td><td>• AS 3580.9.6: 2005
• AS 3580.1.1: 2007</td><td>• AS 3580.9.3: 2003
• AS 3580.1.1: 2007</td><td>• AS 3580.10.1:2003
• AS 3580.1.1: 2007</td></tr>
</table></td><td></td></tr>
<tr><td>Statutory</td><td colspan="2">Appropriate monitoring of emissions and consumables will be undertaken for legislative reporting requirements (such as to inform National Greenhouse and Energy Reporting Scheme (NGERS) calculations).</td><td>As required</td></tr>
<tr><td>General – Inspections</td><td colspan="2">• Field Superintendent to assess potential air/dust issues during construction and drilling
• Environmental Advisor inspection of activities to determine if all reasonable and feasible air/dust emission mitigation measures are in place</td><td>• Daily during construction and drilling
• 6 monthly during operation</td></tr>
<tr><td></td><td colspan="2">• Well Operator to undertake ‘Well Runs’ during operation to assess any potential air/dust emission issues.</td><td>Daily during operation</td></tr>
</table>

1.7 Reporting Requirements

Description	Timing	Reference
306 (1)(b)The titleholder must ensure that a report is immediately made to an Inspector upon the occurrence of: An escape of petroleum in a gaseous form in excess of 500 cubic metres	As required	SOP. 306(1)(b)
306 (1)(c) The titleholder must ensure that a report is immediately made to an Inspector upon the occurrence of: Any uncontrolled escape or ignition of petroleum, any other flammable or combustible material or toxic chemicals causing a potentially hazardous situation	As required	SOP. 306(1)(c)
The licensee must submit a brief summary report on the Leak Detection and Repair (LDAR) program with the annual return. The summary report must include: a. The total number of components inspected as well as the number and percentage of minor, major and significant leaking components found by component types;	As required	EPL 20350 (Condition R4.3)

Description	*Timing*	*Reference*
b. The type of components and the scale of the leak for any equipment where leaks are found; c. The emission level of leaking equipment and emission level of re-check after leak was repaired; d. The repair responses and times as listed in 'Table: Repair Responses and Times'.		
All other reporting requirements for air quality reporting will be managed through Santos' Compliance tracking system (ComTrack)	As required	

Annexure 1: Figures

Legend

- Air Monitoring Locations
- Wells
- Santos Leased Land
- NSW Parks[1]
- Cadastre Boundaries[1]

Source:
[1]© Mapinfo Australia Pty Ltd and PSMA Australia Ltd

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Coordinate System: GDA 1994 MGA Zone 55
Projection: Transverse Mercator
Datum: GDA 1994
Units: Meter

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DRAWN: STB **APPROVED: II** DATE: 10/10/2014

Figure: 1

DEWHURST GAS EXPLORATION PROJECT PEMP

AIR QUALITY MONITORING POINTS

Santos

Hazard and Risk Management Sub Plan

1.1 Background

This Hazard and Risk Management Plan (HRMP) is one of the Environmental Sub-Plans under the Project Environmental Management Plan (PEMP) for the Dewhurst Gas Exploration Pilot Wells Program and the Exploration Pilot Expansion Project (the Project).

This HRMP addresses mitigation measures and monitoring and reporting requirements.

All Santos NSW (Eastern) Pty Ltd (Santos) employees and their contractors working on the Project must comply with the PEMP and all sub-plans under the PEMP including this HRMP.

1.2 Key Statutory Requirements

1.2.1 General

- *Protection of the Environment Operations Act 1997* (NSW)
- *Contaminated Land Management Act 1997* (NSW)
- *Work, Health and Safety Act 2011* (NSW)
- *Work, Health and Safety Regulation 2011* (NSW)
- *Rural Fires Act 1997*
- *Environmental Planning and Assessment Act 1979*
- Schedule of Onshore Petroleum Operations and Production Safety Requirements (1992)
- Policy TI-O-120 – Ban on use of BTEX Compounds in CSG activities policy (NSW, Trade & Investment, 2012)
- Key Australian Standards (AS) / Codes of Practice:
    - Managing Risks of Hazardous Chemicals in the Workplace Code of Practice, 2012.
    - Managing Electrical Risks In the Workplace Code of Practice, 2012
    - AS1216: Class Labels for Dangerous Goods.
    - AS1940: The Storage and Handling of Flammable and Combustible Liquids.
    - AS2507: The Storage and Handling of Pesticides.
    - AS3780: The Storage and Handling of Corrosives.
    - AS3833: The Storage and Handling of mixed classes of Dangerous Goods in packages and Intermediate Bulk Containers.
    - AS4326: The Storage and Handling of Oxidizing Agents.
    - AS 60079.10.1 - Classification of Areas - Explosive Gas Atmospheres.

- American Petroleum Institute (API) 521 Standard (API,2007).

1.2.2 Project Specific

- Planning Approvals:
  - Department of Primary Industries (DPI) Project Approval for production pilots covering wells 13 to 18H – 21 July 2009 (DPI-PA)[1]
  - Department of Trade and Investment (DT&I) Development Approval for pilot wells 26-29 under Minister for Resources and Energy – 16/8/2013 (MRE-DA).
  - Department of Planning and Environment (DPE) Approval – 18 July 2014 (SSD-6038).
- Renewal Petroleum Exploration Licence 238 (PEL 238).
- Environment Protection Licence 20350 (EPL 20350).
- Schedule of Onshore Petroleum Exploration and Production Safety Requirements (SOPEPSR).
- Review of Environmental Factors (REF (3/13)).
- Review of Environmental Factors - Statement of Commitments (REF – SoC (3/13)).
- NSW Forests Occupation Permit (OP).
- NSW Office of Water (NOW) Water Supply Works Approval (90WA832266).

1.2.3 Santos Environmental, Health and Safety Management System (EHSMS)

This HRMP has been developed in accordance with relevant legislative and regulatory requirements and conditions in Santos' **Environment Health and Safety Management System** (EHSMS), including the following standards and supplementary How to Guides:

- EHSMS 09 Managing EHS Risks
- EHSMS 11.3 Pre-Start-up EHS Review
- EHSMS 11.6 Ignition Control
- EHSMS 11.10 Fire Risk Management
- EHSMS 13 Emergency Preparedness
- EHSMS 14 Monitoring, Measurement and Reporting (including Appendix A Environmental Monitoring Overview)
- EHSMS 15 Incident Investigation and Response

[1] Note the operational conditions of consent and REF statement of commitments under this approval are addressed within the approved Operational Environmental Management Plan (OEMP). This OEMP forms part of the EHSMS process for the Project.

- HSHS 06 Electrical Safety Onshore Australia
- HSHS 08 Chemical Management
- HSHS 08 Radiation
- HSHS 15 Security
- HSHS 19 Excavations
- Hazardous Substance Management, Operations, October 2013
- Bushfire Management Plan, Operations (7099-650-PLA-0011), August 2014
- Pollution Incident Response Management Plan (0011-650-PLA-0003), June 2014

1.3 Objectives

Objectives relating to the HRMP are described below:

- Minimise and manage hazards and risks throughout construction, drilling and operational phases of the Project.
- Protect human health and safety and impacts to the environment from construction, drilling and operations.
- Ensure compliance with relevant legislative and other.

1.4 Performance Indicators

Performance indicators relating to this HRMP are outlined below:

- Effective management of hazards and risks during construction, drilling and operations.
    - no injuries or unauthorised environmental harm caused by hazards and risks during construction, drilling and operations.

1.5 Predicted Impacts

With the proposed mitigation measures in place, it is unlikely that the Project would increase the magnitude of hazards and risks associated with the Project Area. In the event that an emergency scenario did eventuate as a result of the Project, the incident response measures provided in the **Pollution Incident Response Management Plan** – 0011-650-PLA-0003 (**PIRMP)** would be implemented in order to minimise impacts to life, property or the environment. This would include the activation of external emergency services if required. The Project would therefore not create additional, significant hazards or risks at the Project Area.

Santos has in place systems for ensuring that risks are effectively managed during construction, drilling and operational activities. This would include the implementation of the **PIRMP** and adequate safeguarding systems. The proposed design of the well sites has been assessed against relevant safety standards, as well as against Santos's own internal standards.

1.6 Mitigation Measures

Plan Ref	*Actions*	*Timing*	*Reference*
Flare Management			
HAZMP-1	• During construction of the flare the site will be fenced with a 1.6 metre high steel fence to prevent unauthorised entry. • The flare and associated exclusion zone will be fenced with a chain wire fence approximately 1.8 metres high for the duration of operation. • No naked lights, smoking, or motor vehicles not provided with efficient flame and/or spark arresters, shall be permitted within a 30 metre radius of the hole provided that, in any event requiring the use of welding plant or other equipment, the site manager may permit the use of such motor vehicles, welding plant or blow torches under his personal supervision and subject to such special precautions as appear necessary.	During Construction During Operation	SOP 214(2) ,214(3)
Bushfires / Fire Management			
HAZMP-2	A **Bushfire Management Plan** will be implemented prior to construction that addresses the following:	Prior to Construction	SSD-6038 SoC 77
	• Wells will be remotely isolated in the event that the well would be impacted by fire. • During periods of high fire danger gas may be vented to atmosphere to minimise the risk of ignition sources within the forest.	During Operations	REF (3/13), S.2.7.5.2
	• Reasonable precautions to minimise the risk of fire on the Project and in particular in any Facilities, building or structure on the Occupation Permit Area will be considered and implemented.	At all times	OP Condition 17
	• A fire tanker with capacity of not less than 400 L is to be on standby at all times together with adequate devices and appliances to prevent or retard the spread of fire which must be provided and maintained in good working order and condition and kept readily available for use on the Occupation Permit Area to the satisfaction of Forestry NSW.	During Construction & Drilling	OP Condition 18
	• The licence holder must take all reasonably practicable precautions against causing an outbreak of fire. Through implementation of the **Bushfire Management Plan**. - where feasible best practice bushfire risk management will be implemented. - all statutory obligations for bushfire management to be included in the **Bushfire Management Plan**. - an education program for staff and contractors regarding the risks from bushfires will be implemented.	At all times	PEL 238, Condition 22 SSD-6038, SoC 88, 89 & 90
	• No grass, foliage or herbage to be burnt off without the consent of the landholder and the local fire authority.	At all times	PEL 238,

Plan Ref	*Actions*	*Timing*	*Reference*
	• Fire breaks/asset protection zones will be maintained. • Employees and contractors to be trained in firefighting techniques when there is elevated fire risk. • Periodic bushfire hazard assessments to be monitored and communicated to stakeholders. • The requirement of the *Schedule of Onshore Petroleum Operations and Production Safety Requirements (1992)* to be implemented.	At all times	Condition 23 SSD-6038, Schedule 3, Condition 25
Chemical, Fuel and Oil Handling and Storage			
HAZMP-3	• Spill kits will be kept on site and any spills will be contained, cleaned up and reported to the **Field Supervisor** immediately in accordance with PIRMP.. • Spill prevention and oil absorbent materials required to manage spills and leaks for all chemicals, fuels and oils on site will be readily available at all times where prospecting operations are being carried out. • Equipment and/or materials to capture drips and spills must be used during transfer of chemicals, fuels and oils, and when maintaining oil or fuel filled components. • Any spills or leaks (during, construction, drilling or operation) will be contained and cleaned up immediately using a spill kit. • Any materials contaminated by a spill, such as absorbent pads or soil, will be removed from the site and disposed of at a licensed waste management facility in accordance with the Project Waste and Resource Management Plan. • Spill and spill reporting will be managed in accordance with EHSMS 15 and associated 'How to Guidance documents, unless contrary to the requirements set out within this document.	At all times	REF (3/13), S.2.8.1.2 PEL 238, Condition 18 SSD-6038, SoC 6 REF SoC 8, 9, 11, 12, 13, 14, 22, 24 & 29
HAZMP-4	All chemicals, fuels and oils, excluding those contained within plant and equipment and those for personal use, will be: • Stored and handled in accordance with the relevant Safety Data Sheet (SDS) and Australian Standards for the material. • An SDS register of all chemicals used or stored on site will be maintained. • Stored in appropriate containers that are in good condition and labelled to clearly identify the stored product. • Kept in a facility or area which is capable of containing at least 110% of the largest container capacity stored within that area. • All materials shall be in accordance with AS1940 including the need for containers to be stored at sufficient distance from the edge of the bund to allow for any leak to be captured within the bund. • Caustic substances, phosphates, nitrites and other dangerous substances will be stored in leak-proof containers, away from combustible materials. • Chemicals transported to a well location where there is no established suitable store will be transported and stored in an elevated, bunded trailer for protection in the event of heavy rains or site flooding.	At all times	PEL 238, Condition 17 SSD-6038, SoC 29 & 31 SOPEPSR, SOP 4(9) REF (3/13), S. 2.7.3.7

Plan Ref	*Actions*	*Timing*	*Reference*
HAZMP-5	• The name, type, CAS number and quantity of each chemical used on each well throughout the life of the well will be recorded. • Personnel, including contractors, to be made aware of SDS and Australian Standards for chemical management and there need for implementation. • The quantity of chemicals, fuels and oils stored on site will be minimised, where practicable to do so. • The storage, handling, and transport of dangerous goods will be conducted in accordance with *AS1940: The storage and handling of flammable and combustible liquids,*	At all times	WIC Condition 64 65 & 67 SSD-6038 Schedule 3, Condition 23 REF SoC 6, 37, 38, 50, 83, 84, 85.
Explosives Management			
HAZMP-6	• Explosives to be transported, stored and handled in accordance with all applicable explosive control legislation and approved procedures. • Detonators or ignitor needles shall not be stored with other explosives. • Explosives shall be kept in a locked storage magazine which is clearly marked with the words “EXPLOSIVES – DANGER”. The storage magazine shall be in an approved location. Explosives shall not be stored in the vicinity of flammable, combustible, corrosive, oxidizing or radio-active materials. • Explosives shall be handled only by qualified personnel and in accordance with approved procedures. • Explosives no longer required on a site or showing signs of deterioration shall, as soon as possible, be removed from the site. • Packaging having contained EXPLOSIVES shall, as soon as possible, be removed from the site	During Drilling	SOPEPSR, SOP 4(1), 4(2), 4(3), 4(4), 4(5), 4(6)
Radiation			
HAZMP-7	• A person engaged in the handling of, or the use of, radiation apparatus or radio-active substance will comply with the requirements of all applicable radiation control legislation	During Drilling	SOPEPSR, SOP 4(8)
Risk Management			
HAZMP-8	• Significant risks to safety or the environment will be managed through the risk management process that includes identification of hazards, assessment of risks, implementation of control measures and monitoring integrity and effectiveness of control measures.	At all times	WIC Condition 5
HAZMP-9	• A **Significant Hazard Risk Register** will be prepared and implemented that identifies specific controls are in place for identified hazards. The register will identify and manage reasonably foreseeable hazards and risks to EHS as far as reasonably practicable	At all times	WIC Condition 6 & 7
HAZMP-10	• Hazard classification mapping will be updated prior to commencement of construction.	Prior to Construction	SSD-6038, SoC 79

Plan Ref	*Actions*	*Timing*	*Reference*
Fencing and Security			
HAZMP-11	• Well-sites will be fenced in accordance with ENSW Fencing Standards • Areas will be fenced within **Dewhurst 28**, the flare will have a secondary **1.8 metre high fence**. • Every well lease will be fenced and contained within a well lease area **no larger than one hectare**. • During drilling activities, all materials (equipment and machinery) will be stored within the fenced well lease. • All means of access to facilities, building or structures on the **Occupation Permit Area** to be securely fastened or fenced whether or not the facilities, building or structure is occupied.	At all times	WIC Condition 23 & 24 SSD-6038 SoC 76 OP Condition 11 & 25 SOPEPSR, SOP 525 EPBC 2013/6918 Conditions 8f & 8g
Maintenance			
HAZMP-12	• All products will be used in accordance with the manufacturers' recommendations and relevant **Safety Data Sheets**. • Maintenance mechanisms and frequencies are determined by Santos' Maintenance Management System (Oracle EAM) • Maintenance of vehicles, plant and equipment will occur off-site at an appropriately licensed facility unless deemed necessary and appropriate to conduct such maintenance onsite.	During Drilling	WIC Condition 75 SSD-6038, SoC 5
HAZMP-13	• The site will be kept in a clean and tidy manner during site preparation, drilling activities and operation of the pilot wells.	At all times	SSD-6038, SoC 6, 74 & 82
Visual Amenity			
HAZMP-14	• Lights to be directed away from sensitive receivers where practicable. • Night lighting will be restricted to the minimum required for operational and safety requirements. • Enclosed horizontal flaring units will be used where practicable. • No outdoor lights will shine above the horizontal • All external lighting associated with the development will comply with *Australian Standard AS4282 (INT) 1997 – Control of Obtrusive Effects of Outdoor Lighting*. • Cleared areas that are no longer required to be clear will be revegetated with suitable native vegetation in accordance with the rehabilitation strategy.	At all times	SSD-6038, Schedule 3, Condition 24

1.7 Monitoring Requirements

	Description	*Frequency*	*Reference*
Explosives Management	• A record of amounts any types of explosives held in the magazines shall be maintained at all times and such record shall be accessible to an Inspector on request.	During Drilling	SOPEPSR, SOP 4(7)
Chemical, Fuel and Oil Handling and Storage	• An SDS register of all chemicals used or stored onsite will be maintained.	At all times	PA SSD-6038, SoC # 4
	• WorkCover NSW is required to be notified when Dangerous Goods are stored above 'Manifest' quantities specified in the WHS Regulations.	At all times	Work, Health and Safety Regulation, Clause 347

1.8 Reporting Requirements

Description	*Frequency*	*Reference*
Chemical, Fuel and Oil Handling and Storage		
Chemical Management Spill kits will be kept on site and any spills will be contained, cleaned up and reported to the **Field Supervisor** immediately.	At all times	REF March 2013, Section 2.8.1.2
Radiation		
Where by any legislation relevant to radiation control a report is prepared in respect of the monitoring of radiation in connection with Petroleum operations, a copy of that report must be sent to an Inspector within 5 days	During Drilling	SOPEPSR, SOP 38
General		
Santos will notify relevant statutory authorities through Comtrack utilising the Incident Notification Table for the Project (PEMP **Appendix D**) of: • Pollution incidents causing or threatening material harm to the environment. • The notification must be immediate after Santos becomes aware of the incident, breach or complaint. • Santos must submit an Environmental Incident and Complaints Report to the Department within seven days of all: - pollution incidents causing or threatening material harm to the environment. - breaches of the conditions of PEL 238. - breaches of environmental protection legislation (as defined in the POEO Act). - complaints from landholders or the public alleging environmental harm or a breach of conditions of PEL 238 or of	At all times	PEL 238, Condition 54(a), (b), (c) & (d)

Description	*Frequency*	*Reference*
environmental protection legislation.		
• Santos shall immediately notify the Secretary and any other relevant agencies of any incident* that has caused, or threatens to cause, material harm to the environment. • For any other incident associated with the development, Santos shall notify the Secretary and any other relevant agencies as soon as practicable after the Applicant becomes aware of the incident. • Within 7 days of the date of the incident, the Applicant shall provide the Secretary and any relevant agencies with a detailed report on the incident, and such further reports as may be requested. *Note: An incident is defined as: A set of circumstances that: • Causes or threatens to cause material harm to the environment; and/or • Breaches or exceeds the limits or performance measures/criteria in this consent.	At all times	SSD-6038, Schedule 5, Condition 6

Noise Management Sub Plan

1.1 Background

This Noise Management Plan (NMP)) is one of the Environmental Sub-Plans under the Project Environmental Management Plan (PEMP) for the Dewhurst Gas Exploration Pilot Wells Program and the Exploration Pilot Expansion Project (the Project).

This NMP addresses mitigation measures and monitoring and reporting requirements.

Residential Locations are shown below and detailed in Figure 1, Annexure 1:

Location	*Easting*	*Southing*
Residence 1	149° 44° 36”	30° 34° 55”
Residence 2	149° 44° 31”	30° 34° 42”
Residence 3	149° 45° 05”	30° 34° 20”
Residence 4 & ML1	149° 41 38”	30° 36° 26”
ML2	149° 41° 59”	30° 38° 54”
ML3 (to the north of the Project Area)	149° 41° 07”	30° 21° 49”
ML4 (to the north of the Project Area)	149° 41° 07.47”	30° 22° 06”

1.2 Key Statutory Requirements

1.2.1 General

- *Protection of the Environment Operations Act 1997* (NSW)
- New South Wales Industrial Noise Policy (EPA,2000)
- Interim Construction Noise Guideline (ICNG) (DECC, 2009)
- New South Wales Road Noise Policy (DECCW, 2011)
- New South Wales Interim Construction Noise Guideline (DECC, 2009)
- Assessing Vibration: a technical guideline (DEC, 2006)

1.2.2 Project Specific

- Planning Approvals:
  - Department of Primary Industries (DPI) Project Approval for production pilots covering wells 13 to 18H – 21 July 2009 (DPI-PA)[1].
  - Department of Trade and Investment (DT&I) Development Approval for pilot wells 26-29 under Minister for Resources and Energy – 16/8/2013 (MRE-DA).
  - Department of Planning and Environment (DPE) Approval – 18 July 2014 (SSD-6038).

[1] Note the operational conditions of consent and REF statement of commitments under this approval are addressed within the approved Operational Environmental Management Plan (OEMP). This OEMP forms part of the EHSMS process for the Project.

- Environment Protection Licence 20350 (EPL 20350).
- Petroleum Exploration Licence 238 (PEL 238).
- Schedule of Onshore Petroleum Exploration and Production Safety Requirements (SOPEPSR).
- Review of Environmental Factors (REF (3/13)).
- Review of Environmental Factors - Statement of Commitments (REF – SoC (3/13)).
- NSW Forests Occupation Permit (OP).
- NSW Office of Water (NOW) Water Supply Works Approval (90WA832266).

1.2.3 Santos Environmental, Health and Safety Management System (EHSMS)

This NMP has been developed in accordance with relevant legislative and regulatory requirements and conditions in Santos' **Environment Health and Safety Management System** (EHSMS), including:

- EHSMS Noise Emissions Environmental Hazard Standard – EHS12.
- EHS Management System Standard – HSHS12 Occupational Noise.
- EHSMS 14 Monitoring, Measurement and Reporting (including Appendix A Environmental Monitoring Overview).

1.3 Objectives

Objectives relating to the Noise Management Plan are described below:

- Minimise noisy activities and manage community expectations concerning noise emissions;
- Compliance with Environmental Protection Licence 20350 noise limits and relevant guidelines (i.e. Interim Construction Noise Guideline (DECC, 2009);
- To address the Review of Environmental Factors (REF) Mitigation Strategy (Chapter 2.8 of the REF, March, 2013);
- Compliance with relevant regulatory requirements.
- Compliance with the Minister's Conditions of Approval.
- Prevent adverse noise impacts on the amenity of local communities and environment.

1.4 Performance Indicators

Performance indicators relating to this Noise Management Plan are outlined below:

- Zero complaints received from landowners or government agencies concerning noise disturbance.
- Zero noise incidents from construction and operational activities.

1.5 Predicted Impacts

With the proposed mitigation measures in place, it is unlikely that the Project would increase the magnitude of noise in the Project Area. Construction activities are likely to generate noise, particularly during the drilling and cementing activities that may occur up to 24 hours per day, seven days a week. Drilling is only expected to take approximately 40 days.

For construction activities associated with the Project there are no occupied residential receivers located within five kilometres of the sites. For drilling and operational works the closest receivers are at Dewhurst 13-18H. The predicted noise levels at the nearest residence during operation are likely to be just above the criteria for intrusive noise in all climatic scenarios, as well as sleep disturbance during windy conditions; however, soft ground conditions (trees, grass) that were not incorporated into the Environmental Impact Statement (RPS, 2013) noise modelling may reduce sound transmission from construction, drilling and operational activities at the pilot wells.

Users of the forest, such as bushwalkers, picnickers and Forestry NSW staff may be affected by noise and vibration during the works. Drilling activities at Dewhurst 26-29 are unlikely to be audible at any residence during the day or night.

During operations noise will be limited to the occasional combustion of gas through a flare or vehicles visiting the sites, and pumping of water between the wells and gathering system. The flare control valve installed upstream of the flare will reduce the noise of flare operation.

Noise impacts from traffic generated by the Project during construction and operation are considered negligible to minor, and will meet the NSW Road Noise Policy (DECCW, 2011).

1.6 Mitigation Measures

<table>
<tr><th>MP Ref.</th><th>Actions</th><th>Timing</th><th>Reference</th></tr>
<tr><td colspan="4">Construction Noise</td></tr>
<tr><td>NMP-1</td><td>Construction Hours:
a) 7.00am and 6.00pm Monday to Friday.
b) 8.00am and 1.00pm Saturday.
c) Not to be undertaken on Sundays or Public Holidays.
Exceptions to standard construction hours:
• Construction work that causes L Aeq(15 min) noise levels that are no more than 5dB above rating background level at any residence not subject to a private negotiated agreement, in accordance with the Interim Construction Noise Guideline (DESS, 2009).
• The delivery of plant, equipment and materials which is required to be delivered outside of the standard construction hours by Police and / or other authorised authorities.
Exceptions to the standard construction hours will be managed through Santos' 'Out of Hours Approval Form' (refer to Annexure 2).</td><td>During Construction
During Drilling</td><td>EPL (20350) Condition L4.1 & L4.2</td></tr>
<tr><td>NMP-2</td><td>Table 1 Construction Noise Impact Assessment Criteria dB(A)
<table><tr><th>Location</th><th>Standard Construction Hours LAeq (15 min)</th><th>Outside Standard Construction Hours LAeq (15 min)</th></tr><tr><td>Any residence on privately owned land</td><td>40 dB(A)</td><td>35 (dBA)</td></tr></table>Standard construction hours are 7 am to 6 pm Monday to Friday and 8 am to 1 pm Saturday.
All construction works will comply with the requirements of the Interim Construction Noise Guideline (DECC, 2009).</td><td>During Construction
During Drilling</td><td>SSD-6028, Schedule 3, Condition 11 & 12
SSD-6038, SoC 61</td></tr>
<tr><td>NMP-3</td><td>Applicable Meteorological Conditions (Appendix 3 of PA SSD-6028)
1. The noise criteria in Table 1 will apply under all meteorological conditions except the following:
a. average wind speed at microphone height exceeds 5 m/s;
b. wind speeds greater than 3 m/s measured at 10 m above ground level; or
c. temperature inversion conditions greater than 3°C/100 m or stability category F.</td><td>During Construction
During Drilling</td><td>SSD-6028, Appendix 3, Noise Assessment</td></tr>
</table>

<table>
<tr><th>MP Ref.</th><th>Actions</th><th>Timing</th><th>Reference</th></tr>
<tr><td></td><td>Determination of Meteorological Conditions
1. Except for wind speed at microphone height, the data to be used for determining meteorological conditions will be recorded by the meteorological station located at Narrabri Airport.

Compliance Monitoring (Appendix 3 of PA SSD-6028)
1. Attended monitoring is to be used to evaluate compliance with the relevant conditions of this consent.
2. Unless otherwise agreed with the Secretary, this monitoring will be carried out in accordance with the relevant requirements for reviewing performance set out in the NSW Industrial Noise Policy.</td><td></td><td></td></tr>
<tr><td colspan="4">Operational Noise</td></tr>
<tr><td>NMP-4</td><td>The licence holder must carry out operations in accordance with the requirements of the Interim Construction Noise Guidelines (DECC, 2009), as amended or replaced from time to time. Unless otherwise approved by the Minister, the licence holder must ensure that:
a) Noise levels during standard working hours do not exceed the Rating Background Level (RBL) +10dB at any residence or other sensitive receiver (as defined in the Interim Construction Noise Guidelines).
b) Noise levels outside of standard working hours do not exceed the RBL +5dB</td><td>During Operations</td><td>PEL 238, Condition 19</td></tr>
<tr><td>NMP-5</td><td>The noise limits identified in Condition 19 (PEL 238) will not apply where the licence holder has negotiated a written agreement with:
a) The relevant landholder; or
b) In the case of a prospecting operation that will result in an exceedance of the criteria at a dwelling or other sensitive receiver, the resident of that dwelling or occupier of the sensitive receiver;
to allow different limits and the licence holder complies with those limits.</td><td>During Operations</td><td>PEL 238, Condition 20</td></tr>
<tr><td>NMP-6</td><td>Table 2 Operation Noise Impact Assessment Criteria dB(A)
<table><tr><th>Location</th><th>Operational Noise Criteria LAeq (15 min)</th></tr><tr><td>Any residence on privately owned land</td><td>35 dB(A)</td></tr></table>Noise generated by the Project is to be measured in accordance with the relevant requirements and exemptions (including certain meteorological conditions) of the NSW Industrial Noise Policy. Meteorological conditions under which these criteria apply and the requirements for evaluating compliance with these criteria are provided below:</td><td>During Operations</td><td>SSD-6028, Schedule 3, Condition 12
EPL (20350), Condition L3.1 & L3.2</td></tr>
<tr><td>NMP-7</td><td>Noise monitoring as required in Section 1.7 of this Plan will be $L_{A\ eq(15minute)}$ attended noise monitoring and will follow the</td><td>During Operations</td><td>EPL (20350),</td></tr>
</table>

MP Ref.	Actions	Timing	Reference
	requirements set out in the EPL. Monitoring equipment will be situated: • on Santos' property boundary at a position that is 30m or less from the affected premises or dwelling; or • at the affected premise if the Santos' boundary is more than 30m from the dwelling, but not closer than 3m to the dwelling (based on residents approval); or • in a recorded position or positions which takes into account climatic conditions and as such is in a direct line between the residential dwelling or affected area and the noise source(s) associated with Santos' activities		Condition L3.3
NMP-8	A non-compliance of condition L3.2 will occur where noise generated from the premises in excess of the appropriate limit is measured: • At a location other than an area prescribed by condition L3.2: and or • At a point other than the most affected point at a location.	During Operations	EPL (20350), Condition L3.5
NMP-9	The noise limits set out in condition L3.2 apply under all meteorological conditions except for the following: a) Wind speeds greater than 3 metres / sec at 10 metres above ground level. b) Stability category F temperature inversion conditions and wind speeds greater than 2 metres / sec at 10 metres above ground level are to be determined by the sigma-theta method referred to in Part E4 of Appendix E to the NSW Industrial Noise Policy c) Stability category G temperature inversion conditions. Note the agreed meteorological station to be used for this data is the Narrabri Airport weather station	During Operations	EPL (20350), Condition L3.6
NMP-10	For the purpose of determining the noise generated at the premises the modification factors in Section 4 of the NSW Industrial Noise Policy must be applied, as appropriate, to the noise levels measured by the noise monitoring equipment.	During Operations	EPL (20350), Condition L3.8
NMP-11	If during operation the residence located 500 m south of the Dewhurst 13-18H Pilot (RR4 – Refer to Figure 1) is re-occupied, monitoring will be undertaken to confirm operational noise levels at this location. If noise monitoring determines that levels are above noise criteria appropriate management and/or mitigation measures will be implemented.	During Operations	SSD-6038 SoC 62
Construction and Operational Noise			
NMP-12	**Complaint Management:** All complaints will be recorded in accordance with the Community Management Plan and the PEMP Section 3.5. • In the event of a noise complaint, the source of the noise will be investigated. Where necessary, Santos will offer to conduct noise monitoring from the proposed activity at the affected receiver. If it is determined that noise levels are unacceptable, further feasible and reasonable work practices or mitigation measures will be implemented. • In the event of a noise complaint, the effectiveness of noise mitigation measures will be assessed and additional feasible and reasonable measures will be implemented, where necessary.	As required	REF (3/13), S. 2.8.1.3 REF SoC 58

MP Ref.	*Actions*	*Timing*	*Reference*
NMP-13	Where any exceedance of noise monitoring criteria and/or performance measures has occurred, Santos will: • Take all reasonable and feasible steps to ensure that the exceedance ceases and does not reoccur. • Implement remediation measures as directed by the Secretary.	As required	SSD-6038, Schedule 5, Condition 3
NMP-14	Noise impacts will be managed in accordance with the ICNG and OEH requirements. The management approach will include: • Consultation with potentially affected receivers • Monitoring of noise impacts • Implementation of feasible and reasonable work practices • Complaint management and response. • Forestry NSW and the next two nearest sensitive receivers will be notified of the proposed activity prior to commencing works including details of the timing and duration of noise generating activities (13H – 18H only). Where monitoring is required it will be undertaken in accordance with the ICNG (DECC June 2009). This includes the provision of: • The type of monitoring conducted (for example, at a particular project stage or following complaints) and a brief statement of the measurement method. • The noise conditions on the consent/licence. • Descriptions of the nearest affected sensitive receiver. • Plan / diagram showing the location of the monitoring and the noise generating works. • Description of the instrumentation used, including calibration requirements. • Name and position of monitoring personnel. • The weather conditions during monitoring. • The time(s) and duration(s) of monitoring, including dates – in the case of complaints. • A clear description of the activities taking place during the monitoring. • Noise limit consent conditions. Refer to Attended Noise Monitoring Form in **Annexure 3**	As required	REF (3/13), S.2.8.1.3 and S.2.8.1.4 SSD-6038 SoC 60
NMP-15	**Plant and Equipment Management and Maintenance** Source noise levels of the drilling rig will be confirmed prior to arriving on site to verify noise impacts and confirm the management approach using the Project Power-Source Monitoring Form in **Annexure 3.**	Prior to Drilling	REF SoC 60
NMP-16	• All plant will be properly maintained and operated according to manufacturers' recommendations in such a manner as to avoid causing excessive noise. This will include the use and maintenance of noise attenuation equipment such as silencers, mufflers and/or acoustic enclosures where practicable.	At all times	REF SoC 10 SSD-6038 SoC 50

MP Ref.	Actions	Timing	Reference
	• Site inductions and toolbox talks will address ways to use equipment to minimise noise and designated access routes for the Project. • Tool-boxing of staff to ensure they are aware of requirements for noise mitigation and working hours during the relevant phases of the Project. These will be undertaken at the start of each phase and as required during the Project. • Horn signals between drivers will be kept to a minimum.		

1.7 Monitoring and Inspection Requirements

Aspect	Description	Frequency
Complaints - Monitoring	Attended noise monitoring ($LA_{eq(15mins)}$) will be undertaken at sensitive receivers based on assessment of noise complaints	As Required
Out of Hours - Monitoring	Attended noise monitoring ($LA_{eq(15mins)}$) will be undertaken at sensitive locations should construction works be required to be undertaken outside normal construction hours. The frequency of the noise monitoring will be determined to assess that the noise impacts are in accordance with NMP-1 and NMP-2. Appropriate actions will be undertaken should noise levels exceed the criteria for the Project.	As Required
General – Inspections	• Field Superintendent to assess potential noise issues during construction and drilling	Daily during construction and drilling
	• Well Operator to undertake 'Well Runs' during operation to assess any potential noise issues. • Environmental Advisor inspection of activities to determine if all reasonable and feasible noise mitigation measures are in place	• Daily during operation • 6 monthly during operation

1.8 Reporting Requirements

Description	Timing	Reference
Noise monitoring exceedances against criteria specified in the EPL (20350) will be reported in the Annual Return.	At the end of reporting period	EPL (20350), Condition 6
Where any exceedance of noise monitoring criteria and/or performance measures has occurred, Santos will, at the earliest opportunity: • Consider all reasonable and feasible options for remediation (where relevant) and submit a report to the Department	As required	PA SSD-6038, Schedule 5, Condition 3

Description	*Timing*	*Reference*
describing those options and any preferred remediation measures or other course of action; and to the satisfaction of the Secretary.		
• Santos will immediately notify all relevant agencies of any incident* that has caused, or threatens to cause, material harm to the environment. • Within 7 days of the date of the incident, Santos will provide all relevant agencies with a detailed report on the incident, and such further reports as may be requested. **Note: An incident is defined as: A set of circumstances that:* • *Causes or threatens to cause material harm to the environment; and/or* • *Breaches or exceeds the limits or performance measures/criteria in this consent.*	As required	PA SSD-6038, Schedule 5, Condition 6 PEL 238, Condition 54(a), (b), (c) & (d)

Annexure 1: Figures

Legend

- Locations
- Wells
- Wells 13-18H Maximum Noise Impact Contours[1]
- Cadastre Boundaries

[1] *Scenario 1, Environmental Impact Statement (RPS 2013)*

N W E S

0 250 500 1,000 Metres

Coordinate System: GDA 1994 MGA Zone 55
Projection: Transverse Mercator
Datum: GDA 1994
Units: Meter

PATH: T:\JOBS\43177928\Workspaces\43177928.006.mxd

FILE NO: 43177928.006 REV: 1

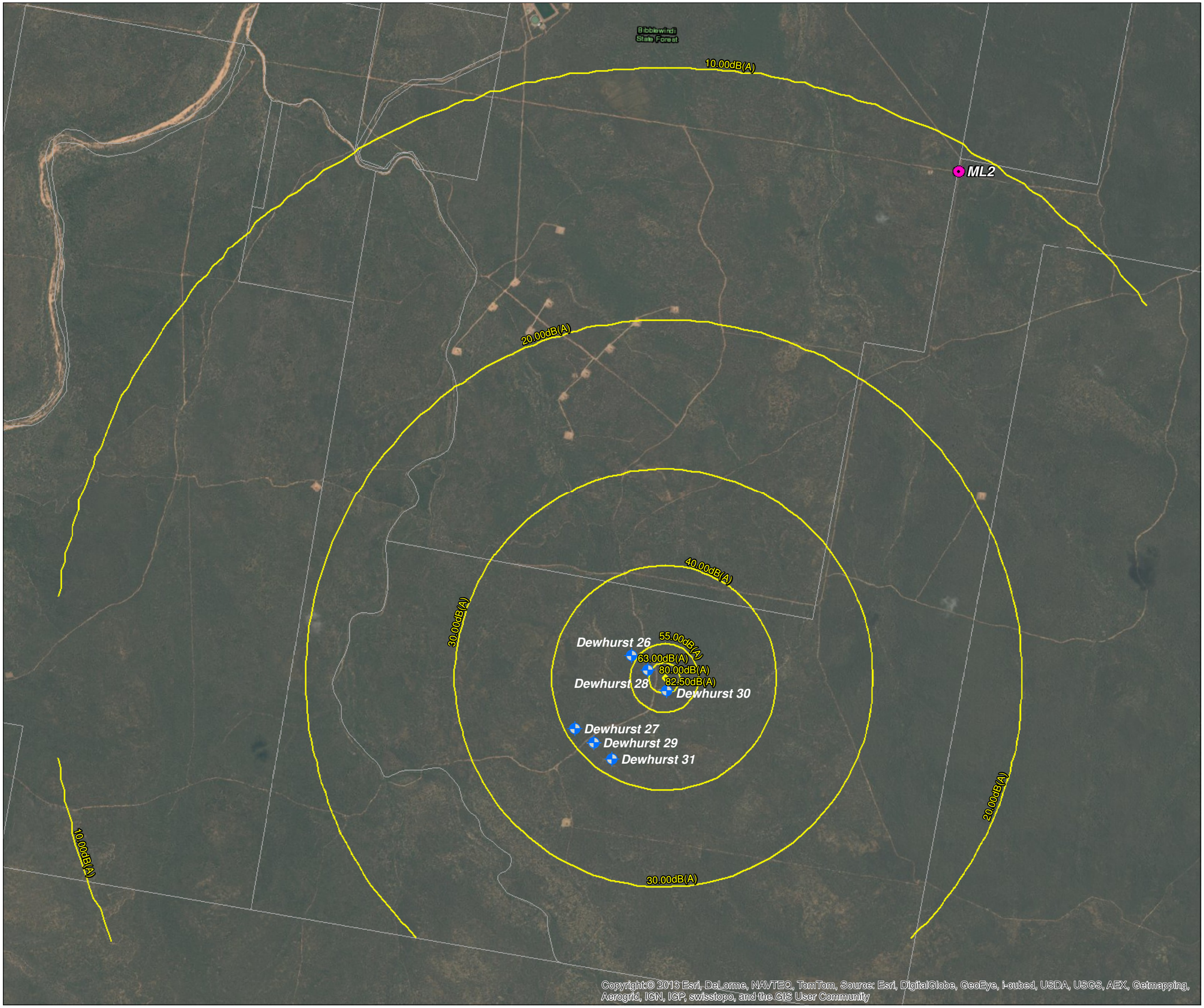
DRAWN: STB **APPROVED:** II DATE: 10/10/2014

Figure: 1

DEWHURST GAS EXPLORATION PROJECT PEMP

NOISE SENSITIVE RECIEVERS SITES 13 - 18

Santos



Legend

- Receivers
- Wells
- Wells 26-31 Maximum Noise Impact Contours[1]
- Cadastre Boundaries

[1] *Scenario 3, Environmental Impact Statement (RPS 2013)*

N
W E
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0 250 500 1,000 Metres

Coordinate System: GDA 1994 MGA Zone 55
Projection: Transverse Mercator
Datum: GDA 1994
Units: Meter

PATH: T:\JOBS\43177928\Workspaces\43177928.007.mxd

FILE NO: 43177928.007 REV: 1

DRAWN: STB APPROVED: II DATE: 10/10/2014

Figure: 2

DEWHURST GAS EXPLORATION PROJECT PEMP

NOISE SENSITIVE RECIEVERS SITES 26 - 31

Santos

Annexure 2: Out of Hours Approval Notification Form

Out of Hours Approval Notification Form

Project:	**Dewhurst Gas Exploration Project**	**No:**	
Company:		**Date**	

Reason for After Hours Work

Agreed reason for after hours work (Tick as Appropriate)
☐ 1. Construction work does not cause L Aeq(15 min) noise levels that are more than 5dB above rating background level at any residence.
☐ 2. Works exceed criteria 1 but form part of a private negotiated agreement, in accordance with the Interim Construction Noise Guideline (DESS, 2009).
☐ 3. The delivery of plant, equipment and materials which is required to be delivered outside of the standard construction hours by Police and/or other authorised authorities
☐ 4. Emergency work to avoid loss of life, damage to property and/or environmental harm. (Approval can be documented retrospectively).

Scope of Work

Description of Proposed After Hours Works Required (include plant equipment to be used and attach a map of location)

Location Description of After Hours Work:	
Proposed After Hours Times	
Date of Proposed After Hours Work:	

Noise Mitigation Measures

Approved by:	
Signature:	Date:

Monitoring Requirement

Approved by:	
Signature:	Date:

EPA and Secretary of Department of Planning and Environment (OPTIONAL)

Name:		Address:	
Signature:			
Name:		Address:	
Signature:			

Annexure 3: Noise Monitoring Forms

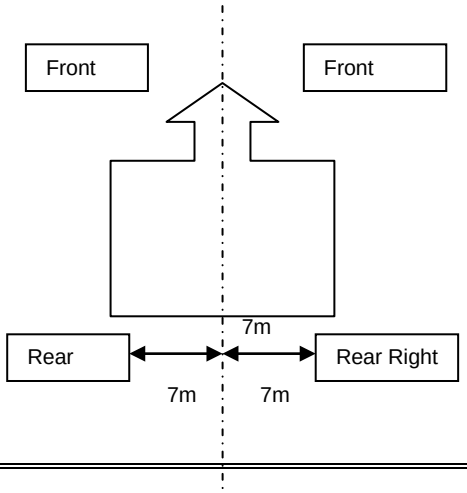
EQUIPMENT NOISE LEVEL REPORT

Project:	**Dewhurst Exploration Project**	**No:**	**ENLR –**
Equipment Owner:		**Date:**	

Equipment Description		
Equipment Model & Serial Number:		
Test Conducted By:		
Date & Time of Test:		
Location of Test Site		
Meteorological Conditions:		

Instrumentation & Test Procedure	
Sound Level Meter	
Calibrator	
Calibration Date	
Test Procedure	Guided by AS 2012.1 – 1990 Stationary Test Condition (Exterior Noise)

Equipment Noise Levels (dBA)					
	FL	FR	RL	RR	Cab Inside
L_{Amax}					
L_{Aeq}					
L_{A10}					
L_{A90}					



Comments / Notes
All measurements taken for 15 secs at 1.5m high
No reflective planes for a distance of m
Equipment revved to an approximated average by the driver of rpm

NOISE MONITORING EVENT REPORT

Project:		**No:**	**NMER –**

Equipment Description		
Equipment Model & Serial Number:		
Test Conducted By:		
Date & Time of Test:		
Location of Test Site		
Meteorological Conditions: (Narrabri Airport)	Wind speeds (gnd level): Wind speeds (10M): Temperature: Temperature Inversion Conditions	

Instrumentation & Test Procedure	
Sound Level Meter	
Calibrator	
Calibration Date	
Test Procedure	Guided by AS 2012.1 – 1990 Stationary Test Condition (Exterior Noise)

Noise Levels (dBA)			
Time			
Measurement Duration			
L_{A01}			
L_{A10}			
L_{A50}			
L_{A90}			

Site Diagram

Comments / Notes

Soil and Surface Water Management Sub Plan

1.1 Background

This Soil and Surface Water Management Plan (SSWMP) is one of the Environmental Sub-Plans under the Project Environmental Management Plan (PEMP)) for the Dewhurst Gas Exploration Pilot Wells Program and the Exploration Pilot Expansion Project (the Project).

This SSWMP outlines the mitigation measures that will be implemented prevent and minimise soil and surface water quality impacts from the activities as well as the monitoring and reporting requirements of the Project.

Mount Pleasant Creek and two unnamed ephemeral watercourses intersect the central gathering system. Water will not be extracted from these watercourses or other surface waters.

Site water management principles will be based on:

- Minimising surface disturbance
- Separating clean and dirty water, including minimising surface water running onto the lease areas; and
- Preventing contaminants from running off the lease area.

Individual Erosion and Sediment Control Plans will be developed for each area in accordance with the ENSW ESC Plan which details that 'these may be required for any disturbance where cleared area is >2500m2 and groundcover is <70%'.

This Plan should be read in conjunction with the following approved plans:

- Produced Water Management Plan February 2014
- Narrabri Gas Field Groundwater Monitoring and Modelling Plan (approved 9/07/13)[1].
- Pollution Incident Response Management Plan, 0011-650-PLA-0003, September 2014.
- Hazard and Risk Management Sub Plan
- Waste Management Sub Plan

1.2 Key Statutory Requirements

1.2.1 General

- *Protection of the Environment Operations Act 1997*.
    - The project holds an Environmental Protection Licence (EPL No. 20350).
    - It is an offence to wilfully or negligently cause any substance to leak, spill or otherwise escape in a manner that harms or is likely to harm the environment.

[1] This approved plan is presently being updated to include Project scope of works.

- It is an offence to pollute waters under Section 120 of the Act.
- Pollution incidents causing or threatening material harm are to be reported to the Environment Protection Authority (EPA).
- Make publically available on the Santos website all EPL listed monitoring data within 14 days of obtaining it.

- *Environmental Planning and Assessment Act 1979*
  - Regulated by NSW Department of Planning and Environment (DPE). There is a Project Approval related to the Project that contains the requirement to prepare and implement management plans and monitoring programs.
- *The Contaminated Land Management Act 1997.*
- *Water Management Act 2000.*
  - Controlled activity approval is required under Part 4 development consents for controlled activities when working on 'waterfront land' (within 40 m of a watercourse) (equivalent to former Part 3A permits under the former *Rivers and Foreshore Improvement Act 1948*).
  - Water Access Licences and various other approvals are required for the extraction and use of water.
- *Environment Protection and Biodiversity Conservation (EPBC) Act 1999*
  - On the 19 June 2013 an amendment to the EPBC Act, to provide that water resources are a matter of national environmental significance (MNES), in relation to coal seam gas and large coal mining developments.
  - The water trigger allows the impacts of proposed coal seam gas developments on water resources to be comprehensively assessed at a national level.
  - The amendment will not apply to actions already approved under the EPBC Act. However, if an approved project has a substantial change to how it is conducted or an extension, the new MNES may apply if there is likely to be significant impact on a water resource.
- National Water Quality Management Strategy.
- Australian and New Zealand Guidelines for fresh and marine water quality 2000 (ANZECC/ARMCANZ, 2000).
- NSW Landcom publication Managing Urban Stormwater - Soils and Construction (4th Edition, March 2004); and Managing Urban Stormwater, EPA 1997
- NSW Office of Water Guidelines for Controlled Activities on Waterfront Land (2012):
  - Guidelines for instream works on waterfront land;
  - Guidelines for laying pipes and cables in watercourses on waterfront land;

- Guidelines for outlet structures on waterfront land;
- Guidelines for vegetation management plans on waterfront land; and
- Guidelines for watercourse crossings on waterfront land.

- Minimum Construction Requirements for Water Bores in Australia, Edition 2, (Land and Water Biodiversity Committee, 2003)
- Australian Standard 1940 – 2004; The Storage and Handling of Flammable and Combustible Liquids.

1.2.2 Project Specific

- Planning Approvals:
  - Department of Primary Industries (DPI) Project Approval for production pilots covering wells 13 to 18H – 21 July 2009 (DPI-PA)[2].
  - Department of Trade and Investment (DT&I) Development Approval for pilot wells 26-29 under Minister for Resources and Energy – 16/8/2013 (MRE-DA).
  - Department of Planning and Environment (DPE) Approval – 18 July 2014 (SSD-6038).
- Renewal Petroleum Exploration Licence 238 (PEL 238).
- Environment Protection Licence 20350 (EPL 20350).
- Schedule of Onshore Petroleum Exploration and Production Safety Requirements (SOPEPSR).
- Review of Environmental Factors (REF (3/13)).
- Review of Environmental Factors - Statement of Commitments (REF – SoC (3/13)).
- NSW Forests Occupation Permit (OP).
- NSW Office of Water (NOW) Water Supply Works Approval (90WA832266).

1.2.3 Santos Environmental, Health and Safety Management System (EHSMS)

This SSWMP has been developed in accordance with relevant legislative and regulatory requirements and conditions in Santos' **Environment Health and Safety Management System** (EHSMS), including the following standards and supplementary How to Guides:

- EHS01 Biodiversity and Land Disturbance
- EHS02 Underground Storage Tanks and Bunds
  - How to Guide: EHS02 Underground Storage Tanks and Bunds

[2] Note the operational conditions of consent and REF statement of commitments under this approval are addressed within the approved Operational Environmental Management Plan (OEMP). This OEMP forms part of the EHSMS process for the Project.

- EHS03 Produced Water
    - How to Guide: EHS03 Developing a Produced Water Management Facility Register
    - How to Guide: EHS03 Developing a Produced Water Management Plan
    - How to Guide: EHS03 Water Management Hierarchy
- EHS08 Contaminated Sites
    - How to Guide: EHS08 Completing a Contaminated Site Assessment
    - How to Guide: EHS08 Completing a Contaminated Site Management Plan
    - How to Guide: EHS08 Completing an Impacted Site Review
    - How to Guide: EHS08 Notifying Contaminated Sites
- Environmental Hazard Standard – EHS10 Water Resources
    - How to Guide: EHS10 Developing a Water Resource Plan
    - How to Guide: EHS10 Water Management Hierarchy
- EHSMS 11 Appendix A Classification of Loss of Containment Incidents
- EHSMS 14 Monitoring, Measurement and Reporting (including Appendix A Environmental Monitoring Overview)
- How to Guide: EHSMS 15 Responding to an Oil Spill Environmental Incident
    - EHSMS 15.2 - Oil Spill to Land: Flow Chart for Environmental Response Flowchart
- Health and Safety Hazard Standard (HSHS) 08 Chemical Management
    - How to Guide: HSHS 08 Chemical Management
- HSHS 19 Excavations
- Spill Response Management Plan, Drilling and Completions, Revision 1, February 2014.
- Produced Water Management Plan, February 2014.
- Pollution Incident Response Management Plan, 0011-650-PLA-0003, September 2014.

1.3 Objectives

Objectives relating to the SSWMP are described below:

- Manage construction and operational activities so as not to cause pollution (including sediment, fuels, oils, concrete rinse water etc.) to enter surface water courses.
- To ensure that any contaminated water from the Project is captured and stored or treated and beneficially re-used where safe and practicable to do so or appropriately managed.
- Ensure compliance with relevant legislative and other requirements including those detailed in Section 1.2.

1.4 Performance Indicators

Performance indicators relating to this SSWMP are outlined below:

- Zero valid complaints received from landowners or government agencies concerning land disturbance, contamination or soil stability;
- Zero water contamination incidents from construction and operational activities; and
- Zero incidents concerning water levels or water quality during operations.

1.5 Predicted Impacts

Project activities are described in detail in the PEMP. The following activities taken from the EIS (RPS 2013) have been assessed as having the potential to impact on local soil and surface water resources.

Activity	*Potential Impact*
Construction	
Installation/upgrade of access roads	Erosion of stockpiled topsoil
	Discharge sediment laden runoff
Construction of drill pad	Erosion of stockpiled spoil
	Discharge sediment laden runoff
Vehicle access	Erosion from track
	Damage undisturbed areas
Drilling	Discharge sediment laden return water
	Erosion of drill pad
	Surface water becomes sediment laden
	Discharge sediment laden runoff
Construction of Gas Gathering Lines	Erosion of stockpiled spoil
	Damage undisturbed areas, including riparian corridors and native vegetation
	Discharge sediment laden runoff
Production and Operation	
Well Production, Operation, Inspection and Maintenance	Erosion of surface due to disturbance around access and equipment
	Discharge of produced water
Inspection and Maintenance of the Gas Gathering System	Erosion of surface due to disturbance around access and equipment
Inspection and Maintenance of the Sales Gas Pipeline	Erosion of surface due to disturbance around access and equipment
Initial Rehabilitation	
Initial well rehabilitation	Erosion of backfilled and rehabilitated excavation

Activity	*Potential Impact*
	Compaction of soil
	Discharge sediment laden runoff
	Damage undisturbed areas
Final Rehabilitation	
Backfilling and rehabilitation of gas gathering line.	Erosion of backfilled and rehabilitated excavation
Decommissioning of wells	Erosion of backfilled and rehabilitated excavation

1.6 Topography, Soils and Landforms

The topography of the Project area is gently undulating with Mount Pleasant Creek and two unnamed ephemeral creeks crossing the area. Sodosols are common in the project area (BASL Site Verification Report, (RPS, 2013). These soils exhibit high erodibililty, poor structure and low fertility.

These watercourses flow north-west to Cowallah Creek that is located approximately 1.6 kilometres (km) east of Dewhurst 27. Cowallah Creek is a tributary of Bohena Creek, that is located approximately 8.1 km north-west of the closest pad (Dewhurst 26).

1.7 Erosion Hazard Assessment

An erosion hazard assessment was conducted in accordance with Landcom (2004) using the Revised Universal Soil Loss Equation (RUSLE).

RUSLE: A = R x K x LS x P x C

A description of the RUSLE equation and the values adopted at this site are detailed below.

RUSLE factors and values used for this site

Factor	*Description*	*Value Used*
A	Computed soil loss (t/ha/yr)	Varies
R	Rainfall erosivity factor	1,600
K	Soil erodibility factor	0.060 (Assumed for inorganic silty sand, poorly graded topsoils and silty clay subsoils)
LS	Slope length and gradient factor	Varies dependent on slope and slope length
P	Soil conservation practice factor	1.3 (compacted)
C	Ground cover factor	1.0

The maximum slope gradient that applies to this SSWMP is 10%. Soil loss for each work site or sub-catchment (ROWs) will be limited to a maximum of 200t/yr (150m^3/yr) using the strategies outlined within Section 4 of this SSWMP.

1.8 Mitigation Measures

Plan Ref	*Actions*	*Timing*	*Reference*
Erosion and Sediment Control Plan			
SSWMP-1	Site specific **Erosion and Sediment Control Plans** will be prepared and implemented for each lease area. The plans will: • Describe the measures that will be employed to minimise soil erosion and the discharge of sediment and other pollutants to lands and/or waters during construction activities. • Be prepared in accordance with the requirements for such plans outlined in *Managing Urban Stormwater: Soils and Construction,* the '*Blue Book*' or the *Best Practice Erosion and Sediment Control Guidelines (IECA, 2008)* (IECA Guidelines).	Prepared prior to Construction Implemented during Construction, Drilling and Operations	SSD-6038 Schedule 3, Condition 9 MRE-DA Condition 13 Water Supply Works Approval 90WA832266, Condition 15 PEL 238, Conditions 11, 12 REF(3.13), Section 2.8.1.1
SSWMP-2	The **Erosion and Sediment Control Plans** will address the following requirements: • Priority will be given to minimising exposed bare earth where practicable to minimise sediment loss as the first barrier. • Appropriate methods erosion and sediment (ErSed) controls will be installed and maintained on the down slope perimeter of all stockpile areas to capture mobile sediments. • A diversion bank will be constructed to direct water around the area of disturbance. • The existing diversion bund at **Dewhurst 13-18H** will be maintained on the up-slope side of the lease areas to divert clean water around the work area. • Diversion bunds will be installed and maintained for the **Dewhurst 30** and **31** lease areas.	At all times	REF – SoC (3/13) Conditions 4, SSD-6038 Appendix 4, Conditions 23 & 24 REF Section 2.8.1.1
SSWMP-3	• The erosion and sediment controls will be maintained as appropriate until disturbed areas of the site are stabilised. • ErSed devices will be installed around the area of disturbance as necessary. • Drainage structures will be maintained for the life of the development.	At all times	REF Section 6.1.1.2 REF – SoC (3/13) Condition 17

Plan Ref	*Actions*	*Timing*	*Reference*
Water Flows			
SSWMP-4	• The crossing of Mt Pleasant Creek will be designed to minimise up and downstream erosion of the bed and banks and changes to flow velocities. • River crossings will be rehabilitated such that the natural flow of water is unimpeded and stream bank stability is maintained to prevent erosion. • Open trenching works within 20 metres of watercourses will not be undertaken during significant rainfall events • Construction activities will not impede lateral water flows.	During Design During Construction and Drilling	REF SoC (3/13), Condition18 REF Section 2.7.4.1 PEL 238, Condition 49 SSD-6038 Schedule 3, Condition 10
SSWMP-5	• Construction activity within 40 m of any watercourse, including construction of the drill pad, upgrades to access roads and any watercourse crossing will be designed by a suitably qualified person, consistent with the NSW Guidelines for Controlled activities (July 2012)	Prior to Construction	MRE-DA Condition 9 Water Supply Works Approval 90WA832266, Condition 10
Lease Area Establishment			
SSWMP-6	The following will be undertaken during lease area establishment using **industrial matting** (preferred method – may be suitable for Dewhurst 26, 27 and 29 lease areas): • The extent of the lease area will be delineated on site. • Vegetation will be slashed and graded (if required). The top soil layer will remain intact. • Areas of industrial matting will be placed on the ground throughout the lease area. • A designated stockpile area will be marked out and appropriate sediment controls installed along the down slope perimeter of this area. • All excavated spoil will be stockpiled in the designated area.	During Construction	REF (3/13), Section 2.8.1.1

Plan Ref	*Actions*	*Timing*	*Reference*
SSWMP-7	The following will be undertaken during lease area establishment using **traditional methods** (if required): • The extent of the lease area will be delineated on site. • Appropriate sediment catchment controls will be installed along the down slope perimeter of the lease area. • A designated stockpile area will be marked out and appropriate controls installed along the down slope perimeter of this area. • A drainage diversion bund will be constructed upslope of the lease area to divert clean water around the lease area. • Vegetation, topsoil and spoil will be stripped separately and stockpiled in the designated stockpile area. • The lease area will be graded to a low point where the lined sedimentation basin will be constructed.	During Construction	REF (3/13), Section 2.8.1.1
Stockpiling			
SSWMP-8	• ErSed devices will be installed and maintained on the down slope perimeter of all stockpile areas. • Topsoil and subsoil material will be stockpiled separately. • Topsoil and subsoil will be stockpiled at the site for a period of up to approximately six months from release of the drill rig, until partial rehabilitation of the lease area can take place. • Stockpiles will be maintained with a slope of no greater than 2(horizontal): 1(vertical). • Stockpiles will be lightly compacted using the back of an excavator bucket or similar to reduce erosion potential. • Topsoil stockpiles will be maintained at a height no greater than two metres.	During Construction	REF Section 2.8.1.1
SSWMP-9	• Excess spoil generated during site preparation activities will be stockpiled on site and used as backfill during site rehabilitation. No uncontaminated soil or spoil will be removed from the site.	During Construction	REF – SoC (3/13), Condition 2 PEL 238, Condition 31
Drilling Activities and Operation			
SSWMP-10	Hydraulic fracturing / fracture stimulation / fracking will not be undertaken.	During Drilling	MRE-DA Condition 4 SSD-6038, Schedule 2, Condition 6

Plan Ref	*Actions*	*Timing*	*Reference*
SSWMP-11	If during the construction of the wells, saline or contaminated water is encountered above the production aquifer, Santos will: • Take all reasonable steps to minimise contamination and environmental harm; • Ensure that such water is sealed off by inserting casing to a depth sufficient to exclude the saline or contaminated water from the work, and, if specified by the minister, placing an impermeable seal between the casing(s) and the walls of the work from the bottom of the casing to ground level as specified by the minister; and • Comply with any requirements specified by the minister. • The above requirements do not apply where the water supply work is being constructed for the purpose of taking saline water through a salinity or water table management access licence and the only contaminated water encountered is saline water.	At all times	Water Supply Works Approval 90WA832266, Condition 6
SSWMP-12	• Water that drains to the cellar pit will be circulated with the drilling mud throughout the drilling process. • Drilling mud will be stored in surface tanks which will be regularly inspected and maintained. • Any spilled liquids or contaminated water that is captured will be removed to a licensed waste facility for treatment or disposal in accordance with the **Waste Management Sub Plan**.	During Drilling During Operations	REF (3/13) Section 2.8.1.9 REF – SoC (3/13), Conditions 7
SSWMP-13	• Over-balanced drill techniques will be used to prevent produced water from rising through the well to the surface.	During Drilling	REF – SoC (3/13), Condition 20

Plan Ref	*Actions*	*Timing*	*Reference*
SSWMP-14	• No drilling fluid additives containing Benzene, Toluene, Ethylbenzene and Xylene (BTEX) chemicals will be used. • Drilling fluids will be managed in accordance with the Santos **Fluids Management Plan**. • Drill cuttings, fluids and groundwater returned to the surface as part of the drilling process will be contained in above-ground tanks or in-ground sumps pending re-circulation or disposal. • In-ground sumps will be lined with an impermeable barrier to prevent contamination of groundwater or material will be stored in surface tanks or metal bins. • Produced water, and other waste fluids produced from a well, will be disposed of at an authorised wastewater treatment facility or treated to EPL criteria prior to discharging. • Drilling fluids will be transported to and from site by an appropriate contractor. • Produced water will not be discharged to land, except where approved under Condition 2 [of PEL 238] or the **Produced Water Management Plan** under Condition 14. • At the surface, each pilot well will be connected to a small separator, operating at low pressure (approximately 275 kPag) to separate any coal seam gas from the produced formation water. • Both the gas and water will be collected from each well and transferred to the gathering systems. • A minimum freeboard of 300 millimetres will be maintained for any tanks or pits containing liquid waste.	During Construction, Drilling and Operations	SSD-6038, Schedule 3, Condition 5 Water Supply Works Approval 90WA832266, Condition 6 SOPEPSR, SOP 726 PEL 238, Condition 15 SSD-6038 Schedule 3, Condition 8 REF – SoC (3/13), Conditions , 19, 25, 27, 28, 30, 33 & 36 REF (3/13) Section 2.7.5.1 SSD-6038 SoC, Condition 3
Pollution Prevention			
SSWMP-15	• Additives, chemicals, fuels and oils, transported, used and stored on site will managed in accordance with the **Hazard and Risk Management** Plan and relevant Safety Data Sheet (SDS).	During Construction & Drilling	REF SoC 8, 9, 11, 12, 13, 14, 22, 24, 29, & 31 EPL 20350 O5.3
SSWMP-16	• Above ground tanks containing material that is likely to cause environmental harm will be bunded or have an alternative spill containment system in place.	During Construction & Drilling	EPL 20350, Condition O5.3
SSWMP-17	• The maintenance and cleaning of vehicles and other equipment or plant will be carried out in areas from where the resultant contaminants cannot be released into any waters.	During Construction & Drilling	REF- SoC (3/13), Condition 25
SSWMP-18	• No refuse, garbage, petroleum products, trade waste, building material, earth fill or any offensive or polluting matter or liquid will be placed, tipped or discharged on any land or in any water or watercourse within the Occupation Permit Area. • Santos will not place any obstructing matter on any land or in any water or watercourse or act or fail to act so as to cause any flow of water to be restricted, obstructed or diverted and will comply with any requirement of Forestry NSW regarding a watercourse.	At all times	OP Condition 4.10.1

Plan Ref	*Actions*	*Timing*	*Reference*
SSWMP-19	• Weather forecasts will be monitored and in the event that prolonged, severe wet weather or flooding is predicted, works will cease and plant, machinery and any chemicals will be secured and bunded. This will also occur during drilling.	During Operations	SSD-6038 SoC, Condition 32
SSWMP-20	• Spills will be managed in accordance with the Narrabri Gas Project **Pollution Incident Response Management Plan** (PIRMP) and Santos EHSMS.	As Required	EPL 20350, ConditionO4.1
Other			
SSWMP-21	• No water will be extracted from waterways or other surface waters including Mount Pleasant Creek, Tuppiari Creek, Cowallah Creek or Jacks Creek.	During Construction & Drilling	REF (3/13) Section 2.8.1, SSD – 6038 Schedule 3, Condition 22
SSWMP-22	• Sufficient water for all stages of the development will be maintained, and if necessary, the scale of operations adjusted under the consent to match its available water supply and licenced water entitlements.	At all times	SSD – 6038 Schedule 3, Condition 11
SSWMP-23	• If a well is abandoned or replaced it will be decommissioned in compliance with the minimum requirements for decommissioning bores as prescribed in the document	As Required	Water Supply Works Approval 90WA832266, Condition 1

1.9 Monitoring Requirements

Aspect	*Description*	*Frequency*
Statutory	When directed by the minister by notice in writing, Santos will install metering equipment (complying with Australian technical specifications) to measure and record the flow of water taken through the water supply work (wells). The metering equipment would be sited and installed at a place in the pipe, channel or conduit between the groundwater source and the first discharge outlet and be operated and maintained in a proper and efficient manner. Santos would keep a logbook or data logger to record the following information i. Each date and period of time on which water was taken using the water supply work; ii. The volume of water taken on that date; iii. The access licence number of the access licence under which water was taken on that date, or, if water was taken under some other authority (such as basic landholder rights entitlement), the authority under which water was taken iv. The purpose or purposes for which the water taken on that date was used;	As required

Aspect	*Description*	*Frequency*
	v. Details of any cropping carried out using the water taken through the water supply work including the type of crop, area cropped, and dates of planting and harvesting; vi. Where metering equipment has been installed for use in connection with the water supply work, the meter reading before water is taken; vii. Where metering equipment has not been installed for use in connection with the water supply work, viii. details of all pumping activities for the water supply work including pump running hours, pump power usage or pump fuel usage, pump start and stop times for water taken and pump capacity per unit of time; The logbook would be produced to the Minister for inspection when requested and be retained for five years from the date to which the information relates.	
General – Inspections	• Field Superintendent to assess potential soil and water issues during construction and drilling	Daily during construction and drilling
	• Well Operator to undertake 'Well Runs' during operation to assess any potential soil and water issues. • Environmental Advisor inspection of activities to determine if all reasonable and feasible soil and water mitigation measures are in place	• Daily during operation • 6 monthly during operation

1.10 Reporting Requirements

Description	*Timing*	*Reference*
Notify all relevant authorities (DPE, EPA, DRE as well as NSW Health, WorkCover NSW, Local Council and Fire and Rescue NSW).of any incident that has caused or threatens to cause material harm to the environment **immediately** after becoming aware of the incident. Provide written report within 7 days of the date of the incident. (Refer to PEMP and PIRMP).	As required	PEL 238, Condition 54 EPL 20350, Condition R2 SSD-6038 Schedule 5, Section 6
All other reporting requirements for soil and water reporting will be managed through Santos' Compliance tracking system (ComTrack)	As required	

Traffic Management Sub Plan

1.1 Background

This Traffic Management Plan (TMP) is one of the Environmental Sub-Plans under the Project Environmental Management Plan (PEMP)) for the Dewhurst Gas Exploration Pilot Wells Program and the Exploration Pilot Expansion Project (the Project).

This TMP addresses mitigation measures and monitoring and reporting requirements in relation to traffic.

All Santos NSW (Eastern) Pty Ltd (Santos) employees and their contractors working on the Project must comply with the PEMP and all sub-plans under the PEMP including this TMP.

1.2 Key Statutory Requirements

1.2.1 General

- *Roads Act 1993* (NSW)
- Managing Urban Stormwater: Soils and Construction, Volume 2C, Unsealed Roads (DECC, 2007)
- Erosion and sediment control on unsealed roads – A field guide for erosion and sediment control maintenance practices (OEH, 2012)
- Policy and Guldeilnes for Aquatic Habitat Management and Fish Conservation (DPI, 1999)
- Why do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings (NSW Fisheries 2003)

1.2.2 Project Specific

- Planning Approvals;
  - Department of Primary Industries (DPI) Project Approval for production pilots covering wells 13 to 18H – 21 July 2009 (DPI-PA)[1].
  - Department of Trade and Investment (DT&I) Development Approval for pilot wells 26-29 under Minister for Resources and Energy – 16/8/2013 (MRE-DA);
  - Department of Planning and Environment (DPE) Approval – 18 July 2014 (SSD-6038);
- Renewal Petroleum Exploration Licence 238 (PEL 238);
- Environment Protection Licence 20350 (EPL 20350);
- Schedule of Onshore Petroleum Exploration and Production Safety Requirements (SOPEPSR);
- Review of Environmental Factors (REF (3/13));

[1] Note the operational conditions of consent and REF statement of commitments under this approval are addressed within the approved Operational Environmental Management Plan (OEMP). This OEMP forms part of the EHSMS process for the Project.

- Review of Environmental Factors - Statement of Commitments (REF – SoC (3/13)); and
- NSW Forests Occupation Permit (OP).

1.2.3 Santos Environmental, Health and Safety Management System (EHSMS)

HSHS2 – Land Transportation.

Additional legal obligations and other requirements are captured in **EHSMS02 Legal Obligations and Other Requirements**.

1.3 Objectives

Objectives relating to the TMP are described below:

- Minimise and manage all traffic impacts on the environment and potentially affected receivers throughout construction, drilling and operational phases of the Project.
- Protect human health and safety and impacts to the environment from construction, drilling and operations.
- Ensure compliance with relevant legislative and other requirements including the MRE-DA, SSD-6038, PEL 238, EPL 20350, and OP.

1.4 Performance Indicators

Performance indicators relating to this TMP are outlined below:

- No traffic related issues raised by the community and stakeholders during all phases of the Project.
- No damage to public infrastructure including roads during all phases of the Project.

1.5 Predicted Impacts

Review of Environmental Factors for Dewhurst 26-29 petroleum wells PEL 238, Gunnedah Basin, NSW (March 2013)

Section 6.3 in the REF for Dewhurst 26-29 petroleum wells PEL 238, Gunnedah Basin, NSW (March 2013) describes the potential impacts on the community including effects on traffic. It is anticipated that the works would generate minimal traffic on Beehive Road and the southern part of Garlands Road, particularly during establishment and drilling. It is noted, however, that such impacts are considered negligible, particularly given that these roads are not heavily used by the local community and do not have residential properties.

Environmental Impact Assessment for Dewhurst Gas Exploration Pilot Expanision (October 2013)

Section 15 of the EIS for Dewhurst Gas Exploration Pilot Expanision (October 2013) describes the potential impacts on traffic, based on the Traffic and Transport Assessment (Dewhurst Gas Expansion) by GTA Consultants.

During construction, it is expected that a minor increase in local traffic would occur due to delivery and collection of equipment, materials and plant and vehicle movements by personnel and contractors. Impacts during operations are expected to be minimal, with one vehicle entering and exiting the site each day. It is anticipated that the Project would have a negligible impact on existing traffic on the Newell Highway or roads within the Pilliga East State Forest.

Through the implementation of the proposed mitigation measures outlined in **Section 1.6** of this TMP, the works will not likely generate any significant traffic impacts on the surrounding road network.

1.6 Mitigation Measures

Plan Ref	*Actions*	*Timing*	*Reference*
Vehicle Access and Movements			
TMP-1	Santos will prepare a Code of Conduct, in consultation with RMS, for all drivers required to access the site. The Code of Conduct will include: • Details of the roads to be followed to access and exit the site. • Management actions that ensure drivers operate their vehicles in a safe, professional and courteous manner. • Measures to minimise or avoid access to the site outside of daylight hours, wherever practicable.	At all times	SSD-6038 Schedule 3, Condition 21
TMP-2	Vehicles will not travel at speeds greater than 80 kilometres per hour along roads (within the forest) and will not travel in excess of signed limits.	At all times	SSD-6038 SoC 63
TMP-3	Santos will ensure that: • Access to the Dewhurst 13-1BH and Dewhurst 26-31 pilots shall primarily be via the intersection of X-Line Road and the Newell Highway. • Heavy vehicle activity associated with lease construction passing through residential areas will be confined to standard construction hours (7.00 am to 6.00 pm Monday to Friday, 8.00 am to 1.00 pm Saturday). • Movement of vehicles will be on designated roads. • The site boundary will be clearly demarcated to ensure that plant and vehicles keep within the approved area of disturbance.	During Construction	SSD-6038 SoC 64, 67, 68, 70 OP Condition 29 Section 4.21.1
TMP-4	Santos will ensure that all employees and agents will comply with the Forestry of NSW (FNSW) Plan of Management and the reasonable directions of FNSW and its officers in relation to the washing down, operation, movement and parking of vehicles within the Occupation Permit Area.	At all times	OP Condition 12 Section 4.8
TMP-5	Santos will ensure all Project employees and agents will receive the appropriate induction (consistent with Santos policies), which will include driver protocols and identification of any local hazards.	As required	SSD-6038.SoC 65
TMP-6	An in-vehicle monitoring system (IVMS) will be fitted to all Santos vehicles.	As required	SSD-6038 SoC 66
Road Maintenance and Repair			
TMP-7	• Santos may limit the use of any road based on the combination of road and weather conditions. • Any damage to roads caused by construction activities will be repaired at Santos cost in accordance with the OP, land access agreement or the PEL 238 conditions.	During Construction	PEL 238 Condition 30 SSD-6038 SoC 69

Plan Ref	*Actions*	*Timing*	*Reference*
	• Santos will maintain roads at least to the condition the roads were in prior to construction. Santos will obtain FNSW written approval prior to maintenance or repairs. • As required, Santos will pay to the relevant roads authority, the reasonable costs incurred for fixing damage to public roads caused by Project-related activities. If there is no agreement on reasonable costs between both parties, the matter will be referred to the Director-General for resolution.		OP Condition 30 PEL 238 Condition 28
TMP-8	Access Tracks will be maintained and managed in accordance with: • Managing Urban Stormwater – Soils and Construction Volume 2C Unsealed Roads (DECC, 2007) and Erosion and sediment control on unsealed roads – A field guide for erosion and sediment control maintenance practices (OEH, 2012). • Requirements of the Policy and Guidelines for Aquatic Habitat Management and Fish Conservation (DPI 1999); and • Why do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings (NSW Fisheries 2003).	At all times	SSD-6038 Schedule 3, Condition 18 PEL 238 Condition 29
TMP-9	Santos will seal the first 30 metres of X-Line Road at the intersection of X-Line Road and Newell Highway, to the satisfaction of RMS.	During Construction	SSD-6038 Schedule 3, Condition 19
TMP-10	Santos will install Size B “Turning Traffic” Signs (W5-25) and 300m distance plates at a distance of 300 metres on either side of the X-Line Road intersection with the Newell Highway, before undertaking construction of the Dewhurst 13-18H Extension and Dewhurst 30 and 31 Extension wells, to the satisfaction of the RMS.	Prior to works in this area	SSD-6038 Schedule 3, Condition 20
Signage			
TMP-11	• Santos will not erect, display, affix, paint or exhibit on or to the Occupation Permit Area any signage, advertisement, notice or hoarding without the prior written approval of FNSW. • Santos will not make any permanent marking on any tree, plant or rock in the Occupation Permit Area; • Before leaving the Occupation Permit Area or as requested by FNSW, Santos will remove any signage, advertisements, notices, hoarding or markings placed by or on behalf of Santos. • Santos will repair/resolve any damage or disfigurement caused by the placement or removal of any signage, advertisement, notice, hoarding or marking.	At all times	OP Condition 26 Section 4.16
Construction of New Access Tracks/Roads			
TMP-12	• Existing roads will be used in preference to constructing new roads and tracks; • Santos will ensure that roads are properly constructed, drained and maintained by Santos at its cost to a standard which will at least provide all-weather access for four-wheel drive vehicles or to such other appropriate and reasonable standard that complies with FNSW's operational, environmental and safety standards; • The location of any new roads required for Santos’ activities will be subject to the Authorised Officer's approval;	At all times	PEL 238 Condition 29 OP Condition 31 Section 4.22

Plan Ref	*Actions*	*Timing*	*Reference*
	• Any new access road construction or realignment will be marked on the ground and the final route inspected and approved by the FNSW Officers prior to commencement of such work; • Any temporary road will be restored or revegetated in accordance with the provisions in the OP, if no longer required.		
Interference with Access			
TMP-13	Santos will not interfere with the use of any public road or prevent access along any other road or track without written approval of the relevant roads authority (as defined under the *Roads Act 1993*) or, in the case of any other road or track, the landholders and/or residents relying on that road or track for access.	At all times	PEL 238 Condition 27

1.7 Monitoring Requirements

Aspect	*Description*	*Frequency*
Damage to Roads	Damage to roads caused by construction activities will be monitored to satisfy a number of Project specific requirements/conditions including the Condition of Consent (Appendix 4 – SOC 69) and the Occupation Permit, and for confirming damages caused by the Project during construction. Monitoring damage will be via Dilapidation Surveys conducted prior to commencement of construction and following completion of construction.	Before Construction After Construction
Induction	An Induction Records register indicating the induction of all site staff and delivery drivers will be maintained to satisfy the Condition of Consent (Appendix 4 – SOC 65).	During Construction, Drilling and Operations

1.8 Reporting Requirements

Description	*Frequency*	*Reference*
Written approval will be obtained from the relevant roads authority (as defined under the *Roads Act 1993*) prior to any works that may interfere the use of any public road or prevent access on a public road.	At all times	PEL 238 Condition 27

Waste and Resource Management Sub Plan

1.1 Background

This Waste and Resource Management Plan (WRMP) is one of the Environmental Sub-Plans under the Project Environmental Management Plan (PEMP) for the Dewhurst Gas Exploration Pilot Wells Program and the Exploration Pilot Expansion Project (the Project).

This WRMP identifies:

- The types of waste generated during all phases of the Project;
- The waste management processes and procedures for each waste stream;
- The waste transport requirements;
- The monitoring requirements;
- The audit and inspection requirements; and
- The record keeping and reporting requirements.

All Santos NSW (Eastern) Pty Ltd (Santos) employees and their contractors working on the Project must comply with the PEMP and all sub-plans under the PEMP including this WRMP.

1.2 Key Statutory Requirements

1.2.1 General

- *Protection of the Environment Operations Act 1997* (NSW)
- *Contaminated Land Management Act 1997* (NSW)
- *Waste Avoidance and Resource Recovery Act* 2001 (NSW)
- *Protection of Environment Operations (Waste) Regulation* 2005 (NSW)
- National Environment Protection (Movement of Controlled Waste between States and Territories) Measure (Commonwealth)
- Australia Code for the Transport of Dangerous Foods by Road and Rail (Commonwealth)

1.2.2 Project Specific

- Planning Approvals;
  - Department of Primary Industries (DPI) Project Approval for production pilots covering wells 13 to 18H – 21 July 2009 (DPI-PA)[1].
  - Department of Trade and Investment (DT&I) Development Approval for pilot wells 26-29 under Minister for Resources and Energy – 16/8/2013 (MRE-DA);

[1] Note the operational conditions of consent and REF statement of commitments under this approval are addressed within the approved Operational Environmental Management Plan (OEMP). This OEMP forms part of the EHSMS process for the Project.

  - Department of Planning and Environment (DPE) Approval – 18 July 2014 (SSD-6038);
- Renewal Petroleum Exploration Licence 238 (PEL 238);
- Environment Protection Licence 20350 (EPL 20350);
- Schedule of Onshore Petroleum Exploration and Production Safety Requirements (SOPEPSR);
- Review of Environmental Factors (REF (3/13));
- Review of Environmental Factors - Statement of Commitments (REF – SoC (3/13)); and
- NSW Forests Occupation Permit (OP).

1.2.3 Santos Environmental, Health and Safety Management System (EHSMS)

This WRMP has been developed in accordance with relevant legislative and regulatory requirements and conditions in Santos' Environment Health and Safety Management System (EHSMS), including:

- ENSW Waste Management Plan – (0011-650-PLA-0002.2)
- Environmental Hazard Standard for Waste – EHS04 Waste
  - How to Guide – Tracking and Transporting Wastes within Australia; and
  - How to Guide – Understanding Waste Concepts.

1.3 Objectives

The objectives of this WRMP are:

- provide a framework for understanding and addressing all aspects of waste management, including:
  - the types of waste streams including third party wastes generated by the Project;
  - the waste management strategy for destination of waste;
  - the risks associated with the management (including handling and disposal) of waste;
  - utilising the Waste Hierarchy as per How to Guide - Understanding Waste Concepts, which is, preferenced in descending order: waste avoidance, reduction, reuse, recycling and recovery and minimise waste treatment and disposal; and
  - the environmental monitoring and reporting requirements.
- minimise any risk to health and safety of Santos personnel, contractors and other stakeholders; and
- Ensure the Project is compliant with relevant legislative and other requirements as outlined in Section 1.2.

All operations and activities carried out by Santos' personnel and contractors will be conducted in a manner that minimises the environmental impact from the generation, transport, storage and disposal of wastes. Project personnel and contractors will be made are aware and comply with this WRMP.

1.4 Performance Indicators

Performance indicators relating to this WRMP are outlined below:

- Implementation of the waste reduction hierarchy of avoid, reduce, reuse, recycle, recover, treat and dispose;
- Implementation of WRMP evidenced through fulfilment of all Project-specific monitoring and reporting requirements (refer to **Section 1.7**);
- No non-compliances related to waste identified during all phases of the Project;
- Signage and labelling of waste storage containers and areas observed – evidenced in audits and inspections;

1.5 Predicted Impacts

Table 1 and **Table 2** describe the predicted waste generated from works as described in the Review of Environmental Factors (REF) for Dewhurst 26-29 petroleum wells PEL 238, Gunnedah Basin, NSW (March 2013) and the Environmental Impact Statement (EIS) for Dewhurst Gas Exploration Pilot Expanision (October 2013), respectively.

Table 1. Predicted waste generated from works as described in the REF

Source	Classification	Estimated Quantity
Sewage waste	Liquid waste	$2m^3$ per month
General waste including food waste from personnel and non-recyclables	General solid waste (putrescible)	$20m^3$
Drill cuttings	General solid waste (non-putrescible)	$680m^3$
Drilling mud		$400m^3$
Mud contaminated cement slurry		$115m^3$

Table 2. Predicted waste generated from works as described in the EIS

Source	Classification	Estimated Quantity
Construction Activities		
Drill fluid	Liquid waste	825m^3
Drilling fluid-contaminated cement slurry		160m^3
Produced water		450m^3
Fuels, engine coolant and hydrocarbon residuals		< 200L
Human waste including pump out waste and sewage		< 60m^3
General waste including food waste from personnel and non-recyclables	General solid waste (putrescible)	<40m^3
Drill cuttings	General solid waste (non-putrescible)	350m^3
Drained oil filters, empty oil containers and oil absorbent materials that do not contain free liquids, plastics (e.g. packaging pipe caps), concrete wastes, cured resins, paints, glues, etc.		< 80m^3
Contaminated soil ^	Dependent on waste material	Undetermined
Recyclables including glass, PET bottles, aluminium, scrap metal (e.g. pipe cuttings), rope spacers, paper and cardboard.	Recyclable	<40m^3
Operational Activities		
Produced water	Liquid waste	Max. 845m^3 per day
Waste generated from maintenance works	Various	Undetermined

^ Contaminated soil was not identified in the EIS, however, it is considered a potential waste that may be generated during construction/operation.

1.6 Mitigation Measures

Plan Ref	*Actions*	*Timing*	*Reference*
Waste Management			
WRMP-1	Prior to commencement of construction, Santos will implement a Waste Management Plan that will be based on the waste reduction hierarchy of avoid, reduce, reuse, recycle, recover, treat and dispose. This plan will target the requirements to: • minimise and monitor the waste generated by the development; • ensure all above ground tanks containing material that is likely to cause environmental harm will managed in accordance with the Project Hazard and Risk Management Sub Plan; • ensure it has in place appropriate containment, mitigation, contingency, remediation and rehabilitation methods and actions in order to prevent an accidental spill of waste material or in the event of an accidental spill; • ensure that the waste generated by the development is appropriately stored, handled and disposed of; • manage on-site sewage treatment and disposal in accordance with the requirements of Narrabri Shire Council. • report on waste management and minimisation in the Annual Review.	Prior to construction	SSD-6038 Schedule 3, Condition 22 SSD-6038 Appendix 4, Condition 73 REF (3/13) Section 2.8.1.2
WRMP-2	Santos will ensure that: a) The sites of prospecting operations are maintained in a clean and tidy condition at all times; b) All waste, including contaminated residues, must be collected, segregated, according to their classifications under the Waste Classification Guidelines (DECCW, 2009), and securely deposited in properly constructed containers and disposed of lawfully; A written record will be kept in accordance with the ENSW Waste Management Plan c) Drilling by-products contaminated by chemicals, oils or fuels must be collected and remediated or disposed lawfully; and d) All drill cuttings and drilling fluids not being reused in drilling operations are disposed lawfully. The management of waste, including its transport will comply with the *Protection of the Environment Operations Act 1997* (POEO Act) and Protection of the Environment Operations (Waste) Regulation 2005 (POEO (Waste) Regulation).	At all times	PEL 238 Condition 36 SSD-6038 Appendix 4, Condition 72 & 74 REF – SoC (3/13) OPCondition 43
WRMP-3	Appropriate waste/recycling receptacles will be provided and will include covered rubbish bins for disposal of domestic wastes. These will remain during drilling activities.	At all times	EPL 20350 O5.1 REF – SoC (3/13) Condition 41

Plan Ref	*Actions*	*Timing*	*Reference*
WRMP-4	Solid wastes requiring on-site storage will be placed within suitable storage containers in a designated waste transfer point within the lease area prior to transportation to appropriate facilities.	As required	REF (3/13) Section 2.8.1.2
WRMP-5	Santos will ensure that all waste materials generated at the wells (whether or not contaminated with oil) are disposed of in accordance with DECC Waste Classification Guidelines	At all times	SOPEPSR #601.2 EPL 20350 O5.2
WRMP-6	Any liquid and/or non-liquid waste for processing, resource recovery or disposal at the premises will be assessed and classified in accordance with the DECC Waste Classification Guidelines, prior to despatch from the site.	As required	MRE-DA Condition 11 EPL 20350 O5.2
WRMP-7	Regulated waste will be collected by licensed contractors for off-site disposal. General and recyclable waste will be transported to appropriate facilities.	As required	SSD-6038 Appendix 4, Condition 75 REF (3/13) Section 2.8.1.2
WRMP-8	**Drilling Waste Management** Drilling fluids and drill cuttings will be reused or recycled where practical. Where reuse / recycling is not practical drill fluids & drill cuttings will be disposed of appropriately. Recycling will involve: 1. The drill cuttings will be tested to determine the appropriate reuse management or disposal method. 2. Drilling fluids will be reused on-site where possible or transported back to the treatment and processing facility in Narrabri if operational so it can be reused in future drilling operations. 3. Following completion of cementing, excess fluids and cement slurries will be segregated in suitable storage containers and removed and disposed in accordance with its waste classification.	During Construction During Drilling	SSD-6038 Appendix 4, Condition 71 & 76 REF (3/13) Section 2.7.3.4 & 2.8.1.2
WRMP-9	Drilling fluids will be transported to and from the site by an suitable contractor.	During Drilling	REF – SoC (3/13) Condition 21
WRMP-10	Liquid waste Portable toilets will be provided on site and will be regularly serviced by a licensed contractor. Sewage waste will be removed from site by a licensed contractor for treatment and disposal, as required.	During Construction During Drilling	SSD-6038 Appendix 4, Condition 77 REF – SoC (3/13) Condition 48
WRMP-11	Produced water will be managed in accordance with the Produced Water Management Plan	At all times	REF (3/13)

Plan Ref	Actions	Timing	Reference
			REF – SoC
WRMP-12	All staff and contractors will be made aware of waste management procedures during the site-specific induction and through toolbox talks.	At all times	SSD-6038 Appendix 4, Condition 79 REF – SoC (3/13) Condition 49
WRMP-13	Disposal of chemical, fuel and oil containers will be managed according to the SDS or manufacturers' directions to avoid potential impacts to the environment or human health.	At all times	SSD-6038 Appendix 4, Condition 80

1.7 Monitoring Requirements

Aspect	Description	Frequency
General – Inspections	Field Superintendent to assess potential waste issues during construction and drilling	Daily during construction and drilling
	• Well Operator to undertake 'Well Runs' during operation to assess any potential waste issues. • Environmental Advisor inspection of activities to determine if all reasonable and feasible waste mitigation measures are in place	• Daily during operation • 6 monthly during operation

1.8 Reporting Requirements

Description	Timing	Reference
Recording waste streams by completing a **Waste Management Facility Inventory Form**, containing details of all waste generated from the Project. The information in the form must include: • Classification; • Source; • Quantities; • Transport; • Storage and handling conditions; and • Final destination (e.g. reuse, recycle, recovery, treatment or final disposal).	As required – for all waste	EHS04 Waste
Tracking of Regulated Waste is recorded by completing a **Waste Transport Certificate** or a **Waste Tracking Form** or similar document (as required in NSW). These forms are completed by the relevant waste management transporter and depot operator.	As required – for all Regulated Waste	EHS04 Waste

Description	*Timing*	*Reference*
These are to be uploaded onto the **Waste Transfer Certificate Register**.		
The quantity, type, classification and final destination of all waste will be recovered by completing a **Waste Tracking Form**.	As required – for all waste	EHS04 Waste
All other reporting requirements for soil and water reporting will be managed through Santos' Compliance tracking system (ComTrack)	As required	

APPENDIX B SANTOS POLICIES

Climate Change Policy

Santos

Our Climate Change Vision:

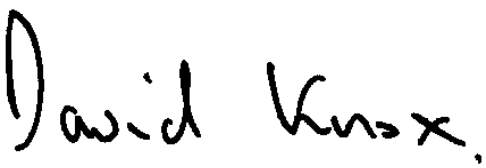
"Santos will lower the carbon intensity of its products"

Climate change is a long-term issue, requiring urgent but informed action to stabilise atmospheric greenhouse gas concentrations. As a global stakeholder in the energy business we recognise that one of our key social and environmental responsibilities is to pursue strategies that address the issue of climate change.

To achieve these commitments we will:

- Continue to reduce the carbon intensity of Santos' products by focussing on energy efficiency, technology development and by embedding a carbon price in all activities
- Use energy more efficiently by identifying opportunities to implement energy efficiency projects and report their progress
- Examine the commercial development of low emission technologies, including storage solutions, which will contribute towards long-term aspirational greenhouse gas emission reduction targets
- Pursue no flaring or venting of associated gas, unless there are no feasible alternatives
- Continue to publicly disclose Santos' greenhouse emissions profile and carefully examine forecast emissions
- Understand, manage and monitor climate change risk and develop appropriate adaptation strategies for our business
- Assist governments and engage with other stakeholders on the design of effective and equitable climate change regulations and policy

Santos will inform employees about its commitment to climate change and ensure climate change initiatives continue to be implemented. The Santos Board will review progress against this policy quarterly.



David Knox
Chief Executive Officer

December 2008

Environmental Policy

Santos

Our Environmental Vision:

"We will continuously seek to find new ways to minimise our environmental impact across the lifecycle of our activities"

At Santos we adopt the principles of sustainable development. We recognise our responsibility to meet community expectations and we are committed to the continuous improvement of our environmental performance. We believe that environmental stewardship is both a management obligation and the responsibility of every individual.

To achieve this we will:

> Comply with and continuously improve the Environment, Health and Safety Management System (EHSMS) across the business.

> Proactively identify environmental hazards, assess their risk and eliminate or, if not possible, manage the risk to as low as reasonably practicable.

> Establish annual environmental objectives and targets, implement programs to achieve them, and review and report on environmental performance against those objectives and targets.

> As a minimum comply with relevant legal and other requirements.

> Ensure that we have the resources and skills necessary to achieve our environmental commitments.

> Include environmental performance in the appraisal of workers' performance.

> Implement strategies to minimise pollution, manage waste, use water and energy efficiently, and address relevant biodiversity issues.

> Formally monitor, audit, review and report annually on our environmental performance and EHSMS requirements against defined objectives.

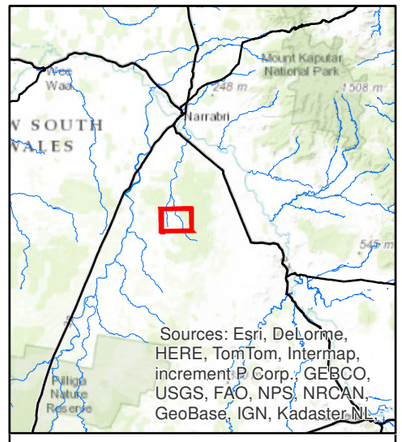
> Require that companies providing contract services to Santos implement environmental policies, systems and procedures in line with this policy.

> Positively influence the environmental performance of Joint Venture activities operated by others.

David Knox.

David Knox
Chief Executive Officer and Managing Director

APPENDIX C LOCATION MAPS



Legend

- Wells
- Cadastre Boundaries

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Projection: Transverse Mercator
Datum: GDA 1994
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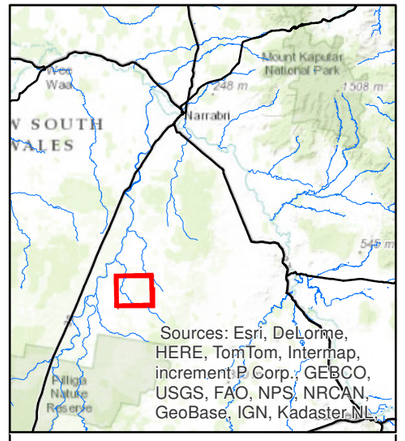
DEWHURST GAS EXPLORATION PROJECT PEMP

LOCATION MAP SITES 13 - 18

Santos



Legend

- Wells
- Cadastre Boundaries

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Projection: Transverse Mercator
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DEWHURST GAS EXPLORATION PROJECT PEMP

LOCATION MAP SITES 26-31

Santos

APPENDIX D PROJECT INCIDENT NOTIFICATION TABLE