Our ref: SD2303563
2025_017

Government of South Australia
Department for Energy and Mining

13 March 2025

**Environmental Impact Classification – Pursuant to Section 98 of the *Petroleum and Geothermal Energy Act 2000* – South Australia Cooper Basin Production and Processing Operations – Statement of Environmental Objectives, Santos, December 2024.**

In accordance with the transitional provisions under the *Energy Resources Act 2000* (the ER Act) and *Energy Resources Regulations 2013* (the ER Regulations), a statement of environmental objectives (SEO) that was developed prior to the commencement of the ER Act need only comply with the requirements of the previous Act; the *Petroleum and Geothermal Energy Act 2000*.

Pursuant to Section 98 of the *Petroleum and Geothermal Energy Act 2000* (the Act) the Minister must classify the regulated activities covered by a prepared Environmental Impact Report (EIR) as either of low, medium or high environmental impact.

The classification must be made on the basis of:

- The prepared EIR;
- Criteria established for classifying the level of environmental impact of regulated activities, a copy of which is found on the Department for Energy and Mining (DEM) web page:

  https://www.energymining.sa.gov.au/industry/energy-resources/regulation/environmental-register; and
- Comment received from relevant Government departments in accordance with established administrative arrangements between these departments and DEM.

This document summarises the classification made by DEM on the *South Australia Cooper Basin Production and Processing Operations – Statement of Environmental Objectives, Santos, December 2024.* This classification is based on information provided in the EIR prepared by Santos.

## ACTIVITY CLASSIFICATION SUMMARY

1. From an analysis of the potential environmental significance of the events and potential impacts associated with the proposed activities against the classification criteria referred to above (assessment provided as Attachment 1), these regulated activities have been classified as **low impact**.

2. Of 256 potential environmental events assessed, 244 were deemed to be of low potential environmental significance. This is due to the fact that appropriate management measures will be implemented to avoid or mitigate any potential environmental consequences.

## CONSULTATION

**Energy Regulation**

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1. For a low impact classification, DEM consults with the Department for Environment and Water (DEW) and the Environment Protection Authority (EPA) on the impact classification level in accordance with relevant administrative arrangement's dated 11 November 2005 and 8 November 2022 respectively.

2. Concurrence received from DEW and the EPA on 24 January and 19 February 2024, respectively, agreed with the classification of **low impact.**

3. In accordance with Section 101 of the Act, activities classified as low impact require DEM to undertake consultation with relevant government agencies. This consultation period was for at least 20 business days. Consultation was initiated on 20 February 2024 and closed on 20 March 2024.

4. Comments received from this consultation are tabled in Appendix C of the EIR, whereby all reasonable comments within scope need to be adequately addressed. DEM are satisfied that all comments raised during consultation have been adequately addressed.

   The Environmental Register can be accessed via the webpage at - https://www.energymining.sa.gov.au/industry/energy-resources/regulation/environmental-register#SEO

Pursuant to delegated powers, I classify this regulated activity as **low impact.**

Benjamin Zammit
**Executive Director**
**Regulation and Compliance Division**
**Department for Energy and Mining**
**Delegate of the Minister for Energy and Mining**

| Company: | Santos Limited | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Project: | Cooper Basin Petroleum Production Operations | | | | | | | | | | | | | | | | | |
| January 2024 | | | | PREDICTABILITY (L=Low, H=High) | | | | | | MANAGEABILITY | | | | | | | | |
| REF | TYPE OF IMPACT | EVENT(S) | POTENTIAL CONSEQUENCES | SIZE | SCOPE | DURATION | FREQUENCY | STAKEHOLDERS | SIGNIFICANCE | AVOIDANCE | PROBABILITY | DURATION | SIZE AND SCOPE | CUMULATIVE EFFECTS | STAKEHOLDERS | SIGNIFICANCE | ASSOCIATED INFORMATION | Environmental significance |
| | **Natural Environment Impacts** | | | | | | | | | | | | | | | | | |
| Section 5 | ***Soil Impacts*** | | | | | | | | | | | | | | | | Six major landforms are found in the Cooper Basin, these include Dunefields, Gibber plains, Floodplains, Salt lakes, Tablelands and Wetlands. The sensitivity of each system to disturbance depends on its basic characteristics including geology, landform, soils, hydrology, flora and fauna. The Cooper Basin dunefields are characterised by parallel dunes of red, yellow or white aeolian sands of the Simpson Sand (Drexel and Preiss 1995), dominated by single crested linear sand ridges. Dunes are separated by flat interdune corridors (swales), which usually consist of claypans (Twidale and Wopfner 1990, Santos 1997a). They range in height from 5 m to 35 m and trend approximately north-east (Twidale and Wopfner 1990). Sand cover rarely exceeds 30 m and a stony base may be exposed in interdune areas. Throughout Cooper Basin licence areas, there are vast expanses of flat to gently undulating gibber covered plains and downs such as the Sturt Stony Desert and the Innamincka or Wadi Wadi Dome (Santos 1997a). While gibber plains are generally considered to be a stable environment, disturbance or removal of the surface layer of stones (gibbers) and the exposure of clay soils can result in significant erosion by either wind or water. Even in gently sloping areas, water can gather enough force to cause erosion gullies in exposed soils (Santos 1997a). The Cooper Creek and Strzelecki floodplains consist of intricately braided channels, swamps and extensive outwash plains. Floodplain topography is relatively flat and consists of an extensive and extremely variable system of rivers and creeks (Blackley et al. 1996). Soils are characterised by deep, grey, self-mulching clays derived from fluvial mudstone and siltstone, and occasional fluvial sand and conglomerates in river and creek beds.Tableland areas are commonly known as dissected residuals or breakaways. They are characterised by a silcrete surface that has been eroded to form low but steep escarpments, mesas, buttes and extensive gibber covered footslopes (Santos 1997b). Tableland areas in the Cooper Basin include Wadi Wadi or Innamincka Dome, Mount Kingsmill and Kertietia Hill. The Basin is dotted with numerous salinas, or salt lakes and salt pans, of varying sizes (see Figure 13). In these lakes, excess evaporation in interior basins leads to the concentration of soluble salts as a surface crust. Despite its aridity, the Cooper Basin contains an array of wetlands. The Coongie Lakes and the Strzelecki wetland systems are included in the Directory of Nationally Important Wetlands – a database managed by the Australian Government's Department of the Environment. | |
| Table 7-15 | | Spills or leaks associated with chemical and fuel storage and handling | Contamination of soil | H | H | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Transportation, storage and handling of chemicals, fuels and oils in accordance with the Safety Data Sheet (SDS), Santos' SMS, and relevant standards and guidelines such as the EPA Bunding Guidelines and AS 1940. Regularly educate staff of product, review and monitor chemical and fuel transportation, including signage/labelling, proper packing and tie downs. Cover dry chemicals during transportation. Chemical and fuel storage procedures, including signage, are reviewed and monitored in audit process in accordance with relevant Santos standard. Removal of fuel or chemicals from site where inundation or flooding is a risk. Loss of containment is managed via the incident management system (IMS) and implementation of corrective actions is based on incident investigation. Appropriate emergency/spill response procedures for loss of containment. Fencing of affected areas if threat is posed to livestock or native fauna. Emergency response procedures are carried out in accordance with Regulation 31. | LOW |
| Table 7-3, Table 7-5 | | Flooding of surrounding floodplain/watercourses during construction, operation and decommissioning | Contamination of soil | H | L | H | H | L | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Work programs in floodplain areas scheduled to take into account seasonal conditions and rainfall/flood likelihood. Measures undertaken to reduce potential impacts of flooding where appropriate (e.g. installation of bunds, removal of contents prior to arrival of flood event via vacuum truck). Fully containerised tanks used for on-site storage. Planning of the installation of new satellite facilities addresses flood risk. Fuel, oil and chemical storage and handling in accordance with the Safety Data Sheet (SDS), Santos' SMS, EPA Bunding Guidelines and AS 1940. Regularly educate staff of product, review and monitor chemical and fuel storage, including signage/labelling, proper packing and tie downs. Loss of containment is managed via the incident management system (IMS) and implementation of corrective actions is based on incident investigation. Manage upstream facilities/assets to mitigate potential hazards at the satellite. Implementation of flood response management plan. Appropriate emergency response plans in place. Emergency spill response equipment on site. | LOW |
| Table 7-5 | | Loss of containment of hydrocarbons outside area designed to contain spills (pipe rupture, reliefs, fittings or leaks from plant or other sources) | Contamination of soil | H | H | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Plant and equipment designed and constructed in accordance with Santos SMS and Engineering Standards (e.g. SMS11.2 Facilities Design and Construction), and relevant Australian/International standards (e.g. AS 1210). To minimise the potential for failure and optimise plant longevity, Santos uses an Integrity Management Program (IMP). The IMP provides a systematic approach to plant operation and maintenance activities in conjunction with the application of appropriate standards to minimise risk to public and third party safety, and the environment. Fit for purpose equipment. Operated under Reliability and Maintenance Management System (RAMMS) framework, Asset Integrity Management System (AIMS) and SMS standard. Inline monitoring alarms, fusible loop system (in the event of a fire). Auto shutdown system. Identification of critical barriers and monitoring/maintenance using performance standards. Safety, testing, maintenance and inspection procedures are implemented. Personnel are trained to supervise and instruct individuals entering site to conduct work. Continued competency assessment, education and training of individuals responsible for activities associated with satellite facilities. Safe work permits must be obtained to ensure only individuals with proper clearance can conduct work on a lease. Hazardous area management criteria are followed. Restricted access to site. Loss of containment is managed via the incident management system (IMS) and implementation of corrective actions is based on incident investigation. Approvals planned to minimise hazardous situations, with controls in place to address risks. | LOW |
| Table 7-3 | | Loss of containment of gas, sludge or oil from pipeline | Contamination of soil | H | H | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Equipment design fit for purpose. All new Santos pipelines are designed, tested and constructed in general accordance with AS 2885 requirements to have sufficient strength, ductility and toughness to withstand design loads to which it may be subjected during cons truction, testing and operation. Installation of emergency isolation valves where required. Undertaking a Safety Management Study during the design process to address location and non-location specific threats and develop adequate controls to mitigate environmental and public/third party safety risk. Safety, testing, maintenance and inspection procedures are implemented according to the IMP. Prestart-up checklist prior to commissioning and decommissioning activities. Pipeline construction integrity verification e.g. hydrotest (records maintained). Supported above ground pipelines are inspected to minimise the potential for contact with surface soils as a result of sand/sand drift or failure of pipe supports. Adherence to Santos standards and implementation of management systems to monitor infrastructure. Santos safety checks, inspections and risk assessments. QA/QC checks prior to hydrocarbon introduction into pipe. Continued competency assessment, education and training of individuals responsible for activities associated with pipeline construction and operation. Personnel are trained to supervise and instruct individuals entering lease to conduct work. Safe work permits must be obtained to ensure only individuals with proper clearance can conduct work on a lease. Hazardous area management criteria are followed. Monitoring of weather conditions. Loss of containment is managed via the incident management system (IMS) and implementation of corrective actions is based on incident investigation. Pipeline HC removal (via pigging) prior to decommissioning. Regularly educate staff on emergency response procedures. Appropriate emergency response plans are in place. Annual review and exercise of response equipment and procedures to ensure preparedness. Emergency spill response equipment on site. Areas assessed for contamination and remediated where required on decommissioning. | LOW |
| Table 7-7 | | Improved/Enhanced Oil Recovery loss of well integrity, Breach/release of waters at surface | Contamination of soil and erosion | H | L | H | H | L | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Well design in accordance with the Drilling, Completions and Well Operations SEO, such as Aquifers isolated behind casing string(s) cemented in place, Casing string and cement slurry designed by qualified and competent engineers and confirmed by senior engineers or external consultants where necessary, Appropriately designed casing and wellhead installed on new wells drilled and retained for use use. Well drilling, completions, operations, integrity management and decommissioning in accordance with the requirements of the DCWO SEO, including Effective barriers exist to maintain well control and prevent crossflow between separate aquifer systems or hydrocarbon reservoirs outside of the target reservoirs, Operational reports verify that barriers have been set and or remedial cement work carried out in accordance with the work program as submitted to and or agreed by DEM, Cased hole cement bond lo gs to confirm quality of cement job in the casing strings, Well integrity management system and checks to confirm well integrity over well life, Where integrity monitoring identifies potential issues, a risk assessment to evaluate safety and environmental im pacts is undertaken to develop prevention and mitigation controls where appropriate appropriate. Regular production operator checks throughout well life life. Reporting and records of loss of well integrity events and corrective actions are in accordance with the requirements of the DCWO SEO. Continued competency assessment, education and training of individuals responsible for activities associated with EHR schemesschemes. Real time pressure monitoring on injection wells and pressure relief valve on the high pressure EHR pump/compression system. In the event of an environmental incident resulting from a loss of well integrity, SMS requirements will be implemented as outlined in the DCWO SEO. | LOW |
| Table 7-8 | | Loss of containment of oily sludge during collection, transfer/transport and treatment (on-site) | Contamination of soil | H | H | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Oil sludge, which is collected from tank bottoms, sumps and interceptor ponds, is managed at the sludge treatment plant. Pits are lined in accordance with applicable standards of the day. Sludge treatment plant is a purpose built and fully contained facility. Operated under Reliability and Maintenance Management System (RAMMS) framework, Asset Integrity Management System (AIMS) and SMS standards. Sludge cake removed and treated off-site through licensed waste transport contractors. Adherence to EPA guidelines (WTC) processes. Minimum freeboard maintained in storage ponds. Continued competency assessment, education and training of individuals responsible for activities associated with operation of Moomba Gas Plant. Loss of containment is managed via the incident management system (IMS) and implementation of corrective actions is based on incident investigation. Safe work permits must be obtained to ensure only individuals with proper clearance can conduct work. Implementation of emergency response procedures and appropriate emergency response plans in place.Emergency spill response equipment maintained and tested on site. | LOW |
| Table 7-8 | | Loss of containment of Moomba Plant oil/oily water or sour water (west flow) including Moomba North, LRP, PFW, RGCP/Benfield Trains | Contamination of soil | H | H | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Equipment design fit for purpose. Ponds are lined in accordance with applicable standards. Interceptor ponds skimmed.  Regular operator checks, inspection and maintenance. Minimum freeboard maintained in storage ponds. Integrity management plans implemented for below and above ground pipelines. Monitoring (and response to) upstream and downstream activities, and response, that might cause overflow. Continued competency assessment, education and training of individuals responsible for activities associated with operation of Moomba Plant. Safe work permits must be obtained to ensure only individuals with proper clearance can conduct work. Loss of containment is managed via the incident management system (IMS) and implementation of corrective actions is based on incident investigation. Level alarms in sumps provide real time monitoring to inform incident response. Implementation of spill response procedures, which include immediate reporting of spills/leaks. Emergency spill response equipment maintained and tested on site. | LOW |

| REF | TYPE OF IMPACT | EVENT(S) | POTENTIAL CONSEQUENCES | SIZE | SCOPE | DURATION | FREQUENCY | STAKEHOLDERS | SIGNIFICANCE | AVOIDANCE | PROBABILITY | DURATION | SIZE AND SCOPE | CUMULATIVE EFFECTS | STAKEHOLDERS | SIGNIFICANCE | ASSOCIATED INFORMATION | Environmental significance |
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| Table 7-8 | | Loss of containment associated with storage of oil and tank farm and road tankers | Contamination of soil | H | H | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Equipment design fit for purpose. Plant and equipment designed and constructed in accordance with Santos SMS and Engineering Standards (e.g. SMS11.2 Facilities Design and Construction), and relevant Australian/International standards (e.g. AS 1210). Instrumentation, high-level alarms and controls incorporated into tank design. Floating roof storage tanks individually bunded in accordance with relevant guidelines e.g. EPA Bunding Guidelines. Truck load-in area designed with sumps and pumps. Operated under Reliability and Maintenance Management System (RAMMS) framework, Asset Integrity Management System (AIMS) and SMS standards. Operator checks and monitoring. Internal and external inspections of tanks as per applicable standards and industry guidelines. Continued competency assessment, education and training of individuals responsible for activities associated with operation of Moomba Plant. Safe work permits must be obtained to ensure only individuals with proper clearance can conduct work. Loss of containment is managed via the incident management system (IMS) and implementation of corrective actions is based on incident investigation. Emergency response procedures are implemented in accordance with Regulation 31. Implementation of spill response procedures, which include immediate reporting of spills/leaks. Emergency spill response equipment maintained and tested on site | LOW |
| Table 7-8 | | Loss of containment associated with operation of the Crude Stabilisation Plant | Contamination of soil | H | H | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Equipment design fit for purpose. Plant and equipment designed and constructed in accordance with Santos SMS and Engineering Standards (e.g. SMS11.2 Facilities Design and Construction), and relevant Australian/International standards (e.g. AS 1210). Concrete pad and closed drainage system. Operated under Reliability and Maintenance Management System (RAMMS) framework, Asset Integrity Management System (AIMS) and SMS standards. Operator checks and monitoring. Internal and external inspections of tanks as per applicable standards and industry guidelines. Continued competency assessment, education and training of individuals responsible for activities associated with operation of Moomba Plant. Safe work permits must be obtained to ensure only individuals with proper clearance can conduct work. Loss of containment is managed via the incident management system (IMS) and implementation of corrective actions is based on incident investigation. Emergency response procedures are implemented in accordance with Regulation 31. Implementation of spill response procedures, which include immediate reporting of spills/leaks. Emergency spill response equipment maintained and tested on site | LOW |
| Table 7-8 | | Loss of containment and inappropriate management of Moomba waste streams and wastewaters (sour water east flow) | Contamination of soil | H | H | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Approximately 2000 $m^3$/day of sour water is transferred to an engineered waste lagoon referred to as 'Lake Brooks'. Data from 2013 showed that sour water had a high salinity and elevated levels of aluminium and boron that can affect native fauna and native vegetation. Studies are undertaken to investigate wastewater management options for the Moomba Gas Plant to identify modifications that could be implemented based on operational requirements and constraints. Implementation of Wastewater Management Plan. Licenced contractors and waste trucks contracted; and applicable WTCs completed in accordance with regulations, as required. Loss of containment is managed via the incident management system (IMS) and implementation of corrective actions is based on incident investigation Response. Loss of containment is reported and investigated. Emergency response procedures are implemented and emergency spill response equipment maintained and tested on site | LOW |
| Table 7-8 | | Explosion, fire or flood event at Moomba Facility | Contamination of soil | H | L | L | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Equipment design fit for purpose. Safety Case assessment and review undertaken every 5 years validating risk management systems, and identification and management of critical barriers through the relevant risk assessment/management process. Safety, testing, maintenance and inspection procedures are implemented. Continued competency assessment, education and training of individuals responsible for activities associated with operation of Moomba Plant. Safe Work Permit system implemented to ensure only individuals with proper clearance can conduct work on inside Moomba Plant. Hazardous area management criteria are continuously reviewed according to relevant Australian Standards and legislative requirements. Operated under Reliability and Maintenance Management System (RAMMS) framework, Asset Integrity Management System (AIMS) and SMS standards. Emergency response procedures are implemented in accordance with Regulation 31. Implementation of spill response procedures, which include immediate reporting of spills/leaks. Emergency spill response equipment maintained and tested on site. | LOW |
| 4.5.3, Table 7-6 | | Storage and disposal of PFW at production facilities | Contamination and/or salinisation of soil | H | L | H | H | H | 1 | No | Medium | Long | Confined | Yes | No | 3 | PFW facilities are designed and constructed in accordance with the relevant standards of the day (e.g. EPA Wastewater Lagoon Construction Guidelines) and may include use of synthetic and/or clay liners. PFW pond systems design, includes detailed planning and consideration of flood risks, proximity to floodplains, waterways and other sensitive receptors. As per standard day-to-day operations, routine inspection of hose lines, connections, high pressure equipment and trip systems are undertaken to identify operational faults and ensure design limits are not compromised during operation. Where required, emergency shutdown systems are installed to prevent uncontrolled releases. Water Quality Monitoring as required. Pond skimming and hydrocarbon recovery. Seepage monitoring (visual or physical i.e. soil sampling). Pond level/capacity monitoring. Pond systems are designed in such a way that concentration of Total Recoverable Hydrocarbons (TRH) in the final-stage pond of any PFW pond system should not exceed: • 30 mg/L in an engineered evaporation pond; or • 10 mg/L in a free-form evaporation pond. | MED |
| 4.5.3, Table 7-6 | | Secondary use of PFW associated with production facility | Contamination and/or salinisation of soil | H | H | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Relevant external approvals obtained where required. Liaise with landowners where required. Reuse is managed in accordance with relevant water quality criteria (e.g. Australian Water Quality Guidelines for Fresh and Marine Waters (ANZECC 2000)) and risk assessment outcomes. Risk to sensitive receptors is minimised by implementation of Santos standards and internal approvals processes. | LOW |
| Table 7-7 | | Loss of containmant of Improved/Enhanced Oil Recovery reinjection water (PFW water containing chemicals including biocide) | Contamination of soil | H | H | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Plant and equipment designed and constructed in accordance with Santos SMS and Engineering Standards (e.g. SMS11.2 Facilities Design and Construction), and relevant Australian/International standards (e.g. AS 2885). Injection surface infrastructure (pumps, flowlines, filtration, chemical dosing facilities) equipped with automatic overpressure shut downs and telemetry monitoring. Quality control of pond construction including above ground earthen bunds to prevent surface water ingress. Ponds designed with liners, as required. Equipment designed and operated in accordance with relevant standards and guidelines. Injection fluid is transferred lines that are rated and tested to meet project requirements. Injection surface infrastructure equipped with shut downs and injection monitoring. Makeup water stored in designated ponds. Maintain minimum pond freeboard. Regular inspection and maintenance of pond walls. Transfer lines tested and maintained to design conditions. Pipeline monitored for leaks (pressure gauges and visual inspection) as per Santos standards. Tracers (if used) are added to the fluid injection well under controlled conditions by specialist contractors in a sealed/closed system Loss of containment is managed via the incident management system (IMS) and implementation of corrective actions is based on incident investigation. | LOW |
| | | | Soil erosion/Scouring | H | H | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | | LOW |
| Table 7-5 | | Management of hydrotest water or water used for flushing pipelines/equipment, pigging or cleaning | Contamination of soil | H | H | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | During pipeline commissioning, there is a potential for hydrotest water that may contain biocides and/or corrosion inhibitors to be released to grade resulting in localised soil and/or shallow groundwater resource contamination. Hydrostatic test water, free of chemical additives and sourced from water bores (not of PFW make-up), may be released to ground adjacent to the construction area, provided it meets discharge guidelines (e.g. ANZECC). Hydrotest water, that contains additives, is released to existing lined evaporation ponds (generally PFW facilities) or to specifically constructed ponds sited to prevent impacts to surface or shallow groundwater. Use of biocides and corrosion inhibitor chemicals are kept to a minimum and where practicable biocides which degrade rapidly when exposed to UV are used. Management of water which contains biocide, other chemicals or hydrocarbons may be into existing lined and fenced evaporation ponds, or to satellite facility pond systems sited to prevent the contamination of surface or near surface waters. Preferential use of satellite pond water, where possible. | LOW |
| Table 7-11 | | Storage and transport of general waste | Contamination of soil | H | H | H | H | H | 1 | Yes | N/A | N/A | N/A | N/A | N/A | 1 | Designed and engineered facilities in accordance with EPA requirements. Application of the waste hierarchy system (avoid, reduce, reuse, recycle, treat, dispose). Waste management is undertaken in accordance with applicable regulatory requirements and licences. Compliance with EPA licence conditions and requirements of the Environment Protection Act 1993 and relevant regulations. Periodic auditing of waste management facilities for compliance against licence and regulatory requirements. Waste streams are segregated on site where appropriate to maximise opportunities for waste recovery, reuse and recycling. Covered bins are provided for the collection and storage of wastes. Rubbish loads are covered during transport to a licensed waste facility. Waste Management Plan. Landfill Environmental Management Plan. Landfarm Management Plans. Inspections, monitoring and maintenance of facilities. | LOW |
| Table 7-11 | | Sewage treatment and effluent management | Contamination of soil | H | H | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Equipment design fit for purpose. Use of permanent septic systems with long term camps where possible. Secondary treated sewage wastewater is disposed of onto land well away from any place from which it is reasonably likely to enter any waters, and to minimise spray drift and ponding. Wastewater Management Plan. Periodic auditing of wastewater management facilities for compliance again licence and regulatory requirements. Department of Health and Ageing approved transportable aerated wastewater treatment plants for temporary purposes, such as camps. Wastewater (sewage and grey water) disposal where possible in accordance with the South Australian Public Health (Wastewater) Regulations 2013 and/or in consultation with the Department for Health and Ageing and/or in accordance with licenses/permits, if any. Appropriate controls for management of sewage effluent (developed in consultation with Department for Health and Ageing) implemented for situations where excursions outside effluent quality guidelines may occur (e.g. startup or system upset). Inspections, monitoring and maintenance of facilities. | LOW |
| Table 7-11 | | Management of contaminated soil | Contamination of soil | H | H | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Suitably designed and engineered facility in accordance with EPA guidelines. Compliance with EPA licence conditions and regulatory requirements. Development and implementation of Landfarm Management Plan, which documents operational controls, management practices and Santos standards. | LOW |
| Table 7-11 | | Management of hazardous materials (chemicals, asbestos) | Contamination of soil | H | H | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Designed and engineered containment facilities. Application of the waste hierarchy system (avoid, reduce, reuse, recycle, treat, dispose). Compliance to requirements of EPA licence conditions and requirements of the Environment Protection Act 1993 and relevant regulations. Waste streams are segregated on site where appropriate to maximise opportunities for waste recovery, reuse and recycling. Waste Management Plan. Landfill Environmental Management Plan. Disposal of asbestos containing material in accordance with the Work Health and Safety Act 2012 and the Work Health and Safety Regulations 2012. Inspection and maintenance of facilities. Transportation of chemicals, fuels and oils in accordance with the Safety Data Sheet (SDS), Santos' SMS, and relevant guidelines such as the ADG Code. Regularly educate staff of product, review and monitor chemical and fuel transportation, including signage/labelling, proper packing and tie downs. WTC documentation, use of licenced contractors. Loss of containment is managed via the incident management system (IMS) and implementation of corrective actions is based on incident investigation. SDSs available. Appropriate emergency response plans in place and emergency spill response equipment on site. | LOW |

| REF | TYPE OF IMPACT | EVENT(S) | POTENTIAL CONSEQUENCES | SIZE | SCOPE | DURATION | FREQUENCY | STAKEHOLDERS | SIGNIFICANCE | AVOIDANCE | PROBABILITY | DURATION | SIZE AND SCOPE | CUMULATIVE EFFECTS | STAKEHOLDERS | SIGNIFICANCE | ASSOCIATED INFORMATION | Environmental significance |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Table 7-12 | | Spills or leaks associated with the storage and/or transportation of water for operational use | Salinisation or contamination of soil | H | H | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Equipment design fit for purpose. Turkey's nests are designed and constructed to minimise loss of water to seepage. Appropriate water source used based on operational requirements and minimisation of pumping distances. Selection criteria for contracting company and personnel. Testing, maintenance and inspection procedures are implemented. Loss of containment is managed via the incident management system (IMS) and implementation of corrective actions is based on incident investigation | LOW |
| Table 7-13 | | Inappropriate management of waste/wastewater from steam supply process | Contamination of soil | H | H | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Equipment design fit for purpose. Boiler blowdown water is managed via a system of interceptor and evaporation ponds. Application of the waste hierarchy system (avoid, reduce, reuse, recycle, treat, dispose). Storage and handling of chemicals, fuels and oils in accordance with the Safety Data Sheet (SDS), Santos' SMS, EPA Bunding Guidelines and AS 1940. Compliance to applicable licence and regulatory requirements. Waste streams are segregated on site where appropriate to maximise opportunities for waste recovery, reuse and recycling. Covered bins are provided for the collection and storage of wastes. Rubbish loads are covered during transport to a licensed waste facility. Wastewater Management Plan | LOW |
| Table 7-14 | | Loss of containment of diesel used for power generation and airport refuelling | Contamination of soil | H | H | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Storage of chemicals, fuels and oils in accordance with the Safety Data Sheet (SDS), Santos' SMS, EPA Bunding Guidelines and AS 1940. Chemical management practices with appropriate labelling. Licensed delivery service. Inspections and maintenance. Regularly educate staff of product, review and monitor chemical and fuel transportation, including signage/labelling, proper packing and tie downs. Loss of containment is managed via the incident management system (IMS) and implementation of corrective actions is based on incident investigation. | LOW |
| Table 7-16 | | Site conditions causing an accident at the airport | Contamination of soil | H | H | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Foreign object debris (FOD) fencing designed and implemented. Airline provider has applicable licenses, registrations and safe track record. Airport is operated in accordance with Civil Aviation Safety Authority (CASA) standards. Jet A-1 fuel supply and storage meets industry standards. Restricted access to the airport and aerodrome. Management of vegetation and surface water ponding adjacent to the airport to minimise attraction of wildlife (e.g. Black Kites). Covered bins are provided for the collection and storage of wastes to minimise attraction of wildlife. Emergency response plans are in place for aircraft incidents. Implementation of emergency/spill response procedures | LOW |
| Table 7-17 | | Loss of containment of fuel and/or chemical at fire training ground | Contamination of soil | H | H | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Runoff from the site is directed to a lined interceptor pit. Fire training ground is located in a fenced compound. Handling and storage of chemicals, fuels and oils in accordance with the Safety Data Sheet (SDS), Santos' SMS, and relevant standards and guidelines such as EPA Bunding Guidelines and AS 1940. Regularly educate staff of product, review and monitor chemical and fuel transportation, including signage/labelling, proper packing and tie downs. Loss of containment is managed via the incident management system (IMS) and implementation of corrective actions is based on incident investigation. Spill kits available on site. | LOW |
| Table 7-17 | | Loss of containment or inappropriate management of waste and wastewaters at fire training ground | Contamination of soil | H | H | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Application of the waste hierarchy system (avoid, reduce, reuse, recycle, treatment, disposal). Covered bins and prompt collection of waste. Wastes generated as part of site/aircraft maintenance/repairs are managed in accordance with WMP and regulatory requirements. Inspection and maintenance of facilities. | LOW |
| Table 7-17 | | Explosion or uncontrolled fire at fire training ground | Contamination of soil | H | H | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | No smoking or safe smoking areas away from equipment or activity. Personnel are trained to supervise and instruct individuals entering area to conduct work. Safe work permits must be obtained to ensure only individuals with proper clearance can conduct works. Implementation of appropriate emergency/spill response procedures for explosion or fire. Safety, testing, maintenance and inspection procedures are implemented | LOW |
| Table 7-3, Table 7-5, Table 7-10 | | Vegetation clearing for construction and maintenance activities | Erosion | H | H | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Minimise vegetation disturbance, and plan construction to avoid areas of sensitive vegetation. Use existing routes/disturbed ground where practicable. Sensitive environments and Ramsar sites are considered during route selection. Avoid important or 'priority' native vegetation where possible. Undertaking a Safety Management Study during the design process to address location and non-location specific threats and develop adequate controls to mitigate environmental and public/third party safety risk. Use of Santos systems for vegetation clearance approvals, which triggers further assessment where required. Prior to greenfield disturbance, or subsequent re-disturbance, a Santos Environmental Adviser and/or ecologist undertakes an environmental assessment in accordance with the relevant Santos standards, the SEO and recommendations based on field inspections, which includes a site inspection for potential sensitive receptors. Relevant internal and external approvals in place before work undertaken. Implementation of the Environmental Sensitivity Profile (ESP) tool to assess proposed pipeline routes for rare, vulnerable and endangered flora and fauna species before the commencement of construction and implement appropriate avoidance or mitigation measures. Stockpile and clear vegetation and respread following construction works to facilitate revegetation. Where possible trim vegetation rather than clearing. Unauthorised off-road or off-lease driving or creation of shortcuts is unacceptable. | LOW |
| Table 7-3, Table 7-5 | | Earthworks, including grading, trenching, backfilling, reinstating and stockpiling for pipeline and facility construction, operation and decommissioning activities | Soil erosion | H | H | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Relevant internal and external approvals in place before work undertaken. Locate facilities to avoid areas subject to inundation as far as possible. Use existing disturbed areas where practicable. Consider alternate locations and construction methods during construction phase planning and scouting to minimise environmental impacts. Off road or off lease driving or creation of shortcuts is prohibited. Sensitive gibber terrain is protected through appropriate site selection and construction practices which include selecting locations that avoid sloping land is preferable (to minimise the requirements for large cut and fill or importation of borrow material to level the site), constructing erosion control measures where appropriate (i.e. diversion banks or berms), rolling of gibber terrain, is preferable, where possible. Construction activities are not carried out on salt lakes. First disturbances (such as location scouting) are undertaken in accordance with Santos standards. Management of sensitive areas (e.g. sloped areas or gibber) is detailed in scope of works, approval documents and company procedures. Erosion is controlled by appropriate placement, batter slopes and construction of water flow diversion banks. Reinstate construction areas as soon as practicable. Rip areas of compacted soil (except on gibber plains and tableland environments). Respread topsoil and stockpiled vegetation. Total or partial restoration of borrow pits as soon as practicablecticable. Restore natural contours to minimise impacts to natural drainage patterns. Where possible trim vegetation rather than clear. Assets decommissioning to be in accordance with SMS, which defines minimum mandatory requirements for the planning and management of asset decommissioning. | LOW |
| | | | Inversion of soil profile | H | H | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | | LOW |
| | | | Soil compaction of the easement | H | H | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | | LOW |
| Table 7-5, Table 7-10 | | Movement of heavy machinery and vehicles for pipeline and facility construction, operation and decommissioning activities | Soil compaction | H | H | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Rip areas of compacted soils (except on gibber and tableland environments) where required. Minimise the creation of new access tracks. Undertaking a Safety Management Study during the design process to address location and non-location specific threats and develop adequate controls to mitigate environmental and public/third party safety risk. Driving on designated areas only (i.e. lease and access tracks). Unauthorised off-road or off-lease driving or creation of shortcuts is unacceptable. Where areas of sensitive vegetation are identified they will be flagged and signposted to indicate restricted access applies. Communication of heavy vehicle movement and other potential hazards to safety associated with operations to potentially affected parties prior to commencement of operations. Erosion control measures in place, where appropriate. Construction activity not undertaken during flood warning period. | LOW |
| | | | Erosion | H | H | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | | LOW |
| Table 7-3, Table 7-5 | | Flooding fo surrounding floodplain/watercourses during construction, operation and decommissioning | Erosion | H | L | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | PFW pond systems design, which includes detailed planning and consideration of flood risks, proximity to floodplains, waterways and other sensitive receptors. Measures undertaken to reduce potential impacts of flooding where appropriate (e.g. installation of bunds, removal of contents prior to arrival of flood event, maintain a minimum freeboard in ponds). Monitoring and communicating Cooper Basin Flood Reports, when available. Erosion control measures in place, where appropriate. Nodal compressors are typically located in dry environments. Works programs in floodplain areas scheduled to take into account seasonal conditions and rainfall/flood likelihood. Construction activity not undertaken during flood warning period. | LOW |
| Table 7-10 | | Road construction earthworks | Erosion | H | H | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Relevant internal and external approvals in place before work undertaken. Consider alternate routes, locations and construction methods during planning and scouting phase to minimise environmental impacts. Use existing routes/disturbed areas where practicable. Off-road or off-lease driving or creation of shortcuts is prohibited. Sensitive gibber terrain is protected through appropriate construction and maintenance practices which include - selecting routes that avoid sloping land is preferable (to minimise the requirements for large cut and fill or importation of borrow material to level the site) - constructing erosion control measures where appropriate (i.e. diversion banks or berms) - rolling of gibber terrain, is preferable, where possible - avoiding environmentally sensitive and restricted areas, such as important native vegetation and fauna habitat, where possible. Construction activities are not carried out on salt lakes. First disturbances (such as location scouting) are undertaken in accordance with Santos standards. Management of sensitive areas (e.g. sloped areas or gibber) is detailed in scope of works, approval documents and company procedures. Erosion is controlled by appropriate placement, batter slopes and construction of water flow diversion banks. The location of new borrow pits considers: minimisation of impacts to the environment (e.g. native vegetation and landforms), minimising water retention, avoidance of sites of cultural and heritage significance, stakeholder engagement to minimise impact to third party operations, minimisation of visual impacts from construction activities by using native vegetation and landforms for screening, maintenance of applicable clearance distances between borrow pits and infrastructure (e.g. facilities, fences, homesteads, roads and airstrips) to minimise risk associated with livestock, safety, erosion, and visual impacts. Reinstate construction areas as soon as practicable. Rip areas of compacted soil (except on gibber plains and tableland environments). Respread topsoil and stockpiled vegetation. Total or partial restoration of borrow pits as soon as practicable. Restore natural contours to minimise impacts to natural drainage patterns. | LOW |
| | | | Inversion of soil profile | H | H | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | | LOW |
| | | | Soil compaction | H | H | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | | LOW |
| Table 7-10 | | Movement of heavy machinery and vehicles for road construction and maintenance | Erosion | H | H | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Driving on designated areas only (i.e. lease and access tracks). Unauthorised off-road or off-lease driving or creation of shortcuts is avoided. Rip areas of compacted soils (except on gibber and tableland environments). Inductions. | LOW |
| | | | Soil Compaction | H | H | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | | LOW |
| Table 7-4 | | Direct Air Capture – waste disposal | Contamination to soil or waterways during disposal | H | L | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | CO 2 Capture material waste disposal organised with waste disposal groups, Amine based disposal systems well established, Post trial CSIRO will collect and handle the Capture material | LOW |

| REF | TYPE OF IMPACT | EVENT(S) | POTENTIAL CONSEQUENCES | SIZE | SCOPE | DURATION | FREQUENCY | STAKEHOLDERS | SIGNIFICANCE | AVOIDANCE | PROBABILITY | DURATION | SIZE AND SCOPE | CUMULATIVE EFFECTS | STAKEHOLDERS | SIGNIFICANCE | ASSOCIATED INFORMATION | Environmental significance |
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| Section 5 | Surface Water and Groundwater Impacts | | | | | | | | | | | | | | | | The Cooper Creek floodplain is a major feature of the South Australian section of the Cooper Basin. It covers the central third of the basin and includes the Coongie Lakes system to the north and the Strzelecki Creek floodplain that feeds Lake Blanche in the south (see Figure 13).The Cooper Creek originates in the moister catchments of south-west Queensland and channels water through the Basin to Lake Eyre. It has the hydrologic character of an unregulated arid zone river with an extremely variable flow regime and, although it flows every year, several months often pass without flow (Puckridge et al. 1999). The Cooper Creek floodplain occurs in close association with the dunefields of the Basin. The dunefields are extremely arid and lack any permanent surface water. Groundwater can be found at shallow depths in dunefield areas adjacent to major watercourses (for example the Strzelecki and Cooper creeks). Despite its aridity, the Cooper Basin contains an array of wetlands. The Coongie Lakes and the Strzelecki wetland systems are included in the Directory of Nationally Important Wetlands. The Coongie Lake system is also listed under the Ramsar Convention as a Wetland of International Importance in recognition of its important role in providing refuge for the conservation of migratory and nomadic birds (Morton et al.1995; Blackley et al. 1996). It covers the floodplain, lake and channel system of the upper Cooper Creek in South Australia, as well as large areas of dunefield with no hydrological connection to Coongie Lakes or the Cooper Creek. Wetlands may be perennial or ephemeral and are considered to contain water more often, or be subjected to more frequent inundation, than surrounding areas of floodplain (Santos 1997a). The Cooper Creek intermittently discharges into a vast area of swamps, lakes and overflows (Morton et al. 1995). Most wetlands in the Basin receive flows from this system which carries floodwaters throughout the basin and occasionally, during major flooding events, to Lake Eyre. Wetlands are also filled intermittently by heavy rainfall. Flooding is considered to be the most crucial factor in the recharge of many wetlands in the Basin. Salt lakes are predominantly dry, but are occasionally filled by floodwaters from the major river systems. During flooding, water may remain fresh and can support abundant fish populations. Lakes become increasingly saline as they dry. The frequency of flooding and inundation is highly variable. Permanent surface water is scarce in elevated areas of tablelands. Minor drainage channels occur in lowland plains and can contain permanent waterholes. Temporary surface water can also be found lying in pools after rain in lowland plain areas. Permanent surface water sources are generally lacking, but temporary pools of water often form after rain in low depressions or gilgai. Minor drainage channels occur throughout lowland plain areas. Within the Eromanga Basin, aquifers include the Eyre Formation of the Lake Eyre Basin, some parts of the Winton, Coorikiana, Cadna-owie, Murta, Birkhead formations, and large parts of the Mackunda, Namur, Adori, Hutton, Poolowanna and Cuddapan formations. In the Cooper Basin, parts of the Nappamerri, Toolachee, Daralingie, Epsilon, Patchawarra and Merrimelia formations, and all of the Tirrawarra Sandstone, may act as aquifers. The Patchawarra, Epsilon and Toolachee are composed of sandstone-shale-coal cycles each of which contain potential aquifer/reservoir systems and a seal or aquitard. In these systems, trapping of gas indicates that most of the aquitards are seals and the formations as a whole act as seals, for example, the entire Murteree Shale and Roseneath Shale are seals. The Nappamerri Formation, which overlies the coal measures, is a regional seal to the gas sands of the Cooper Basin, except around the eastern, southern and western margins of the Cooper where it has been eroded. As a seal, it prevents the vertical movement of gas and oil, diverting the hydrocarbons laterally until they reach the eroded edge of the Nappamerri, where the hydrocarbons can resume their vertical movement. | |
| Table 7-15 | | Spills or leaks associated with chemical and fuel storage and handling | Contamination of surface water or shallow groundwater resources | H | L | H | L | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Transportation, storage and handling of chemicals, fuels and oils in accordance with the Safety Data Sheet (SDS), Santos' SMS, and relevant standards and guidelines such as the EPA Bunding Guidelines and AS 1940. Regularly educate staff of product, review and monitor chemical and fuel transportation, including signage/labelling, proper packing and tie downs. Cover dry chemicals during transportation. Chemical and fuel storage procedures, including signage, are reviewed and monitored in audit process in accordance with relevant Santos standard. Removal of fuel or chemicals from site where inundation or flooding is a risk. Loss of containment is managed via the incident management system (IMS) and implementation of corrective actions is based on incident investigation. Appropriate emergency/spill response procedures for loss of containment. Fencing of affected areas if threat is posed to livestock or native fauna. Emergency response procedures are carried out in accordance with Regulation 31. | LOW |
| Table 7-3, Table 7-5 | | Flooding fo surrounding floodplain/watercourses during construction, operation and decommissioning | Contamination of surface water or shallow groundwater resources | H | L | H | H | L | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Work programs in floodplain areas scheduled to take into account seasonal conditions and rainfall/flood likelihood. Measures undertaken to reduce potential impacts of flooding where appropriate (e.g. installation of bunds, removal of contents prior to arrival of flood event via vacuum truck). Fully containerised tanks used for on-site storage. Planning of the installation of new satellite facilities addresses flood risk. Fuel, oil and chemical storage and handling in accordance with the Safety Data Sheet (SDS), Santos' SMS, EPA Bunding Guidelines and AS 1940. Regularly educate staff of product, review and monitor chemical and fuel storage, including signage/labelling, proper packing and tie downs. Loss of containment is managed via the incident management system (IMS) and implementation of corrective actions is based on incident investigation. Manage upstream facilities/assets to mitigate potential hazards at the satellite. Implementation of flood response management plan. Appropriate emergency response plans in place. Emergency spill response equipment on site. | LOW |
| Table 7-5 | | Loss of containment of hydrocarbons outside area designed to contain spills (pipe rupture, reliefs, fittings or leaks from plant or other sources) | Contamination of surface water or shallow groundwater resources | H | L | H | H | L | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Plant and equipment designed and constructed in accordance with Santos SMS and Engineering Standards (e.g. SMS11.2 Facilities Design and Construction), and relevant Australian/International standards (e.g. AS 1210). To minimise the potential for failure and optimise plant longevity, Santos uses an Integrity Management Program (IMP). The IMP provides a systematic approach to plant operation and maintenance activities in conjunction with the application of appropriate standards to minimise risk to public and third party safety, and the environment. Fit for purpose equipment. Operated under Reliability and Maintenance Management System (RAMMS) framework, Asset Integrity Management System (AIMS) and SMS standard. Inline monitoring alarms, fusible loop system (in the event of a fire). Auto shutdown system. Identification of critical barriers and monitoring/maintenance using performance standards. Safety, testing, maintenance and inspection procedures are implemented. Personnel are trained to supervise and instruct individuals entering site to conduct work. Continued competency assessment, education and training of individuals responsible for activities associated with satellite facilities. Safe work permits must be obtained to ensure only individuals with proper clearance can conduct work on a lease. Hazardous area management criteria are followed. Restricted access to site. Loss of containment is managed via the incident management system (IMS) and implementation of corrective actions is based on incident investigation. Approvals planned to minimise hazardous situations, with controls in place to address risks. | LOW |
| Table 7-3 | | Loss of containment of gas, sludge or oil from pipeline | Contamination of surface water or shallow groundwater resources | H | L | H | H | L | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Equipment design fit for purpose. All new Santos pipelines are designed, tested and constructed in general accordance with AS 2885 requirements to have sufficient strength, ductility and toughness to withstand design loads to which it may be subjected during cons truction, testing and operation. Installation of emergency isolation valves where required. Undertaking a Safety Management Study during the design process to address location and non-location specific threats and develop adequate controls to mitigate environmental and public/third party safety risk. Safety, testing, maintenance and inspection procedures are implemented according to the IMP. Prestart-up checklist prior to commissioning and decommissioning activities. Pipeline construction integrity verification e.g. hydrotest (records maintained). Supported above ground pipelines are inspected to minimise the potential for contact with surface soils as a result of sand/sand drift or failure of pipe supports. Adherence to Santos standards and implementation of management systems to monitor infrastructure. Santos safety checks, inspections and risk assessments. QA/QC checks prior to hydrocarbon introduction into pipe. Continued competency assessment, education and training of individuals responsible for activities associated with pipeline construction and operation. Personnel are trained to supervise and instruct individuals entering lease to conduct work. Safe work permits must be obtained to ensure only individuals with proper clearance can conduct work on a lease. Hazardous area management criteria are followed. Monitoring of weather conditions. Loss of containment is managed via the incident management system (IMS) and implementation of corrective actions is based on incident investigation. Pipeline HC removal (via pigging) prior to decommissioning. Regularly educate staff on emergency response procedures. Appropriate emergency response plans are in place. Annual review and exercise of response equipment and procedures to ensure preparedness. Emergency spill response equipment on site. Areas assessed for contamination and remediated where required on decommissioning. | LOW |
| Table 7-8 | | Loss of containment of oily sludge during collection, transfer/transport and treatment (on-site) | Contamination of shallow groundwater resources | H | L | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Oil sludge, which is collected from tank bottoms, sumps and interceptor ponds, is managed at the sludge treatment plant. Pits are lined in accordance with applicable standards of the day. Sludge treatment plant is a purpose built and fully contained facility. Operated under Reliability and Maintenance Management System (RAMMS) framework, Asset Integrity Management System (AIMS) and SMS standards. Sludge cake removed and treated off-site through licensed waste transport contractors. Adherence to EPA guidelines (WTC) processes. Minimum freeboard maintained in storage ponds. Continued competency assessment, education and training of individuals responsible for activities associated with operation of Moomba Gas Plant. Loss of containment is managed via the incident management system (IMS) and implementation of corrective actions is based on incident investigation. Safe work permits must be obtained to ensure only individuals with proper clearance can conduct work. Implementation of emergency response procedures and appropriate emergency response plans in place.Emergency spill response equipment maintained and tested on site. | LOW |
| Table 7-8 | | Loss of containment of Moomba Plant oil/oily water or sour water (west flow) including Moomba North, LRP, PFW, RGCP/Benfield Trains | Contamination of shallow groundwater resources | H | L | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Equipment design fit for purpose. Ponds are lined in accordance with applicable standards. Interceptor ponds skimmed. ? Regular operator checks, inspection and maintenance. Minimum freeboard maintained in storage ponds. Integrity management plans implemented for below and above ground pipelines. Monitoring (and response to) upstream and downstream activities, and response, that might cause overflow. Continued competency assessment, education and training of individuals responsible for activities associated with operation of Moomba Plant. Safe work permits must be obtained to ensure only individuals with proper clearance can conduct work. Loss of containment is managed via the incident management system (IMS) and implementation of corrective actions is based on incident investigation. Level alarms in sumps provide real time monitoring to inform incident response. Implementation of spill response procedures, which include immediate reporting of spills/leaks. Emergency spill response equipment maintained and tested on site. | LOW |

| REF | TYPE OF IMPACT | EVENT(S) | POTENTIAL CONSEQUENCES | SIZE | SCOPE | DURATION | FREQUENCY | STAKEHOLDERS | SIGNIFICANCE | AVOIDANCE | PROBABILITY | DURATION | SIZE AND SCOPE | CUMULATIVE EFFECTS | STAKEHOLDERS | SIGNIFICANCE | ASSOCIATED INFORMATION | Environmental significance |
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| Table 7-8 | | Loss of containment associated with storage of oil and tank farm and road tankers | Contamination of shallow groundwater resources | H | L | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Equipment design fit for purpose. Plant and equipment designed and constructed in accordance with Santos SMS and Engineering Standards (e.g. SMS11.2 Facilities Design and Construction), and relevant Australian/International standards (e.g. AS 1210). Instrumentation, high-level alarms and controls incorporated into tank design. Floating roof storage tanks individually bunded in accordance with relevant guidelines e.g. EPA Bunding Guidelines. Truck load-in area designed with sumps and pumps. Operated under Reliability and Maintenance Management System (RAMMS) framework, Asset Integrity Management System (AIMS) and SMS standards. Operator checks and monitoring. Internal and external inspections of tanks as per applicable standards and industry guidelines. Continued competency assessment, education and training of individuals responsible for activities associated with operation of Moomba Plant. Safe work permits must be obtained to ensure only individuals with proper clearance can conduct work. Loss of containment is managed via the incident management system (IMS) and implementation of corrective actions is based on incident investigation. Emergency response procedures are implemented in accordance with Regulation 31. Implementation of spill response procedures, which include immediate reporting of spills/leaks. Emergency spill response equipment maintained and tested on site | LOW |
| Table 7-8 | | Loss of containment associated with operation of the Crude Stabilisation Plant | Contamination of shallow groundwater resources | H | L | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Equipment design fit for purpose. Plant and equipment designed and constructed in accordance with Santos SMS and Engineering Standards (e.g. SMS11.2 Facilities Design and Construction), and relevant Australian/International standards (e.g. AS 1210). Concrete pad and closed drainage system. Operated under Reliability and Maintenance Management System (RAMMS) framework, Asset Integrity Management System (AIMS) and SMS standards. Operator checks and monitoring. Internal and external inspections of tanks as per applicable standards and industry guidelines. Continued competency assessment, education and training of individuals responsible for activities associated with operation of Moomba Plant. Safe work permits must be obtained to ensure only individuals with proper clearance can conduct work. Loss of containment is managed via the incident management system (IMS) and implementation of corrective actions is based on incident investigation. Emergency response procedures are implemented in accordance with Regulation 31. Implementation of spill response procedures, which include immediate reporting of spills/leaks. Emergency spill response equipment maintained and tested on site | LOW |
| Table 7-8 | | Loss of containment and inappropriate management of Moomba waste streams and wastewaters (sour water east flow) | Contamination of shallow groundwater resources | H | L | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Approximately 2000 $m^3$/day of sour water is transferred to an engineered waste lagoon referred to as 'Lake Brooks'. Data from 2013 showed that sour water had a high salinity and elevated levels of aluminium and boron that can affect native fauna and native vegetation. Studies are undertaken to investigate wastewater management options for the Moomba Gas Plant to identify modifications that could be implemented based on operational requirements and constraints. Implementation of Wastewater Management Plan. Licenced contractors and waste trucks contracted; and applicable WTCs completed in accordance with regulations, as required. Loss of containment is managed via the incident management system (IMS) and implementation of corrective actions is based on incident investigation Response. Loss of containment is reported and investigated. Emergency response procedures are implemented and emergency spill response equipment maintained and tested on site | LOW |
| Table 7-8 | | Explosion, fire or flood event at Moomba Facility | Contamination of shallow groundwater resources | H | L | H | H | L | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Equipment design fit for purpose. Safety Case assessment and review undertaken every 5 years validating risk management systems, and identification and management of critical barriers through the relevant risk assessment/management process. Safety, testing, maintenance and inspection procedures are implemented. Continued competency assessment, education and training of individuals responsible for activities associated with operation of Moomba Plant. Safe Work Permit system implemented to ensure only individuals with proper clearance can conduct work on inside Moomba Plant. Hazardous area management criteria are continuously reviewed according to relevant Australian Standards and legislative requirements. Operated under Reliability and Maintenance Management System (RAMMS) framework, Asset Integrity Management System (AIMS) and SMS standards. Emergency response procedures are implemented in accordance with Regulation 31. Implementation of spill response procedures, which include immediate reporting of spills/leaks. Emergency spill response equipment maintained and tested on site. | LOW |
| 4.5.3, Table 7-6 | | Storage and disposal of PFW at production facilities | Contamination of surface water or shallow groundwater resources | H | H | L | H | L | 1 | No | Medium | Long | Confined | Yes | No | 3 | PFW facilities are designed and constructed in accordance with the relevant standards of the day (e.g. EPA Wastewater Lagoon Construction Guidelines) and may include use of synthetic and/or clay liners. PFW pond systems design, includes detailed planning and consideration of flood risks, proximity to floodplains, waterways and other sensitive receptors. As per standard day-to-day operations, routine inspection of hose lines, connections, high pressure equipment and trip systems are undertaken to identify operational faults and ensure design limits are not compromised during operation. Where required, emergency shutdown systems are installed to prevent uncontrolled releases. Water Quality Monitoring as required. Pond skimming and hydrocarbon recovery. Seepage monitoring (visual or physical i.e. soil sampling). Pond level/capacity monitoring. Pond systems are designed in such a way that concentration of Total Recoverable Hydrocarbons (TRH) in the final-stage pond of any PFW pond system should not exceed: • 30 mg/L in an engineered evaporation pond; or 10 mg/L in a free-form evaporation pond. | MED |
| 4.5.3, Table 7-6, Table 7-12 | | Secondary use of PFW associated with production facility | Contamination of surface water or shallow groundwater resources | H | L | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Relevant external approvals obtained where required. Liaise with landowners where required. Reuse is managed in accordance with relevant water quality criteria (e.g. Australian Water Quality Guidelines for Fresh and Marine Waters (ANZECC 2000)) and risk assessment outcomes. Risk to sensitive receptors is minimised by implementation of Santos standards and internal approvals processes. | LOW |
| Table 7-7 | | Loss of containmant of Improved/Enhanced Oil Recovery reinjection water (PFW water containing chemicals including biocide) | Contamination of shallow groundwater resources, siltation of waterways | H | L | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Plant and equipment designed and constructed in accordance with Santos SMS and Engineering Standards (e.g. SMS11.2 Facilities Design and Construction), and relevant Australian/International standards (e.g. AS 2885). Injection surface infrastructure (pumps, flowlines, filtration, chemical dosing facilities) equipped with automatic overpressure shut downs and telemetry monitoring. Quality control of pond construction including above ground earthen bunds to prevent surface water ingress. Ponds designed with liners, as required. Equipment designed and operated in accordance with relevant standards and guidelines. Injection fluid is transferred lines that are rated and tested to meet project requirements. Injection surface infrastructure equipped with shut downs and injection monitoring. Makeup water stored in designated ponds. Maintain minimum pond freeboard. Regular inspection and maintenance of pond walls. Transfer lines tested and maintained to design conditions. Pipeline monitored for leaks (pressure gauges and visual inspection) as per Santos standards. Tracers (if used) are added to the fluid injection well under controlled conditions by specialist contractors in a sealed/closed system Loss of containment is managed via the incident management system (IMS) and implementation of corrective actions is based on incident investigation. | LOW |
| | | | Soil Erosion/Scouring | H | L | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | | LOW |
| Table 7-7 | | Improved/Enhanced Oil Recovery fracture propagation out of target zone | Cross-flow between aquifer formations resulting in degradation of reservoir/aquifer quality | H | L | H | H | L | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Reservoir modelling for injection scheme design. Completion design for injection wells. Use of Fit for purpose equipment. Integrity of the well bore and packer are routinely tested. Cement bond logs run to test for poor cement bonds where appropriate. Real time pressure monitoring on injection wells and over pressure protection. Injection operating guidelines. Ongoing monitoring of reservoir response to injection. Well integrity management system, testing, maintenance and inspection procedures are implemented. Ensure individuals in areas of responsibility are trained to handle events. Well design in accordance with the Drilling, Completions and Well Operations SEO, such as Aquifers isolated behind casing string(s) cemented in place, Casing string and cement slurry designed by qualified and competent engineers and confirmed by senior engineers or external consultants where necessary, Appropriately designed casing and wellhead installed on new wells drilled and retained for use use. Well drilling, completions, operations, integrity management and decommissioning in accordance with the requirements of the DCWO SEO, including Effective | LOW |
| Table 7-5 | | Management of hydrotest water or water used for flushing pipelines/equipment, pigging or cleaning | Contamination of surface water or shallow groundwater resources | H | H | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | During pipeline commissioning, there is a potential for hydrotest water that may contain biocides and/or corrosion inhibitors to be released to grade resulting in localised soil and/or shallow groundwater resource contamination. Hydrostatic test water, free of chemical additives and sourced from water bores (not of PFW make-up), may be released to ground adjacent to the construction area, provided it meets discharge guidelines (e.g. ANZECC). Hydrotest water, that contains additives, is released to existing lined evaporation ponds (generally PFW facilities) or to specifically constructed ponds sited to prevent impacts to surface or shallow groundwater. Use of biocides and corrosion inhibitor chemicals are kept to a minimum and where practicable biocides which degrade rapidly when exposed to UV are used. Management of water which contains biocide, other chemicals or hydrocarbons may be into existing lined and fenced evaporation ponds, or to satellite facility pond systems sited to prevent the contamination of surface or near surface waters. Preferential use of satellite pond water, where possible. | LOW |
| Table 7-11 | | Storage and transport of general waste | Contamination of shallow groundwater resources | H | H | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Designed and engineered facilities in accordance with EPA requirements. Application of the waste hierarchy system (avoid, reduce, reuse, recycle, treat, dispose). Waste management is undertaken in accordance with applicable regulatory requirements and licences. Compliance with EPA licence conditions and requirements of the Environment Protection Act 1993 and relevant regulations. Periodic auditing of waste management facilities for compliance against licence and regulatory requirements. Waste streams are segregated on site where appropriate to maximise opportunities for waste recovery, reuse and recycling. Covered bins are provided for the collection and storage of wastes. Rubbish loads are covered during transport to a licensed waste facility. Waste Management Plan. Landfill Environmental Management Plan. Landfarm Management Plans. Inspections, monitoring and maintenance of facilities. | LOW |
| Table 7-11 | | Sewage treatment and effluent management | Contamination of shallow groundwater resources and waterways | H | H | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Equipment design fit for purpose. Use of permanent septic systems with long term camps where possible. Secondary treated sewage wastewater is disposed of onto land well away from any place from which it is reasonably likely to enter any waters, and to minimise spray drift and ponding. Wastewater Management Plan. Periodic auditing of wastewater management facilities for compliance again licence and regulatory requirements. Department of Health and Ageing approved transportable aerated wastewater treatment plants for temporary purposes, such as camps. Wastewater (sewage and grey water) disposal where possible in accordance with the South Australian Public Health (Wastewater) Regulations 2013 and/or in consultation with the Department for Health and Ageing and/or in accordance with licenses/permits, if any. Appropriate controls for management of sewage effluent (developed in consultation with Department for Health and Ageing) implemented for situations where excursions outside effluent quality guidelines may occur (e.g. startup or system upset). Inspections, monitoring and maintenance of facilities. | LOW |

| REF | TYPE OF IMPACT | EVENT(S) | POTENTIAL CONSEQUENCES | SIZE | SCOPE | DURATION | FREQUENCY | STAKEHOLDERS | SIGNIFICANCE | AVOIDANCE | PROBABILITY | DURATION | SIZE AND SCOPE | CUMULATIVE EFFECTS | STAKEHOLDERS | SIGNIFICANCE | ASSOCIATED INFORMATION | Environmental significance |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Table 7-3, Table 7-5, Table 7-10 | | Vegetation clearing for construction and maintenance activities | Siltation of watercourses | H | H | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Minimise vegetation disturbance, and plan construction to avoid areas of sensitive vegetation. Use existing routes/disturbed ground where practicable. Sensitive environments and Ramsar sites are considered during route selection. Avoid important or 'priority' native vegetation where possible. Undertaking a Safety Management Study during the design process to address location and non-location specific threats and develop adequate controls to mitigate environmental and public/third party safety risk. Use of Santos systems for vegetation clearance approvals, which triggers further assessment where required. Prior to greenfield disturbance, or subsequent re-disturbance, a Santos Environmental Adviser and/or ecologist undertakes an environmental assessment in accordance with the relevant Santos standards, the SEO and recommendations based on field inspections, which includes a site inspection for potential sensitive receptors. Relevant internal and external approvals in place before work undertaken. Implementation of the Environmental Sensitivity Profile (ESP) tool to assess proposed pipeline routes for rare, vulnerable and endangered flora and fauna species before the commencement of construction and implement appropriate avoidance or mitigation measures. Stockpile and clear vegetation and respread following construction works to facilitate revegetation. Where possible trim vegetation rather than clearing. Unauthorised off-road or off-lease driving or creation of shortcuts is unacceptable. | LOW |
| Table 7-3, Table 7-5 | | Earthworks, including grading, trenching, backfilling, reinstating and stockpiling for pipeline and facility construction, operation and decommissioning activities | Siltation of watercourses | H | H | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Relevant internal and external approvals in place before work undertaken. Consider alternate locations and construction methods during planning and scouting phase to minimiseenvironmental impacts. Locate facilities to avoid areas subject to inundation as far as possible. Use existing disturbed areas where practicable. Off road or off lease driving or creation of shortcuts is prohibited. Sensitive gibber terrain is protected through appropriate site selection and construction practices which include selecting locations that avoid sloping land is preferable (to minimise the requirements for large cut and fill or importation of borrow material to level the site), constructing erosion control measures where appropriate (i.e. diversion banks or berms), rolling of gibber terrain, is preferable, where possible. Construction activities are not carried out on salt lakes. First disturbances (such as location scouting) are undertaken in accordance with Santos standards. Management of sensitive areas (e.g. sloped areas or gibber) is detailed in scope of works, approval documents and company procedures. Erosion is controlled by appropriate placement, batter slopes and construction of water flow diversion banks. Reinstate construction areas as soon as practicable. Rip areas of compacted soil (except on gibber plains and tableland environments). Respread topsoil and stockpiled vegetation. Total or partial restoration of borrow pits as soon as practicableticable. Restore natural contours to minimise impacts to natural drainage patterns. Where possible trim vegetation rather than clear. Assets decommissioning to be in accordance with SMS, which defines minimum mandatory requirements for the planning and management of asset decommissioning. | LOW |
| Table 7-3, Table 7-5 | | Flooding fo surrounding floodplain/watercourses during construction, operation and decommissioning | Siltation of watercourses | H | L | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | PFW pond systems design, which includes detailed planning and consideration of flood risks, proximity to floodplains, waterways and other sensitive receptors. Measures undertaken to reduce potential impacts of flooding where appropriate (e.g. installation of bunds, removal of contents prior to arrival of flood event, maintain a minimum freeboard in ponds). Monitoring and communicating Cooper Basin Flood Reports, when available. | LOW |
| Table 7-7 | | Enhanced hydrocarbon recovery injection of non-compatible water | Contamination or souring of reservoir or aquifer | H | L | H | H | L | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Demonstrated fluid compatibility in the design phase phase. Injection fluid treatment design design. Reinjection activities are only undertaken in reservoirs where the risk of fluid loss to adjacent formations is considered low. Reinjection programs are subject to detailed technical assessment which includes modelling modelling. Applicable approvals are obtained prior to operations operations. Operational program for water quality testing on injection water. Establishment and measurement of ch emical dosage metering metering. | LOW |
| Table 7-10 | | Road construction earthworks | Siltation of watercourses | H | H | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Relevant internal and external approvals in place before work undertaken. Consider alternate routes, locations and construction methods during planning and scouting phase to minimise environmental impacts. Use existing routes/disturbed areas where practicable. Off-road or off-lease driving or creation of shortcuts is prohibited. Sensitive gibber terrain is protected through appropriate construction and maintenance practices which include - selecting routes that avoid sloping land is preferable (to minimise the requirements for large cut and fill or importation of borrow material to level the site) - constructing erosion control measures where appropriate (i.e. diversion banks or berms) - rolling of gibber terrain, is preferable, where possible - avoiding environmentally sensitive and restricted areas, such as important native vegetation and fauna habitat, where possible. Construction activities are not carried out on salt lakes. First disturbances (such as location scouting) are undertaken in accordance with Santos standards. Management of sensitive areas (e.g. sloped areas or gibber) is detailed in scope of works, approval documents and company procedures. Erosion is controlled by appropriate placement, batter slopes and construction of water flow diversion banks. Vegetation clearance is minimised as far as practicable. The location of new borrow pits considers: minimisation of impacts to the environment (e.g. native vegetation and landforms), minimising water retention, avoidance of sites of cultural and heritage significance, stakeholder engagement to minimise impact to third party operations, minimisation of visual impacts from construction activities by using native vegetation and landforms for screening, maintenance of applicable clearance distances between borrow pits and infrastructure (e.g. facilities, fences, homesteads, roads and airstrips) to minimise risk associated with livestock, safety, erosion, and visual impacts. Reinstate construction areas as soon as practicable. Rip areas of compacted soil (except on gibber plains and tableland environments). Respread topsoil and stockpiled vegetation. Total or partial restoration of borrow pits as soon as practicable. Restore natural contours to minimise impacts to natural drainage patterns. Roads are located and constructed to maintain pre-existing water flows (e.g. channel contours are maintained on floodplains and at creek crossings). Roads constructed at (or not significantly above) the natural surface as a minimum standard. Culverts and floodways are installed where required to maintain water flows, drainage and surface runoff. Where required, detailed hydrological assessment is undertaken for structures such as roads in floodplains or creek crossings to ensure no significant impacts on surface water flows or aquatic fauna (e.g. fish passage must be maintained). Sensitive land systems (e.g. wetlands) are avoided wherever possible. Where activities are undertaken in or near these areas, appropriate review, assessment and mitigation measures are in place to ensure that surface water flows are maintained and contamination of surface water and groundwater resources is avoided. Monitoring of erosion and drainage patterns post-construction and corrective actions implemented where required. | LOW |
| | | | Disturbance to natural drainage patterns | H | H | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | | LOW |
| Table 7-11 | | Management of contaminated soil | Contamination of shallow groundwater resources or waterways | H | H | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Suitably designed and engineered facility in accordance with EPA guidelines. Compliance with EPA licence conditions and regulatory requirements. Development and implementation of Landfarm Management Plan, which documents operational controls, management practices and Santos standards. | LOW |
| Table 7-11 | | Management of hazardous materials (chemicals, asbestos) | Contamination of shallow groundwater resources | H | H | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Designed and engineered containment facilities. Application of the waste hierarchy system (avoid, reduce, reuse, recycle, treat, dispose). Compliance to requirements of EPA licence conditions and requirements of the Environment Protection Act 1993 and relevant regulations. Waste streams are segregated on site where appropriate to maximise opportunities for waste recovery, reuse and recycling. Waste Management Plan. Landfill Environmental Management Plan. Disposal of asbestos containing material in accordance with the Work Health and Safety Act 2012 and the Work Health and Safety Regulations 2012. Inspection and maintenance of facilities. Transportation of chemicals, fuels and oils in accordance with the Safety Data Sheet (SDS), Santos' SMS, and relevant guidelines such as the ADG Code. Regularly educate staff of product, review and monitor chemical and fuel transportation, including signage/labelling, proper packing and tie downs. WTC documentation, use of licenced contractors. Loss of containment is managed via the incident management system (IMS) and implementation of corrective actions is based on incident investigation. SDSs available. Appropriate emergency response plans in place and emergency spill response equipment on site. | LOW |
| Table 7-13 | | Inappropriate management of waste/wastewater from steam supply process | Contamination of stormwater | H | H | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Equipment design fit for purpose. Boiler blowdown water is managed via a system of interceptor and evaporation ponds. Application of the waste hierarchy system (avoid, reduce, reuse, recycle, treat, dispose). Storage and handling of chemicals, fuels and oils in accordance with the Safety Data Sheet (SDS), Santos' SMS, EPA Bunding Guidelines and AS 1940. Compliance to applicable licence and regulatory requirements. Waste streams are segregated on site where appropriate to maximise opportunities for waste recovery, reuse and recycling. Covered bins are provided for the collection and storage of wastes. Rubbish loads are covered during transport to a licensed waste facility. Wastewater Management Plan | LOW |
| Table 7-14 | | Loss of containment of diesel used for power generation and/or airport refuelling | Contamination of groundwater and/or waterways | H | H | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Storage of chemicals, fuels and oils in accordance with the Safety Data Sheet (SDS), Santos' SMS, EPA Bunding Guidelines and AS 1940. Chemical management practices with appropriate labelling. Licensed delivery service. Inspections and maintenance. Regularly educate staff of product, review and monitor chemical and fuel transportation, including signage/labelling, proper packing and tie downs. Loss of containment is managed via the incident management system (IMS) and implementation of corrective actions is based on incident investigation. | LOW |
| Table 7-16 | | Site conditions causing an accident at the airport | Contamination of waterways | H | H | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Foreign object debris (FOD) fencing designed and implemented. Airline provider has applicable licenses, registrations and safe track record. Airport is operated in accordance with Civil Aviation Safety Authority (CASA) standards. Jet A-1 fuel supply and storage meets industry standards. Restricted access to the airport and aerodrome. Management of vegetation and surface water ponding adjacent to the airport to minimise attraction of wildlife (e.g. Black Kites). Covered bins are provided for the collection and storage of wastes to minimise attraction of wildlife. Emergency response plans are in place for aircraft incidents. Implementation of emergency/spill response procedures | LOW |
| Table 7-17 | | Loss of containment of fuel and/or chemical at fire training ground | Contamination of surface and shallow groundwater resources | H | H | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Runoff from the site is directed to a lined interceptor pit. Fire training ground is located in a fenced compound. Handling and storage of chemicals, fuels and oils in accordance with the Safety Data Sheet (SDS), Santos' SMS, and relevant standards and guidelines such as EPA Bunding Guidelines and AS 1940. Regularly educate staff of product, review and monitor chemical and fuel transportation, including signage/labelling, proper packing and tie downs. Loss of containment is managed via the incident management system (IMS) and implementation of corrective actions is based on incident investigation. Spill kits available on site. | LOW |
| Table 7-17 | | Loss of containment or inappropriate management of waste and wastewaters at fire training ground | Contamination of shallow groundwater resources | H | H | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Application of the waste hierarchy system (avoid, reduce, reuse, recycle, treatment, disposal). Covered bins and prompt collection of waste. Wastes generated as part of site/aircraft maintenance/repairs are managed in accordance with WMP and regulatory requirements. Inspection and maintenance of facilities. | LOW |
| Table 7-17 | | Explosion or uncontrolled fire at fire training ground | Contamination of waterways | H | L | L | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | No smoking or safe smoking areas away from equipment or activity. Personnel are trained to supervise and instruct individuals entering area to conduct work. Safe work permits must be obtained to ensure only individuals with proper clearance can conduct works. Implementation of appropriate emergency/spill response procedures for explosion or fire. Safety, testing, maintenance and inspection procedures are implemented | LOW |

| REF | TYPE OF IMPACT | EVENT(S) | POTENTIAL CONSEQUENCES | SIZE | SCOPE | DURATION | FREQUENCY | STAKEHOLDERS | SIGNIFICANCE | AVOIDANCE | PROBABILITY | DURATION | SIZE AND SCOPE | CUMULATIVE EFFECTS | STAKEHOLDERS | SIGNIFICANCE | ASSOCIATED INFORMATION | Environmental significance |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Table 7-12 | | Extraction of water from the artesian and sub-artesian reservoirs | Impacts to groundwater users | H | L | L | H | L | 2 | No | Low | N/A | N/A | N/A | N/A | 1 | Use PFW as a water source where feasible. Minimise use of groundwater. Compliance with water licence and allocations where applicable. Utilisation of existing Santos groundwater bores where applicable. Installation of any new water bores is undertaken in accordance with all government regulations and licensing conditions. Installation of any new water bores in accordance with the Far North Prescribed Wells Area Water Allocation Plan (FNPWA WAP) and will include consultation as required. Installation of any new water bores will include an impact assessment of adjacent surface water systems (that are dependent on base flow). | LOW |
| 7.11.3, Table 7-12 | | Extraction of water from Cooper Creek | Disturbance to natural drainage patterns | H | H | H | H | L | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Approval for extraction is gained through internal Santos processes. Application will include estimated total volume of water required. A request to extract water from Cooper Creek must demonstrate that PFW and/or groundwater of an acceptable quality cannot be sourced within an economically viable haulage distance (maximum 2 hour return journey). Approved extraction occurs where potential risks to existing users downstream of Callyamurra have been assessed and impacts mitigated. Any approved extraction occurs where water flow at Callamurra is >= 2.15m (>= 0.1m flow at Innamincka Causeway) and rising. Water should not be extracted from permanent water refuges (e.g Callyamurra). Maps of approved surfacewater extraction points at Innamincka, Kudrieke and Mitchie Crossings are included in Appendix E. Extraction only occurs at these points, and does not involve permanent pumping stations. Cumulative extraction is capped at 15ML per year. Extraction volumes recorded in monitoring database and included in annual DEM reporting. | LOW |
| Section 5 | Vegetation Impacts | | | | | | | | | | | | | | | | The vegetation characteristics of the Cooper Basin are divided into six landform systems. Dunefields: vegetation on dunes includes herbs, ephemeral herbs on dune crests, open shrublands of sandhill wattle, whitewood or hakea and hummock grassland of spinifex and sandhill canegrass. Vegetation in interdune areas is largely dependent on dune spacing and may consist of hummock grassland, chenopod shrubland, open shrubland or low open woodland. Floodplains: major intermittent watercourses are characterised by woodlands of river red gum, coolibah or gidgee with a tall shrub layer fringing the floodplains, channels and semi-permanent waterholes. Open coolibah woodland and with an understorey of lignum, chenopod shrubland and grasses is common in frequently flooded areas with outer floodplain areas often consisting of open shrubland. Groundcover on floodplains has a high ephemeral content. Gibber plains: vegetation ranges from relatively dense low open shrubland to naturally bare tussock grasslands, or to short-lived cooperburrs and ephemeral grasses. Low woodland of gidgee and mulga on drainage lines. Salt Lakes: immediate surrounds usually fringed with samphire grading to low open chenopod shrubland in the outer surrounds. Tablelands: low open woodlands, shrublands and low open chenopod shrublands, with more heavily wooded areas of mulga, red mulga and gidgee along drainage lines and more permanent waterholes. Wetlands: vegetation similar to floodplains is present, with open woodlands of river red gum or coolibah with an understorey of lignum and chenopod shrubland typically bordering the margins of wetland areas. A number of species listed under Commonwealth (Environment Protection and Biodiversity Conservation Act 1999) and State (National Parks and Wildlife Act 1972) legislation are known to occur in the Cooper Basin. One threatened ecological community listed under the EPBC Act occurs in the broader region, the community of native species dependent on natural discharge of groundwater from the Great Artesian Basin. This community occurs at Great Artesian Basin (GAB) springs, which are located beyond the margins of the Cooper Basin. Five ecological communities identified as threatened in the South Australian Arid Lands Biodiversity Strategy occur in the broader region; Coolibah and River Red Gum woodland on regularly inundated floodplains, Old-man Saltbush on floodplains, Queensland Bluebush shrubland on cracking clay depressions subject to periodic waterlogging, Broughton Willow and Coolibah and Queensland Bean Tree woodland on drainage lines and floodplains, and Mulga low woodland on low dunes and sand plain. The primary threat to these ecological communities is habitat modification or inhibited regeneration associated with total grazing pressure (DEH 2009a, b and c). | |
| Table 7-3, Table 7-5 | | Earthworks, including grading, trenching, backfilling, reinstating and stockpiling for pipeline and facility construction, operation and decommissioning activities | Loss of native vegetation and fauna habitat | H | H | H | H | H | 1 | No | Medium | Long | Confined | Yes | N/A | 3 | Minimise vegetation disturbance, and plan construction to avoid areas of sensitive vegetation. Use existing routes/disturbed ground where practicable. Sensitive environments and Ramsar sites are considered during route selection. Avoid important or 'priority' native vegetation where possible. Undertaking a Safety Management Study during the design process to address location and non-location specific threats and develop adequate controls to mitigate environmental and public/third party safety risk. Facilities are designed and constructed to minimise impacts to native fauna. Undertaking Undertaking a Safety Management Study during the design process to address location and non location specific threats and develop adequate controls to mitigate environmental and public/third party safety risk. Use of Santos systems for vegetation clearance approvals, which triggers further assessment where required. Prior to greenfield disturbance, or subsequent re-disturbance, a Santos Environmental Adviser and/or ecologist undertakes an environmental assessment in accordance with the relevant Santos standards, the SEO and recommendations based on field inspections, which includes a site inspection for potential sensitive receptors. Relevant internal and external approvals in place before work undertaken. Implementation of the Environmental Sensitivity Profile (ESP) tool to assess proposed pipeline routes for rare, vulnerable and endangered flora and fauna species before the commencement of construction and implement appropriate avoidance or mitigation measures. Stockpile and clear vegetation and respread following construction works to facilitate revegetation. Where possible trim vegetation rather than clearing. Unauthorised off-road or off-lease driving or creation of shortcuts is unacceptable. Implementation of the Cooper Basin Pest Plants and Animals Management Plan. Relevant internal and external approvals (Notice of Entry) in place before work undertaken. Consider alternate routes, locations and construction methods during construction phase planning and scouting to minimise environmental impacts. Monitor pest plants when present, within the construction area for outbreaks and where necessary implement control measures. Where the EPBC Act is potentially triggered as a result of pipeline operations (and failure of controls), Santos will comply with legal requirements as they arise. Pipeline activities are not undertaken within one kilometre of the Coonige Lakes National Park. All new and/or re-disturbances are subject to an environmental assessment in accordance with relevant Santos standards. Consultation with landholders in relation to the possible existence of pest plants. Induction of employee and contractor personnel with respect to existence and spread of pest plants. Ensure that imported material is from an area considered to be pest plant/disease free. Management of sensitive areas (e.g. sloped areas or gibber) is detailed in scope of works, approval documents and company procedures. Rip areas of compacted soil (except on gibber plains and tableland environments). Encourage minimised time that areas are open with progressing clearing and reinstatement of vegetation. Reinstate construction areas as soon as possible. Respread topsoil and stockpilled vegetation seedstock to facilitate revegetation. Monitor pest plant where present, within the construction area for outbreaks and where necessary implement control measures. Assets decommissioning to be in accordance with SMS, which defines minimum mandatory requirements for the planning and management of asset decommissioning. | MED |
| | | | Introduction and/or spread of pest plants | H | L | H | H | L | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | | LOW |
| Table 7-3, Table 7-5 | | Movement of heavy machinery and vehicles for pipeline and facility construction, operation and decommissioning activities | Damage to native vegetation | H | H | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Minimise the creation of new access tracks. Undertaking a Safety Mangement Study during the design process to address location and non-location specific threats and develop adequate controls to mitigate environmental and public/third party safety risk. Driving on designated areas only (i.e. lease and access track). Unauthorised off-road and off-lease driving creation of shortcuts is unacceptable. Where areas of sensitive vegetation are identified they will be flagged and signposted to indicate restricted access applies. Rip areas of compacted soils (expect on gibber and tableland environments) where required. Induction of employees and contractor personnel with respect to road use and driver behaviour. | LOW |
| | | | Introduction and/or spread of pest plants | H | L | H | H | L | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | | LOW |
| Table 7-3, Table 7-5 | | Flooding fo surrounding floodplain/watercourses during construction, operation and decommissioning | Loss of vegetation and topsoil (either stockpiled or in situ) | H | H | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Measures undertaken to reduce potential impacts of flooding where appropriate (e.g. installation of bunds, removal of contents prior to arrival of flood event, maintain a minimum freeboard in ponds). Monitoring and communicating Cooper Basin Flood Reports, when available. Works programs in floodplain areas scheduled to take into action seasonal conditions and rainfall/flood likelihood. Construction activity not undertaken during flood warning period. Fully containerised tanks used for on-site storage. Planning of installation of new satellite facilitities addresses flood risk. Implementation of flood response management plan. Fuel, oil and chemical storage and handling in accordance with the Safety Data Sheet (SDS), Santos' SMS, EPA Bunding Guidelines and AS 1940. Regularly educate staff of product, review and monitor chemical and fuel storage, including signage/labelling, proper packing and tie downs. Loss of containment is management via the incident management system (IMS) and implementation of corrective action is based on incident investigation. Manage upstream facilities/assets to mitigate potential hazards at the satellite. | LOW |
| | | | Exposure of contaminants to native vegetation and habitats | H | L | L | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | | LOW |
| Table 7-3 | | Loss of containment of gas, sludge or oil from pipeline | Impacts to native vegetation | H | L | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Fit for purpose equipment. Installation of emergency isolation valves where required. All new Santos pipelines are designed, tested and constructed in general accordance with AS 2885 requirements to have sufficient strength, ductility and toughness to withstand design loads to which it may be subjected during cons truction, testing and operation. Undertaking a Safety Management Study during the design process to address location and non-location specific threats and develop adequate controls to mitigate environmental and public/third party safety risk. Safety, testing, maintenance and inspection procedures are implemented according to the IMP. Prestart-up checklist prior to commissioning and decommissioning activities. Pipeline construction integrity verification e.g. hydrotest (records maintained). Supported above ground pipelines are inspected to minimise the potential for contact with surface soils as a result of sand/sand drift or failure of pipe supports. Adherence to Santos standards and implemetation of management systems to monitor infrastructure. Santos safety checks, inspections and risk assessments. QA/QC checks prior to hydrocarbon introduction into pipe. Continued competency assessment, education and training of individuals responsible for activities with pipeline construction and operation. Personnel are trained to supervise and instruct individuals entering lease to conduct work. Safe work permits must be obtained to ensure only individuals with proper clearance can conduct work on a lease. Hazardous area management criteria are followed. Monitoring of weather conditions. Restrictred access to site. Loss of containment is managed via the incident management system (IMS) and implementation of corrective actions is based on incident investigation. Pipeline HC removal (via pigging) prior to decommissioning. Regularly educate staff on emergency response procedures. Appropriate emergency response plans are in place. Annual review and exercise of response equipment and procedures to ensure preparedness. Emergency spill response equipment on site. Spill response and clean up. Areas assessed for contamination and remediated where required on decommissioning. | LOW |
| Table 7-3 | | Loss of containment of chemicals, fuel or hydrotest water associated with pipeline construction, operation and decommissioning activities | Impacts to native vegetation or fauna habitats | H | L | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Undertaking a Safety Management Study during the design process to address location and non-location specific threats and develop adequate controls to mitigate environmental and public/third party safety risk. Fuel, oil and chemical storage and handling in accordance with the Safety Data Sheet (SDS), Santos' SMS, EPA Bunding Guidelines and AS 1940. Regularly educate staff of product, review and monitor chemical and fuel storage, including signage/labelling, proper packing and tie downs. Regularly educate staff on emergency response procedures. Use of biocides and corrosion inhibitor chemicals are kept to a minimum and where practicable biocides which degrade rapidly when exposed to UV are used. Management of water containing biocide, other chemicals or hydrocarbons, may either be into existing lines and fenced evaporation ponds, or to satellite facility pond systems. Loss of containment is managed via the incident management system (IMS) and implementation of corrective actions is based on incident investigation. Ecological assessment of new proposed lease sites to evaluate sensitivity, including habitat assessment. Storage fuels and chemicals in designated areas. Scheduled (and/or upon request) removal of waste from operational sites. Spill response and clean up. Pond construction to include steep sided edges to prohibit vegetation growth and /or creation of breaches which could attract birdlife. Erection of fencing around infrastructure to limit access by livestock and native fauna, where required. Regular and ongoing inspection by site operators to ensure integrity of site controls, such as fencing. Implementation of appropriate emergency/spill response procedures. Annual review and exercise of response equipment and procedures to ensure preparedness. Spill response and clean up. Fencing of impacted areas if threat is posed to native fauna or livestock. | LOW |

| REF | TYPE OF IMPACT | EVENT(S) | POTENTIAL CONSEQUENCES | SIZE | SCOPE | DURATION | FREQUENCY | STAKEHOLDERS | SIGNIFICANCE | AVOIDANCE | PROBABILITY | DURATION | SIZE AND SCOPE | CUMULATIVE EFFECTS | STAKEHOLDERS | SIGNIFICANCE | ASSOCIATED INFORMATION | Environmental significance |
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| Table 7-5 | | Loss of containment of hydrocarbons outside area designed to contain spills (pipe rupture, reliefs, fittings or leaks from plant or other sources) | Impacts to native vegetation and fauna habitats | H | L | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Fit for purpose equipment. Consideration of proximity to surrounding infrastructure and implementation of a flare exclusion zone. Plant and equipment designed and constructed in accordance with Santos SMS and Engineering Standards (e.g. SMS11.2 Facilities Design and Construction), and relevant Australian/International Standards (e.g. AS 1210). Preferential use of diesel vehicles. Process safety and integrity management systems featured in the FFP. Minimising volume of flammable/combustible substances through all phases of works. Consideration of weather conditions i.e. wind direction. Safety, testing, maintenance and inspection procedures are implemented. Personnel are trained to supervise and instruct individuals entering site to conduct work. Continued competency assessment, eductation and training of individuals responsible for activities associated with satellilte facilities. Safe work permits must be obtained to ensure only individuals with proper clearance can conduct work at operational facilities. Hazardous area management criteria are followed. HAZOP reviews. Ignition sources are controlled via permit to work. Restricted access to site. Red alert days (additional checks and balances). Appropriate emergency response plans in place. Emergency response training for emergency response personnel. Emergency spill reponse equipment on site. Spill response and clean up. | LOW |
| 4.5.3, Table 7-6 | | Storage and disposal of PFW at production facilities | Damage to native vegetation and fauna habitat | H | L | H | H | L | 1 | No | Medium | Long | Confined | Yes | No | 3 | PFW facilities are designed and constructed in accordance with the relevant standards of the day (e.g. EPA Wastewater Lagoon Construction Guidelines) and may include use of synthetic and/or clay liners. PFW pond systems design, includes detailed planning and consideration of flood risks, proximity to floodplains, waterways and other sensitive receptors. As per standard day-to-day operations, routine inspection of hose lines, connections, high pressure equipment and trip systems are undertaken to identify operational faults and ensure design limits are not compromised during operation. Where required, emergency shutdown systems are installed to prevent uncontrolled releases. Water Quality Monitoring as required. Pond skimming and hydrocarbon recovery. Seepage monitoring (visual or physical i.e. soil sampling). Pond level/capacity monitoring. Pond systems are designed in such a way that concentration of Total Recoverable Hydrocarbons (TRH) in the final-stage pond of any PFW pond system should not exceed: 30 mg/L in an engineered evaporation pond or 10 mg/L in a free-form evaporation pond. PFW plant and pond system maintenance and inspection schedules. | MED |
| | | | Increased grazing/predator pressure | H | L | H | H | H | 1 | No | Medium | Long | Confined | Yes | No | 3 | | MED |
| Table 7-3, Table 7-5 | | Flooding fo surrounding floodplain/watercourses during construction, operation and decommissioning | Loss of vegetation and topsoil (either stockpiled or in situ) | H | L | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | PFW pond systems designed, which includes detailed planning and consideration of floow risks, proximity to floodplains, waterways and other sensitive receptors. Measures undertaken to reduce potential impacts of flooding where appropriate (e.g. installation of bunds, removal of contents prior to arrival of flood event, maintain a minimum freeboard in ponds). PFW plant and pond system maintenance and inspection schedules. Monitoring and communicating Cooper Basin Flood reports, when available. | LOW |
| 4.5.3, Table 7-6 | | Secondary use of PFW associated with production facility | Potential impacts to topsoil, native vegetation and fauna habitat | H | H | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Relevant external approvals obtained where required. Liaise with landowners where required. Reuse is managed in accordance with relevant water quality criteria (e.g. Australian Water Quality Guidelines for Fresh and Marine Waters (ANZECC 2000)) and risk assessment outcomes. Risk to sensitive receptors is minimised by implementation of Santos standards and internal approvals processes. | LOW |
| Table 7-7 | | Improved/Enhanced Oil Recovery loss of well integrity, Breach/release of waters at surface | Contamination of soil and erosion | H | L | H | H | L | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Well design in accordance with the Drilling, Completions and Well Operations SEO, such as Aquifers isolated behind casing string(s) cemented in place, Casing string and cement slurry designed by qualified and competent engineers and confirmed by senior engineers or external consultants where necessary, Appropriately designed casing and wellhead installed on new wells drilled and retained for use use. Well drilling, completions, operations, integrity management and decommissioning in accordance with the requirements of the DCWO SEO, including Effective barriers exist to maintain well control and prevent crossflow between separate aquifer systems or hydrocarbon reservoirs outside of the target reservoirs, Operational reports verify that barriers have been set and or remedial cement work carried out in accordance with the work program as submitted to and or agreed by DEM, Cased hole cement bond lo gs to confirm quality of cement job in the casing strings, Well integrity management system and checks to confirm well integrity over well life, Where integrity monitoring identifies potential issues, a risk assessment to evaluate safety and environmental im pacts is undertaken to develop prevention and mitigation controls where appropriate appropriate. Regular production operator checks throughout well life life. Reporting and records of loss of well integrity events and corrective actions are in accordance with the requirements of the DCWO SEO. Continued competency assessment, education and training of individuals responsible for activities associated with EHR schemesschemes. Real time pressure monitoring on injection wells and pressure relief valve on the high pressure EHR pump/compression system. In the event of an environmental incident resulting from a loss of well integrity, SMS requirements will be implemented as outlined in the DCWO SEO. | LOW |
| Table 7-7 | | Loss of containmant of Improved/Enhanced Oil Recovery reinjection water (PFW water containing chemicals including biocide) | Impacts to native vegetation and loss of fauna habitat | H | L | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Plant and equipment designed and constructed in accordance with Santos SMS and Engineering Standards (e.g. SMS11.2 Facilities Design and Construction), and relevant Australian/International standards (e.g. AS 2885). Injection surface infrastructure (pumps, flowlines, filtration, chemical dosing facilities) equipped with automatic overpressure shut downs and telemetry monitoring. Quality control of pond construction including above ground earthen bunds to prevent surface water ingress. Ponds designed with liners, as required. Equipment designed and operated in accordance with relevant standards and guidelines. Injection fluid is transferred lines that are rated and tested to meet project requirements. Injection surface infrastructure equipped with shut downs and injection monitoring. Makeup water stored in designated ponds. Maintain minimum pond freeboard. Regular inspection and maintenance of pond walls. Transfer lines tested and maintained to design conditions. Pipeline monitored for leaks (pressure gauges and visual inspection) as per Santos standards. Tracers (if used) are added to the fluid injection well under controlled conditions by specialist contractors in a sealed/closed system Loss of containment is managed via the incident management system (IMS) and implementation of corrective actions is based on incident investigation. Loss of containment is managed via the incident management system (IMS) and implementation of corrective actions is based on incident investigation. | LOW |
| Table 7-8 | | Loss of containment of oily sludge during collection, transfer/transport and treatment (on-site) | Impacts to native vegetation | H | H | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Oil sludge, which is collected from tank bottoms, sumps and interceptor ponds, is managed at the sludge treatment plant. Pits are lined in accordance with applicable standards of the day. Sludge treatment plant is a purpose built and fully contained facility. Operated under Reliability and Maintenance Management System (RAMMS) framework, Asset Integrity Management System (AIMS) and SMS standards. Sludge cake removed and treated off-site through licensed waste transport contractors. Adherence to EPA guidelines (WTC) processes. Minimum freeboard maintained in storage ponds. Continued competency assessment, education and training of individuals responsible for activities associated with operation of Moomba Gas Plant. Loss of containment is managed via the incident management system (IMS) and implementation of corrective actions is based on incident investigation. Safe work permits must be obtained to ensure only individuals with proper clearance can conduct work. Implementation of emergency response procedures and appropriate emergency response plans in place.Emergency spill response equipment maintained and tested on site. | LOW |
| Table 7-8 | | Loss of containment of Moomba Plant oil/oily water or sour water (west flow) including Moomba North, LRP, PFW, RGCP/Benfield Trains | Exposure of fauna habitat and native vegetation to contaminants | H | L | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Equipment design fit for purpose. Ponds are lined in accordance with applicable standards. Interceptor ponds skimmed. Regular operator checks, inspection and maintenance. Minimum freeboard maintained in storage ponds. Integrity management plans implemented for below and above ground pipelines. Monitoring (and response to) upstream and downstream activities, and response, that might cause overflow. Continued competency assessment, education and training of individuals responsible for activities associated with operation of Moomba Plant. Safe work permits must be obtained to ensure only individuals with proper clearance can conduct work. Loss of containment is managed via the incident management system (IMS) and implementation of corrective actions is based on incident investigation. Level alarms in sumps provide real time monitoring to inform incident response. Implementation of spill response procedures, which include immediate reporting of spills/leaks. Emergency spill response equipment maintained and tested on site. | LOW |
| Table 7-8 | | Loss of containment associated with storage of oil and tank farm and road tankers | Exposure of native fauna habitat and vegetation to contaminants | H | L | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Equipment design fit for purpose. Plant and equipment designed and constructed in accordance with Santos SMS and Engineering Standards (e.g. SMS11.2 Facilities Design and Construction), and relevant Australian/International standards (e.g. AS 1210). Instrumentation, high-level alarms and controls incorporated into tank design. Floating roof storage tanks individually bunded in accordance with relevant guidelines e.g. EPA Bunding Guidelines. Truck load-in area designed with sumps and pumps. Operated under Reliability and Maintenance Management System (RAMMS) framework, Asset Integrity Management System (AIMS) and SMS standards. Operator checks and monitoring. Internal and external inspections of tanks as per applicable standards and industry guidelines. Continued competency assessment, education and training of individuals responsible for activities associated with operation of Moomba Plant. Safe work permits must be obtained to ensure only individuals with proper clearance can conduct work. Loss of containment is managed via the incident management system (IMS) and implementation of corrective actions is based on incident investigation. Emergency response procedures are implemented in accordance with Regulation 31. Implementation of spill response procedures, which include immediate reporting of spills/leaks. Emergency spill response equipment maintained and tested on site | LOW |
| Table 7-8 | | Loss of containment and inappropriate management of Moomba waste streams and wastewaters (sour water east flow) | Exposure of native habitats and vegetation to contaminants | H | L | H | L | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Approximately 2000 $m^3$/day of sour water is transferred to an engineered waste lagoon referred to as 'Lake Brooks'. Data from 2013 showed that sour water had a high salinity and elevated levels of aluminium and boron that can affect native fauna and native vegetation. Studies are undertaken to investigate wastewater management options for the Moomba Gas Plant to identify modifications that could be implemented based on operational requirements and constraints. Implementation of Wastewater Management Plan. Licenced contractors and waste trucks contracted; and applicable WTCs completed in accordance with regulations, as required. Loss of containment is managed via the incident management system (IMS) and implementation of corrective actions is based on incident investigation Response. Loss of containment is reported and investigated. Emergency response procedures are implemented and emergency spill response equipment maintained and tested on site. Segregation and applicable storage of waste and wastewater streams. Licenced landfill operated in accordance with licence conditions and landfill environmental managment plan. | LOW |
| Table 7-8 | | Explosion, fire or flood event at Moomba Facility | Impact to native habitat and vegetation | H | H | H | H | L | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Equipment design fit for purpose. Safety Case assessment and review undertaken every 5 years validating risk management systems, and identification and management of critical barriers through the relevant risk assessment/management process. Safety, testing, maintenance and inspection procedures are implemented. Continued competency assessment, education and training of individuals responsible for activities associated with operation of Moomba Plant. Safe Work Permit system implemented to ensure only individuals with proper clearance can conduct work on inside Moomba Plant. Hazardous area management criteria are continuously reviewed according to relevant Australian Standards and legislative requirements. Operated under Reliability and Maintenance Management System (RAMMS) framework, Asset Integrity Management System (AIMS) and SMS standards. Emergency response procedures are implemented in accordance with Regulation 31. Implementation of spill response procedures, which include immediate reporting of spills/leaks. Emergency spill response equipment maintained and tested on site. Emergency response procedures contain a bushfire scenario. | LOW |

| REF | TYPE OF IMPACT | EVENT(S) | POTENTIAL CONSEQUENCES | SIZE | SCOPE | DURATION | FREQUENCY | STAKEHOLDERS | SIGNIFICANCE | AVOIDANCE | PROBABILITY | DURATION | SIZE AND SCOPE | CUMULATIVE EFFECTS | STAKEHOLDERS | SIGNIFICANCE | ASSOCIATED INFORMATION | Environmental significance |
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| Table 7-3, Table 7-5, Table 7-10 | | Vegetation clearing for construction and maintenance activities | Loss of or damage to native vegetation and fauna habitat | H | H | H | H | H | 1 | No | Medium | Long | Confined | Yes | No | 3 | Minimise vegetation disturbance, and plan construction to avoid areas of sensitive vegetation. Use existing routes/disturbed ground where practicable. Sensitive environments and Ramsar sites are considered during route selection. Avoid important or 'priority' native vegetation where possible. Undertaking a Safety Management Study during the design process to address location and non-location specific threats and develop adequate controls to mitigate environmental and public/third party safety risk. Use of Santos systems for vegetation clearance approvals, which triggers further assessment where required. Prior to greenfield disturbance, or subsequent re-disturbance, a Santos Environmental Adviser and/or ecologist undertakes an environmental assessment in accordance with the relevant Santos standards, the SEO and recommendations based on field inspections, which includes a site inspection for potential sensitive receptors. Relevant internal and external approvals in place before work undertaken. Implementation of the Environmental Sensitivity Profile (ESP) tool to assess proposed pipeline routes for rare, vulnerable and endangered flora and fauna species before the commencement of construction and implement appropriate avoidance or mitigation measures. Stockpile and clear vegetation and respread following construction works to facilitate revegetation. Where possible trim vegetation rather than clearing. Unauthorised off-road or off-lease driving or creation of shortcuts is unacceptable. Relevant internal and external approvals in place before work undertaken. Compliance with SEB offset obligations. No domestic pets allowed at camps or worksites. Feeding of native fauna (e.g. dingoes) is prohibited. | MED |
| | | | Introduction and/or spread of pest plants | H | L | H | H | L | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | | LOW |
| Table 7-10 | | Earthworks and heavy vehicle movement relating to road construction and maintenance | Damage to native vegetation | H | H | H | H | H | 1 | No | Medium | Short | Confined | N/A | N/A | 2 | Relevant internal and external approvals in place before work undertaken. Consider alternate routes, locations and construction methods during planning and scouting phase to minimise environmental impacts. Use existing routes/disturbed areas where practicable. Off-road or off-lease driving or creation of shortcuts is prohibited. First disturbances (such as location scouting) are undertaken in accordance with Santos standards. Management of sensitive areas (e.g. sloped areas or gibber) is detailed in scope of works, approval documents and company procedures. Erosion is controlled by appropriate placement, batter slopes and construction of water flow diversion banks.The location of new borrow pits considers: minimisation of impacts to the environment (e.g. native vegetation and landforms); minimising water retention; avoidance of sites of cultural and heritage significance; stakeholder engagement to minimise impact to third party operations. Road construction in heavily wooded areas, such as Coolibah woodland, is minimised as far as practicable. Where pest plants are identified, contaminated material will not be moved to another location. Monitoring and pest plant control measures are implemented where required. Vegetation clearance is minimised as far as practicable. Roads are located and constructed to maintain pre-existing water flows (e.g. channel contours are maintained on floodplains and at creek crossings). Roads constructed at (or not significantly above) the natural surface as a minimum standard.<br>Culverts and floodways are installed where required to maintain water flows, drainage and surface runoff. Where required, detailed hydrological assessment is undertaken for structures such as roads in floodplains or creek crossings to ensure no significant impacts on surface water flows or aquatic fauna (e.g. fish passage must be maintained). Sensitive land systems (e.g. wetlands) are avoided wherever possible. Where activities are undertaken in or near these areas, appropriate review, assessment and mitigation measures are in place to ensure that surface water flows are maintained and contamination of surface water and groundwater resources is avoided. Monitoring of erosion and drainage patterns post-construction and corrective actions implemented where required. Reinstate construction areas as soon as practicable. Rip areas of compacted soil (except on gibber plains and tableland environments). Respread topsoil and stockpiled vegetation.<br>Total or partial restoration of borrow pits as soon as practicable. Restore natural contours to minimise impacts to natural drainage patterns. | LOW |
| | | | Introduction and/or spread of pest plants | H | L | H | H | L | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | | LOW |
| Table 7-10 | | Ignition of fire along road corridor | Impacts to native vegetation | L | L | H | H | L | 2 | No | Low | N/A | N/A | N/A | N/A | 1 | Operation under fire permit requirements. No smoking or safe smoking areas away from equipment or activity. Personnel are trained to supervise and instruct individuals entering area to conduct work. Safe work permits must be obtained to ensure only individuals with proper clearance can conduct works. Petrol vehicles to be excluded from sites. Emergency response procedures contain a bushfire scenario. Safety, testing, maintenance and inspection procedures are implemented. | LOW |
| Table 7-11 | | Storage and transport of general waste | Damage to native vegetation | H | H | H | H | H | 1 | Yes | N/A | N/A | N/A | N/A | N/A | 1 | Designed and engineered facilities in accordance with EPA requirements. Application of the waste hierarchy system (avoid, reduce, reuse, recycle, treat, dispose). Waste management is undertaken in accordance with applicable regulatory requirements and licences. Compliance with EPA licence conditions and requirements of the Environment Protection Act 1993 and relevant regulations. Periodic auditing of waste management facilities for compliance against licence and regulatory requirements. Waste streams are segregated on site where appropriate to maximise opportunities for waste recovery, reuse and recycling. Covered bins are provided for the collection and storage of wastes. Rubbish loads are covered during transport to a licensed waste facility. Waste Management Plan. Landfill Environmental Management Plan. Landfarm Management Plans. Inspections, monitoring and maintenance of facilities. Fit for purpose plant and equipment. | LOW |
| Table 7-11 | | Sewage treatment and effluent management | Damage to native vegetation | H | H | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Fit for purpose plant and equipment. Use of permanent septic systems with long term camps where possible. Secondary treated sewage wastewater is disposed of onto land well away from any place from which it is reasonably likely to enter any waters, and to minimise spray drift and ponding. Fencing installed where required around irrigation areas. Wastewater Management Plan. Periodic auditing of wastewater management facilities for compliance again licence and regulatory requirements. Department of Health and Ageing approved transportable aerated wastewater treatment plants for temporary purposes, such as camps. Wastewater (sewage and grey water) disposal where possible in accordance with the South Australian Public Health (Wastewater) Regulations 2013 and/or in consultation with the Department for Health and Ageing and/or in accordance with licenses/permits, if any. Appropriate controls for management of sewage effluent (developed in consultation with Department for Health and Ageing) implemented for situations where excursions outside effluent quality guidelines may occur (e.g. startup or system upset). Inspections, monitoring and maintenance of facilities. | LOW |
| | | | Introduction and/or spread of pest plants | H | L | H | H | L | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | | LOW |
| Table 7-11 | | Management of hazardous materials (chemicals, asbestos) | Impacts to native vegetation | H | H | H | H | H | 1 | Yes | N/A | N/A | N/A | N/A | N/A | 1 | Designed and engineered containment facilities. Application of the waste hierarchy system (avoid, reduce, reuse, recycle, treat, dispose). Compliance to requirements of EPA licence conditions and requirements of the Environment Protection Act 1993 and relevant regulations. Waste streams are segregated on site where appropriate to maximise opportunities for waste recovery, reuse and recycling. Waste Management Plan. Landfill Environmental Management Plan. Disposal of asbestos containing material in accordance with the Work Health and Safety Act 2012 and the Work Health and Safety Regulations 2012. Inspection and maintenance of facilities. Transportation of chemicals, fuels and oils in accordance with the Safety Data Sheet (SDS), Santos' SMS, and relevant guidelines such as the ADG Code. Regularly educate staff of product, review and monitor chemical and fuel transportation, including signage/labelling, proper packing and tie downs. WTC documentation, use of licenced contractors. Loss of containment is managed via the incident management system (IMS) and implementation of corrective actions is based on incident investigation. SDSs available. | LOW |
| Table 7-12 | | Extraction of water from the Cooper Creek | Damage to native vegetation | H | H | H | H | H | 1 | Yes | N/A | N/A | N/A | N/A | N/A | 1 | Approval for extraction is gained through internal Santos processes. Application will include estimated total volume of water required. A request to extract water from Cooper Creek must demonstrate that PFW and/or groundwater of an acceptable quality cannot be sourced within an economically viable haulage distance (maximum 2 hour return journey). Approved extraction occurs where potential risks to existing users downstream of Callyamurra have been assessed and impacts mitigated. Any approved extraction occurs where water flow at Callamurra is >= 2.15m (>= 0.1m flow at Innamincka Causeway) and rising. Water should not be extracted from permanent water refuges (e.g Callyamurra). Maps of approved surfacewater extraction points at Innamincka, Kudrieke and Mitchie Crossings are included in Appendix E. Extraction only occurs at these points, and does not involve permanent pumping stations. Cumulative extraction is capped at 15ML per year. Extraction volumes recorded in monitoring database and included in annual DEM reporting. | LOW |
| | | | Introduction and/or spread of pest plants | H | L | H | H | L | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | | LOW |
| Table 7-3, Table 7-5 | | Loss of Containment - on- or off-site of fuels and chemicals | Damage to native vegetation | H | H | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Transportation, storage and handling of chemicals, fuels and oils in accordance with the Safety Data Sheet (SDS), Santos' SMS, and relevant standards and guidelines such as the EPA Bunding Guidelines and AS 1940. Regularly educate staff of product, review and monitor chemical and fuel transportation, including signage/labelling, proper packing and tie downs. Cover dry chemicals during transportation. Chemical and fuel storage procedures, including signage, are reviewed and monitored in audit process in accordance with relevant Santos standard. Removal of fuel or chemicals from site where inundation or flooding is a risk. Loss of containment is managed via the incident management system (IMS) and implementation of corrective actions is based on incident investigation. Appropriate emergency/spill response procedures for loss of containment. Spill response and clean up. Fencing of affected areas if threat is posed to livestock or native fauna. Emergency response procedures are carried out in accordance with Regulation 31. | LOW |
| Section 5, Appendix A | Native Fauna Impacts | | | | | | | | | | | | | | | | Terrestrial and avian fauna present in the Cooper Basin area include: mammals; small mammals such as Fat-tailed and Stripe-faced Dunnarts, Giles Planigale, Sandy Inland Mouse and House Mouse are common. Other mammals present include Little Broad-nosed Bat and Lesser Long-eared bat. Larger mammal species include the Red Kangaroo, Dingo, and non-native species including cattle, cat, rabbit and fox. Reptiles; common reptiles include Fat-tailed Gecko, Eastern Brown Snake, Sand Goanna, Sandplain Ctenotus, Ghost Skink, Painted Dragon and Curl snake. Amphibians: ten frog species have been recorded in the Cooper Creek system including several species of burrowing frog which may be relatively widespread and other that would be restricted to areas near water except during flooding. Bird species present include Australian magpie, Galah, Brown Falcon, Budgerigar, Black-faced Woodswallow and Little Corella. The Cooper Creek system supports a diverse array of aquatic fauna including waterbirds, fish, frogs and aquatic invertebrates. The wetlands associated with the North-West branch of the Cooper Creek, including the Coongie Lakes, are recognised as a region of exceptional ecological value. They provide a feeding, resting and breeding site for large numbers of migratory and nomadic birds. The most abundant species during flooding include Grey Teal, Pink-eared Duck, Wood Duck, Australian Pelican, Great Cormorant, Black Swan, Eurasian Coot, Black-tailed Native-Hen, and Red-necked Avocet. they also support rare or threatened waterbird species such as Freckled Duck, Musk Duck, Little Egret and Intermediate Egret. In dry periods, aquatic fauna are concentrated in refuges such as Coongie Lakes and the permanent waterholes on the upstream reaches of the Cooper south Australia. During flooding, these fauna increase rapidly in abundance and occur across the vast area of channels, waterholes, swamps and floodplains in the Cooper Creek system. A number of species listed under Commonwealth (Environment Protection and Biodiversity Conservation Act 1999) and state (National Parks and Wildlife Act 1972) legislation are known to occur in the cooper Basin. Listed rare and threatened species that have been recorded or predicted to occur in the region are listed in Appendix 2. | |
| Table 7-3, Table | | Earthworks, including grading, trenching, backfilling, reinstating and stockpiling for pipeline and | Impeded native fauna movement through construction/decommissioning zone | H | H | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Minimise vegetation disturbance, and plan construction to avoid areas of sensitive vegetation. Use existing routes/disturbed ground where practicable. Sensitive environments and Ramsar sites are considered during route selection. Avoid important or 'priority native vegetation where possible. Undertaking a Safety Management Study during the design process to address location and non-location specific threats and develop adequate controls to mitigate environmental and public/third party safety risk. Use of Santos systems for vegetation clearance approvals, which triggers further assessment where required. Prior to greenfield disturbance, or subsequent re-disturbance, a Santos Environmental Adviser and/or ecologist undertakes an environmental assessment in accordance with the relevant Santos standards, the SEO and recommendations based on field inspections, which includes a site inspection for potential sensitive receptors. Relevant internall and external approvals in place before work undertaken. Implementation of the Environmental Sensitivity Profile (ESP) tool to assess proposed pipeline routes for rare, vulnerable and | LOW |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7-3 | | facility construction, operation and decommissioning activities | Impacts to native fauna | H | H | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | endangered flora and fauna species before the commencement of construction and implement appropriate avoidance or mitigation measures. Stockpile and clear vegetation and respread following construction works to facilitate revegetation. Where possible trim vegetation rather than clearing. Unauthorised off-road or off-lease driving or creation of shortcuts is unacceptable. Implementation of the Cooper Basin Pest Plants and Animals Management Plan. Facilities are designed and constructed to minimise impacts to native fauna. Minimise the time trench lines and excavations remain open, with a corresponding increase in the frequency of native fauna exit structures. Assets decommissioning to be in accordance with SMS, which defines minimum mandatory requirements for the planning and management of asset decommissioning. | LOW |
| Table 7-3, Table 7-5 | | Movement of heavy machinery and vehicles for pipeline and facility construction, operation and decommissioning activities | Injury to or death of native fauna | H | L | H | L | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Undertaking a Safety Management Study during the design process to address location and non-location specific threats and develop adequate controls to mitigate environmental and public/third party safety risk. Driving on designated areas only (i.e. lease and access tracks). Unauthorised off-road or off-lease driving or creation of shortcuts is unacceptable. Induction of employees and contractor personnel with respect to road use and driver behaviour. Assets decommissioning to be in accordance with SMS, which defines minimum mandatory requirements for the planning and management of asset decommissioning. | LOW |
| Table 7-3 | | Loss of containment of gas, sludge or oil from pipeline | Impacts or injury to, or loss of, native fauna | H | L | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Fit for purpose equipment. Installation of emergency isolation valves where required. All new Santos pipelines are designed, tested and constructed in general accordance with AS 2885 requirements to have sufficient strength, ductility and toughness to withstand design loads to which it may be subjected during cons truction, testing and operation. Undertaking a Safety Management Study during the design process to address location and non-location specific threats and develop adequate controls to mitigate environmental and public/third party safety risk. Safety, testing, maintenance and inspection procedures are implemented according to the IMP. Prestart-up checklist prior to commissioning and decommissioning activities. Pipeline construction integrity verification e.g. hydrotest (records maintained). Supported above ground pipelines are inspected to minimise the potential for contact with surface soils as a result of sand/sand drift or failure of pipe supports. Adherence to Santos standards and implemetation of management systems to monitor infrastructure. Santos safety checks, inspections and risk assessments. QA/QC checks prior to hydrocarbon introduction into pipe. Continued competency assessment, education and training of individuals responsible for activities with pipeline construction and operation. Personnel are trained to supervise and instruct individuals entering lease to conduct work. Safe work permits must be obtained to ensure only individuals with proper clearance can conduct work on a lease. Hazardous area management criteria are followed. Monitoring of weather conditions. Restrictred access to site. Loss of containment is managed via the incident management system (IMS) and implementation of corrective actions is based on incident investigation. Pipeline HC removal (via pigging) prior to decommissioning. Regularly educate staff on emergency response procedures. Appropriate emergency response plans are in place. Annual review and exercise of response equipment and procedures to ensure preparedness. Emergency spill response equipment on site. Spill response and clean up. Areas assessed for contamination and remediated where required on decommissioning. | LOW |
| Table 7-3 | | Loss of containment of chemicals, fuel or hydrotest water associated with pipeline construction, operation and decommissioning activities | Impacts to native vegetation or fauna habitats | H | L | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Undertaking a Safety Management Study during the design process to address location and non-location specific threats and develop adequate controls to mitigate environmental and public/third party safety risk. Fuel, oil and chemical storage and handling in accordance with the Safety Data Sheet (SDS), Santos' SMS, EPA Bunding Guidelines and AS 1940. Regularly educate staff of product, review and monitor chemical and fuel storage, including signage/labelling, proper packing and tie downs. Regularly educate staff on emergency response procedures. Use of biocides and corrosion inhibitor chemicals are kept to a minimum and where practicable biocides which degrade rapidly when exposed to UV are used. Management of water containing biocide, other chemicals or hydrocarbons, may either be into existing lines and fenced evaporation ponds, or to satellite facility pond systems. Loss of containment is managed via the incident management system (IMS) and implementation of corrective actions is based on incident investigation. Ecolocigal assessment of new proposed lease sites to evaluate sensitivity, including habitat assessment. Storage fuels and chemicals in designated areas. Scheduled (and/or upon request) removal of waste from operational sites. Spill response and clean up. Pond construction to include steep sided edges to prohibit vegetation growth and /or creation of breaches which could attract birdlife. Erection of fencing around infrastructure to limit access by livestock and native fauna, where required. Regular and ongoing inspection by site operators to ensure integrity of site controls, such as fencing. Implementation of appropriate emergency/spill response procedures. Annual review and exercise of response equipment and procedures to ensure preparedness. Spill response and clean up. Fencing of impacted areas if threat is posed to native fauna or livestock. | LOW |
| Table 7-3, Table 7-5 | | Flooding fo surrounding floodplain/watercourses during construction, operation and decommissioning | Exposure of contaminants to native fauna | H | L | H | H | L | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Measures undertaken to reduce potential impacts of flooding where appropriate (e.g. installation of bunds, removal of contents prior to arrival of flood event, maintain a minimum freeboard in ponds). Monitoring and communicating Cooper Basin Flood Reports, when available. Works programs in floodplain areas scheduled to take into action seasonal conditions and rainfall/flood likelihood. Construction activity not undertaken during flood warning period. Fully containerised tanks used for on-site storage. Planning of installation of new satellite facilitities addresses flood risk. Implementation of flood response management plan. Fuel, oil and chemical storage and handling in accordance with the Safety Data Sheet (SDS), Santos' SMS, EPA Bunding Guidelines and AS 1940. Regularly educate staff of product, review and monitor chemical and fuel storage, including signage/labelling, proper packing and tie downs. Loss of containment is management via the incident management system (IMS) and implementation of corrective action is based on incident investigation. Manage upstream facilities/assets to mitigate potential hazards at the satellite. Fencing of affected areas if threat is posed to livestock or native fauna. | LOW |
| Table 7-15 | | Spills or leaks associated with chemical and fuel storage and handling | Injury or loss of native fauna through exposure | H | H | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Fuel, oil and chemical storage and handling in accordance with the Safety Data Sheet (SDS), Santos' SMS, EPA Bunding Guidelines and AS 1940. Regularly educate staff of product, review and monitor chemical and fuel transportation, includnig signage/labelling, proper packing and tie downs. Driver training and use of in Vehicle Monitoring System (IVMS) to track speed, route and harsh braking. Use of Safety Data Sheets. Licensed operators and site induction process. Loss of containment is managed via the incident management system (IMS) and implementation of corrective actions is based on incident investigation. Logged incidents are reviewed and areas for improvement are identified for includino in furture improvement plans. Regular monitoring of control systems (including emergenlcy shutdown valaves) to ensure that protection levels are adequate. Appropriate emergency response plans in place. Emergency spill response equipment on site. Spill response and clean up. Fencing of affected areas if threat is posed to native fauna. | LOW |
| Table 7-5 | | Fugitive emissions to atmosphere, venting of carbon dioxide, hydrogen sulphide and carbon monoxide, and claring propand, butane, methane and ethane associated with satellite facilities operation | Impacts to native fauna (birds) | H | H | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Implementation of a preventative maintenance strategy to minimise fugitive releases. Consideration of reasonable and practicable measures to minimise greenhouse gas emissions in accordance with Santos' Climate Change Policy. Loss of containment is managed via the incident management system (IMS) and implementation of correction action is based on incident investigation. Gas detection is undertaken within operational areas in accordance with Santos' SMS. Equipment operated and maintained in line with manufacturer specifications. Remote location of satellite facilitites. Equipment designed, installed and operated and maintained to Australian standards, in line with manufacturer specifications. Minimise frequency and duration of venting. Emissions reported annually in accordance with National Pollution Inventory. Fit for purpose equipment. Use of separators and vertical flare stack to eliminate unburnt gases. Preventative maintenance mitigating amount of unnecessary flaring due to valve performance. Operator routine inspection and corrective maintenance. Flaring and venting activites are actively managed and minimised. Continual review and improvement of operations. Competent site personnel and contractors on site at all times. Continued competency assessment, eduction and training of individuals responsible for activities associated with satellite facilities. Restricted access to satellites and signage to inform the public and third parties. Landowners notified of proposed operations and consultation process initiated to ensure appropriate procedures in place to mitigate impacts. Consideration of proximity to surrounding infrastructure and implementation of a flare exclusion zone. | LOW |
| Table 7-5 | | Loss of containment of hydrocarbons outside area designed to contain spills (pipe rupture, reliefs, fittings or leaks from plant or other sources) | Injury to or loss of native fauna | H | L | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Plant and equipment designed and constructed in accordance with Santos SMS and Engineering Standards (e.g. SMS11.2 Facilities Design and Construction), and relevant Australian/International standards (e.g. AS 1210). To minimise the potential for failure and optimise plant longevity, Santos uses an Integrity Management Program (IMP). The IMP provides a systematic approach to plant operation and maintenance activities in conjunction with the application of appropriate standards to minimise risk to public and third party safety, and the environment. Fit for purpose equipment. Operated under Reliability and Maintenance Management System (RAMMS) framework, Asset Integrity Management System (AIMS) and SMS standardd. Inline monitoring alarms, fusible loop system (in the event of a fire). Auto shutdown system. Identification of critical barriers and monitoring/maintenance using performance standards. Safety, testing, maintenance and inspection procedures are implemented. Personnel are trained to supervise and instruct individuals entering site to conduct work. Continued competency assessment, education and training of individuals responsible for activities associated with satellite facilities. Safe work permits must be obtained to ensure only individuals with proper clearance can conduct work on a lease. Hazardous area management criteria are followed. Restricted access to site. Loss of containment is managed via the incident management system (IMS) and implementation of corrective actions is based on incident investigation. Approvals planned to minimise hazardous situations, with controls in place to address risks. Regular review and exercise of response equipment and procedures. Emergency spill equipment on site. Emergency response training for emergency response personnel. Implementation of emergency/spill response procedures. Fencing of contaminated area if threat is posed to livestock or native fauna. | LOW |
| 4.5.3, Table 7-6 | | Storage and disposal of PFW at production facilities | Injury to or loss of native fauna | H | H | H | L | H | 1 | No | Medium | Long | Confined | Yes | No | 3 | PFW facilities are designed and constructed in accordance with the relevant standards of the day (e.g. EPA Wastewater Lagoon Construction Guidelines) and may include use of synthetic and/or clay liners. PFW pond systems design, includes detailed planning and consideration of flood risks, proximity to floodplains, waterways and other sensitive receptors. As per standard day-to-day operations, routine inspection of hose lines, connections, high pressure equipment and trip systems are undertaken to identify operational faults and ensure design limits are not compromised during operation. Where required, emergency shutdown systems are installed to prevent uncontrolled releases. Water Quality Monitoring as required. Pond skimming and hydrocarbon recovery. Seepage monitoring (visual or physical i.e. soil sampling). Pond level/capacity monitoring. Pond systems are designed in such a way that concentration of Total Recoverable Hydrocarbons (TRH) in the final-stage pond of any PFW pond system should not exceed: 30 mg/L in an engineered evaporation pond or 10 mg/L in a free-form evaporation pond. PFW plant and pond system maintenance and inspection schedules. | MED |
| | | | Increased grazing/predator pressure | H | H | H | L | H | 1 | No | Medium | Long | Confined | Yes | No | 3 | | MED |
| Table 7-3, Table 7-5 | | Flooding fo surrounding floodplain/watercourses during construction, operation and decommissioning | Exposure of native fauna to contaminants | H | L | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | PFW pond systems designed, which includes detailed planning and consideration of flow risks, proximity to floodplains, waterways and other sensitive receptors. Measures undertaken to reduce potential impacts of flooding where appropriate (e.g. installation of bunds, removal of contents prior to arrival of flood event, maintain a minimum freeboard in ponds). PFW plant and pond system maintenance and inspection schedules. Monitoring and communicating Cooper Basin Flood reports, when available. | LOW |

| REF | TYPE OF IMPACT | EVENT(S) | POTENTIAL CONSEQUENCES | SIZE | SCOPE | DURATION | FREQUENCY | STAKEHOLDERS | SIGNIFICANCE | AVOIDANCE | PROBABILITY | DURATION | SIZE AND SCOPE | CUMULATIVE EFFECTS | STAKEHOLDERS | SIGNIFICANCE | ASSOCIATED INFORMATION | Environmental significance |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4.5.3, Table 7-6 | | Secondary use of PFW associated with production facility | Exposure of native fauna to contaminants | H | H | H | H | H | 1 | No | Medium | Short | Confined | N/A | N/A | 2 | Relevant external approvals obtained where required. Liaise with landowners where required. Reuse is managed in accordance with relevant water quality criteria (e.g. Australian Water Quality Guidelines for Fresh and Marine Waters (ANZECC 2000)) and risk assessment outcomes. Risk to sensitive receptors is minimised by implementation of Santos standards and internal approvals processes. | LOW |
| Table 7-7 | | Loss of containmant of Improved/Enhanced Oil Recovery reinjection water (PFW water containing chemicals including biocide) | Native fauna acces to contaminants | H | L | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Plant and equipment designed and constructed in accordance with Santos SMS and Engineering Standards (e.g. SMS11.2 Facilities Design and Construction), and relevant Australian/International standards (e.g. AS 2885). Injection surface infrastructure (pumps, flowlines, filtration, chemical dosing facilities) equipped with automatic overpressure shut downs and telemetry monitoring. Quality control of pond construction including above ground earthen bunds to prevent surface water ingress. Ponds designed with liners, as required. Equipment designed and operated in accordance with relevant standards and guidelines. Injection fluid is transferred lines that are rated and tested to meet project requirements. Injection surface infrastructure equipped with shut downs and injection monitoring. Makeup water stored in designated ponds. Maintain minimum pond freeboard. Regular inspection and maintenance of pond walls. Transfer lines tested and maintained to design conditions. Pipeline monitored for leaks (pressure gauges and visual inspection) as per Santos standards. Tracers (if used) are added to the fluid injection well under controlled conditions by specialist contractors in a sealed/closed system Loss of containment is managed via the incident management system (IMS) and implementation of corrective actions is based on incident investigation. Loss of containment is managed via the incident management system (IMS) and implementation of corrective actions is based on incident investigation. | LOW |
| Table 7-7 | | Improved/Enhanced Oil Recovery fracture propagation out of target zone | Impacts to environmental receptors | H | L | H | L | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Reservoir modelling for injection scheme design. Completion design for injection wells. Use of Fit for purpose equipment. Integrity of the well bore and packer are routinely tested. Cement bond logs run to test for poor cement bonds where appropriate. Real time pressure monitoring on injection wells and over pressure protection. Injection operating guidelines. Ongoing monitoring of reservoir response to injection. Well integrity management system, testing, maintenance and inspection procedures are implemented. Ensure individuals in areas of responsibility are trained to handle events | LOW |
| Table 7-8 | | Loss of containment of oily sludge during collection, transfer/transport and treatment (on-site) | Exposure of native fauna to contaminants | H | L | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Oil sludge, which is collected from tank bottoms, sumps and interceptor ponds, is managed at the sludge treatment plant. Pits are lined in accordance with applicable standards of the day. Sludge treatment plant is a purpose built and fully contained facility. Operated under Reliability and Maintenance Management System (RAMMS) framework, Asset Integrity Management System (AIMS) and SMS standards. Sludge cake removed and treated off-site through licensed waste transport contractors. Adherence to EPA guidelines (WTC) processes. Minimum freeboard maintained in storage ponds. Continued competency assessment, education and training of individuals responsible for activities associated with operation of Moomba Gas Plant. Loss of containment is managed via the incident management system (IMS) and implementation of corrective actions is based on incident investigation. Safe work permits must be obtained to ensure only individuals with proper clearance can conduct work. Implementation of emergency response procedures and appropriate emergency response plans in place. Emergency spill response equipment maintained and tested on site. Moomba interceptor and pond system is fenced - pest animal access and sand drift control. Greater Moomba Area is fenced. Manual skimming of interceptor ponds. | LOW |
| Table 7-8 | | Loss of containment of Moomba Plant oil/oily water or sour water (west flow) including Moomba North, LRP, PFW, RGCP/Benfield Trains | Exposure of native fauna and habitat to contaminants | H | H | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Equipment design fit for purpose. Ponds are lined in accordance with applicable standards. Interceptor ponds skimmed. Regular operator checks, inspection and maintenance. Minimum freeboard maintained in storage ponds. Integrity management plans implemented for below and above ground pipelines. Monitoring (and response to) upstream and downstream activities, and response, that might cause overflow. Continued competency assessment, education and training of individuals responsible for activities associated with operation of Moomba Plant. Safe work permits must be obtained to ensure only individuals with proper clearance can conduct work. Loss of containment is managed via the incident management system (IMS) and implementation of corrective actions is based on incident investigation. Level alarms in sumps provide real time monitoring to inform incident response. Implementation of spill response procedures, which include immediate reporting of spills/leaks. Emergency spill response equipment maintained and tested on site. Greater Moomba Area is fenced. | LOW |
| Table 7-8 | | Loss of containment associated with storage of oil and tank farm and road tankers | Exposure of native fauna to contaminants | H | L | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Equipment design fit for purpose. Plant and equipment designed and constructed in accordance with Santos SMS and Engineering Standards (e.g. SMS11.2 Facilities Design and Construction), and relevant Australian/International standards (e.g. AS 1210). Instrumentation, high-level alarms and controls incorporated into tank design. Floating roof storage tanks individually bunded in accordance with relevant guidelines e.g. EPA Bunding Guidelines. Truck load-in area designed with sumps and pumps. Operated under Reliability and Maintenance Management System (RAMMS) framework, Asset Integrity Management System (AIMS) and SMS standards. Operator checks and monitoring. Internal and external inspections of tanks as per applicable standards and industry guidelines. Continued competency assessment, education and training of individuals responsible for activities associated with operation of Moomba Plant. Safe work permits must be obtained to ensure only individuals with proper clearance can conduct work. Loss of containment is managed via the incident management system (IMS) and implementation of corrective actions is based on incident investigation. Emergency response procedures are implemented in accordance with Regulation 31. Implementation of spill response procedures, which include immediate reporting of spills/leaks. Emergency spill response equipment maintained and tested on site. Fencing minimises entry of native fauna. | LOW |
| Table 7-8 | | Loss of containment and inappropriate management of Moomba waste streams and wastewaters (sour water east flow) | Exposure of native fauna to contaminants | H | L | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Approximately 2000 $m^3$/day of sour water is transferred to an engineered waste lagoon referred to as 'Lake Brooks'. Data from 2013 showed that sour water had a high salinity and elevated levels of aluminium and boron that can affect native fauna and native vegetation. Studies are undertaken to investigate wastewater management options for the Moomba Gas Plant to identify modifications that could be implemented based on operational requirements and constraints. Implementation of Wastewater Management Plan. Licenced contractors and waste trucks contracted; and applicable WTCs completed in accordance with regulations, as required. Loss of containment is managed via the incident management system (IMS) and implementation of corrective actions is based on incident investigation Response. Loss of containment is reported and investigated. Emergency response procedures are implemented and emergency spill response equipment maintained and tested on site. Segregation and applicable storage of waste and wastewater streams. Licenced landfill operated in accordance with licence conditions and landfill environmental managment plan. | LOW |
| Table 7-8 | | Explosion, fire or flood event at Moomba Facility | Impact to native fauna | H | L | H | H | H | 1 | No | Medium | Short | Confined | N/A | N/A | 2 | Equipment design fit for purpose. Safety Case assessment and review undertaken every 5 years validating risk management systems, and identification and management of critical barriers through the relevant risk assessment/management process. Safety, testing, maintenance and inspection procedures are implemented. Continued competency assessment, education and training of individuals responsible for activities associated with operation of Moomba Plant. Safe Work Permit system implemented to ensure only individuals with proper clearance can conduct work on inside Moomba Plant. Hazardous area management criteria are continuously reviewed according to relevant Australian Standards and legislative requirements. Operated under Reliability and Maintenance Management System (RAMMS) framework, Asset Integrity Management System (AIMS) and SMS standards. Emergency response procedures are implemented in accordance with Regulation 31. Implementation of spill response procedures, which include immediate reporting of spills/leaks. Emergency spill response equipment maintained and tested on site. Emergency response procedures contain a bushfire scenario. No access to Moomba Gas Plant compound due to security and fencing. | LOW |
| Table 7-3, Table 7-5, Table 7-10 | | Vegetation clearing for construction and maintenance activities | Impeded native fauna movement through construction zone | H | H | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Minimise vegetation disturbance, and plan construction to avoid areas of sensitive vegetation. Use existing routes/disturbed ground where practicable. Sensitive environments and Ramsar sites are considered during route selection. Avoid important or 'priority' native vegetation where possible. Undertaking a Safety Management Study during the design process to address location and non-location specific threats and develop adequate controls to mitigate environmental and public/third party safety risk. Use of Santos systems for vegetation clearance approvals, which triggers further assessment where required. Prior to greenfield disturbance, or subsequent re-disturbance, a Santos Environmental Adviser and/or ecologist undertakes an environmental assessment in accordance with the relevant Santos standards, the SEO and recommendations based on field inspections, which includes a site inspection for potential sensitive receptors. Relevant internal and external approvals in place before work undertaken. Implementation of the Environmental Sensitivity Profile (ESP) tool to assess proposed pipeline routes for rare, vulnerable and endangered flora and fauna species before the commencement of construction and implement appropriate avoidance or mitigation measures. Stockpile and clear vegetation and respread following construction works to facilitate revegetation. Where possible trim vegetation rather than clearing. Unauthorised off-road or off-lease driving or creation of shortcuts is unacceptable. Relevant internal and external approvals in place before work undertaken. Compliance with SEB offset obligations. Roads are designed and constructed to minimise impacts to native fauna. Feeding of native fauna (e.g. dingoes) is prohibited. | LOW |
| Table 7-10 | | Earthworks and heavy vehicle movement relating to road construction and maintenance | Impeded native fauna movement through construction zone | H | H | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Relevant internal and external approvals in place before work undertaken. Consider alternate routes, locations and construction methods during planning and scouting phase to minimise environmental impacts. Use existing routes/disturbed areas where practicable. Off-road or off-lease driving or creation of shortcuts is prohibited. First disturbances (such as location scouting) are undertaken in accordance with Santos standards. Management of sensitive areas (e.g. sloped areas or gibber) is detailed in scope of works, approval documents and company procedures. Erosion is controlled by appropriate placement, batter slopes and construction of water flow diversion banks.The location of new borrow pits considers: minimisation of impacts to the environment (e.g. native vegetation and landforms); minimising water retention; avoidance of sites of cultural and heritage significance; stakeholder engagement to minimise impact to third party operations. Road construction in heavily wooded areas, such as Coolibah woodland, is minimised as far as practicable. Where pest plants are identified, contaminated material will not be moved to another location. Monitoring and pest plant control measures are implemented where required. Vegetation clearance is minimised as far as practicable. Roads are located and constructed to maintain pre-existing water flows (e.g. channel contours are maintained on floodplains and at creek crossings). Roads constructed at (or not significantly above) the natural surface as a minimum standard.<br>Culverts and floodways are installed where required to maintain water flows, drainage and surface runoff. Where required, detailed hydrological assessment is undertaken for structures such as roads in floodplains or creek crossings to ensure no significant impacts on surface water flows or aquatic fauna (e.g. fish passage must be maintained). Sensitive land systems (e.g. wetlands) are avoided wherever possible. Where activities are undertaken in or near these areas, appropriate review, assessment and mitigation measures are in place to ensure that surface water flows are maintained and contamination of surface water and groundwater resources is avoided. Monitoring of erosion and drainage patterns post-construction and corrective actions implemented where required. Reinstate construction areas as soon as practicable. Rip areas of compacted soil (except on gibber plains and tableland environments). Respread topsoil and stockpiled vegetation. Total or partial restoration of borrow pits as soon as practicable. Restore natural contours to minimise impacts to natural drainage patterns. | LOW |
| | | | Injury or death of native fauna in construction zone | H | H | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | | LOW |
| | | | Collision with native fauna resulting in injury or loss | H | H | H | L | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | | LOW |

| REF | TYPE OF IMPACT | EVENT(S) | POTENTIAL CONSEQUENCES | SIZE | SCOPE | DURATION | FREQUENCY | STAKEHOLDERS | SIGNIFICANCE | AVOIDANCE | PROBABILITY | DURATION | SIZE AND SCOPE | CUMULATIVE EFFECTS | STAKEHOLDERS | SIGNIFICANCE | ASSOCIATED INFORMATION | Environmental significance |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Table 7-10 | | Ignition of fire along road corridor | Injury or loss of native fauna | L | L | H | H | L | 2 | No | Low | N/A | N/A | N/A | N/A | 1 | Operation under fire permit requirements. No smoking or safe smoking areas away from equipment or activity. Personnel are trained to supervise and instruct individuals entering area to conduct work. Safe work permits must be obtained to ensure only individuals with proper clearance can conduct works. Petrol vehicles to be excluded from sites. Emergency response procedures contain a bushfire scenario. Safety, testing, maintenance and inspection procedures are implemented. | LOW |
| Table 7-11 | | Storage and transport of general waste | Scavenging by native and pest species | H | L | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Designed and engineered facilities in accordance with EPA requirements. Application of the waste hierarchy system (avoid, reduce, reuse, recycle, treat, dispose). Waste management is undertaken in accordance with applicable regulatory requirements and licences. Compliance with EPA licence conditions and requirements of the Environment Protection Act 1993 and relevant regulations. Periodic auditing of waste management facilities for compliance against licence and regulatory requirements. Waste streams are segregated on site where appropriate to maximise opportunities for waste recovery, reuse and recycling. Covered bins are provided for the collection and storage of wastes. Rubbish loads are covered during transport to a licensed waste facility. Waste Management Plan. Landfill Environmental Management Plan. Landfarm Management Plans. Inspections, monitoring and maintenance of facilities. | LOW |
| | | | Injury or loss of native fauna and or fauna habitat | H | H | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | | LOW |
| Table 7-11 | | Sewage treatment and effluent management | Scavenging by native and pest species | H | L | L | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Fit for purpose plant and equipment. Use of permanent septic systems with long term camps where possible. Secondary treated sewage wastewater is disposed of onto land well away from any place from which it is reasonably likely to enter any waters, and to minimise spray drift and ponding. Fencing installed where required around irrigation areas. Wastewater Management Plan. Periodic auditing of wastewater management facilities for compliance again licence and regulatory requirements. Department of Health and Ageing approved transportable aerated wastewater treatment plants for temporary purposes, such as camps. Wastewater (sewage and grey water) disposal where possible in accordance with the South Australian Public Health (Wastewater) Regulations 2013 and/or in consultation with the Department for Health and Ageing and/or in accordance with licenses/permits, if any. Appropriate controls for management of sewage effluent (developed in consultation with Department for Health and Ageing) implemented for situations where excursions outside effluent quality guidelines may occur (e.g. startup or system upset). Inspections, monitoring and maintenance of facilities. | LOW |
| | | | Injury or loss of native fauna and or fauna habitat | H | H | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | | LOW |
| Table 7-11 | | Management of Contaminated Soil | Exposure of native fauna to contaminants | H | H | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Suitably designed and engineered facility in accordance with EPA guidelines. Compliance with EPA licence conditions and regulatory requirements. Development and implementation of Landfarm Management Plan, which documents operational controls, management practices and Santos standards. | LOW |
| Table 7-11 | | Management of hazardous materials (chemicals, asbestos) | Exposure of native fauna to harmful chemicals | H | H | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Designed and engineered containment facilities. Application of the waste hierarchy system (avoid, reduce, reuse, recycle, treat, dispose). Compliance to requirements of EPA licence conditions and requirements of the Environment Protection Act 1993 and relevant regulations. Waste streams are segregated on site where appropriate to maximise opportunities for waste recovery, reuse and recycling. Waste Management Plan. Landfill Environmental Management Plan. Disposal of asbestos containing material in accordance with the Work Health and Safety Act 2012 and the Work Health and Safety Regulations 2012. Inspection and maintenance of facilities. Transportation of chemicals, fuels and oils in accordance with the Safety Data Sheet (SDS), Santos' SMS, and relevant guidelines such as the ADG Code. Regularly educate staff of product, review and monitor chemical and fuel transportation, including signage/labelling, proper packing and tie downs. WTC documentation, use of licenced contractors. Loss of containment is managed via the incident management system (IMS) and implementation of corrective actions is based on incident investigation. SDSs available. | LOW |
| | | | Injury or loss of native fauna and or fauna habitat | H | H | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | | LOW |
| Table 7-12 | | Extraction of water from Cooper Creek | Impacts to Native Fauna | H | H | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Approval for extraction is gained through internal Santos processes. Application will include estimated total volume of water required. A request to extract water from Cooper Creek must demonstrate that PFW and/or groundwater of an acceptable quality cannot be sourced within an economically viable haulage distance (maximum 2 hour return journey). Approved extraction occurs where potential risks to existing users downstream of Callyamurra have been assessed and impacts mitigated. Any approved extraction occurs where water flow at Callamurra is >= 2.15m (>= 0.1m flow at Innamincka Causeway) and rising. Water should not be extracted from permanent water refuges (e.g Callyamurra). Maps of approved surfacewater extraction points at Innamincka, Kudrieke and Mitchie Crossings are included in Appendix E. Extraction only occurs at these points, and does not involve permanent pumping stations. Cumulative extraction is capped at 15ML per year. Extraction volumes recorded in monitoring database and included in annual DEM reporting. | LOW |
| Table 7-13 | | Combustion of gas for steam and power supply | Impacts to native fauna - birds | H | H | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Fit for purpose equipment. Remote location of Moomba Gas Plant. Plant and equipment designed and constructed in accordance with Santos. SMS and Engineering Standards (e.g. SMS11.2 Facilities Design and Construction), and relevant Australian/International standards (e.g. AS 1210). Reliability and Maintenance Management System (RAMMS) framework. Asset Integrity Management System (AIMS). SMS standards. Equipment and plant maintenance (preventative and corrective). Application of the waste hierarchy system (avoid, reduce, reuse, recycle, treat, dispose). Compliance to applicable licence and regulatory requirements. Waste streams are segregated on site where appropriate to maximise opportunities for waste recovery, reuse and recycling.<br>Covered bins are provided for the collection and storage of wastes. Rubbish loads are covered during transport to a licensed waste facility. Wastewater Management Plan | LOW |
| Table 7-15 | | Loss of Containment from fuel and chemical storage - on- or off-site | Injury to or loss of native fauna | H | H | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Transportation, storage and handling of chemicals, fuels and oils in accordance with the Safety Data Sheet (SDS), Santos' SMS, and relevant standards and guidelines such as the EPA Bunding Guidelines and AS 1940. Regularly educate staff of product, review and monitor chemical and fuel transportation, including signage/labelling, proper packing and tie downs. Cover dry chemicals during transportation. Chemical and fuel storage procedures, including signage, are reviewed and monitored in audit process in accordance with relevant Santos standard. Removal of fuel or chemicals from site where inundation or flooding is a risk. Loss of containment is managed via the incident management system (IMS) and implementation of corrective actions is based on incident investigation. Appropriate emergency/spill response procedures for loss of containment. Spill response and clean up. Fencing of affected areas if threat is posed to livestock or native fauna. Emergency response procedures are carried out in accordance with Regulation 31. | LOW |
| Table 7-16 | | Plane Accident at Moomba airport | Injury to or loss of native fauna | H | L | H | L | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Foreign object debris (FOD) fencing. Airline provider has applicable licenses, registrations and safe track record. Airport is operated in accordance with Civil Aviation Safety Authority (CASA) standards. Jet A-1 fuel supply and storage meets industry standards. Restricted access to the airport and aerodrome. Management of vegetation and surface water ponding adjacent to the airport to minimise attraction of wildlife (e.g. Black Kites). Covered bins are provided for the collection and storage of wastes to minimise attraction of wildlife. Emergency response plans are in place for aircraft incidents. Implementation of emergency/spill response procedures. | LOW |
| Table 7-18 | | Loss of containment, innapropriate management of waste at camps, offices and contractor facilities | Scavenging by native and pest species | H | H | H | L | H | 1 | No | Medium | Short | Confined | N/A | N/A | 2 | Sewage (and grey water) is treated by septic or by the Moomba WWTP. Application of the waste hierarchy system (avoid, reduce, reuse, recycle, treat, dispose). Procurement processes to embed specific conditions in contracts, which includes a LTO. Compliance to applicable licence, Santos and regulatory requirements. Waste streams are segregated on site where appropriate to maximise opportunities for waste recovery, reuse and recycling. Covered bins are provided for the collection and storage of wastes. Waste is removed regularly. Waste Management Plan and Wastewater Management Plan. | LOW |
| Table 7-18 | | Vehicle collision at camps and within the confines of offices or contractor facilities | Injury to or loss of native fauna | H | H | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Active promotion of appropriate road use behaviours. Induction of employees and contractor personnel with respect to road use and driver behaviour. Setting of appropriate speed limits for oil and gas industry personnel. Use of In Vehicle Monitoring System (IVMS) to track speed, route and harsh braking. Driver awareness training mandatory for all company and contractor personnel. Policy of driving with vehicle lights on. Signage erected to warn of possible hazards on the roads. Driving on designated areas only (i.e. access tracks and designated lease areas). Reporting systems in place for recording injuries and accidents. Procurement processes to embed specific conditions in contracts, which includes a LTO. | LOW |
| | Air Impacts | | | | | | | | | | | | | | | | | |
| Table 7-3 | | Loss of containment of gas, sludge or oil from pipeline | Localised reduction in air quality with greenhouse gas emissions. | H | L | H | L | H | 1 | No | Medium | Short | Confined | N/A | N/A | 2 | Fit for purpose equipment. Installation of emergency isolation valves where required. All new Santos pipelines are designed, tested and constructed in general accordance with AS 2885 requirements to have sufficient strength, ductility and toughness to withstand design loads to which it may be subjected during cons truction, testing and operation. Undertaking a Safety Management Study during the design process to address location and non-location specific threats and develop adequate controls to mitigate environmental and public/third party safety risk. Safety, testing, maintenance and inspection procedures are implemented according to the IMP. Prestart-up checklist prior to commissioning and decommissioning activities. Pipeline construction integrity verification e.g. hydrotest (records maintained). Supported above ground pipelines are inspected to minimise the potential for contact with surface soils as a result of sand/sand drift or failure of pipe supports. Adherence to Santos standards and implemetation of management systems to monitor infrastructure. Santos safety checks, inspections and risk assessments. QA/QC checks prior to hydrocarbon introduction into pipe. Continued competency assessment, education and training of individuals responsible for activities with pipeline construction and operation. Personnel are trained to supervise and instruct individuals entering lease to conduct work. Safe work permits must be obtained to ensure only individuals with proper clearance can conduct work on a lease. Hazardous area management criteria are followed. Monitoring of weather conditions. Restrictred access to site. Loss of containment is managed via the incident management system (IMS) and implementation of corrective actions is based on incident investigation. Pipeline HC removal (via pigging) prior to decommissioning. Regularly educate staff on emergency response procedures. Appropriate emergency response plans are in place. Annual review and exercise of response equipment and procedures to ensure preparedness. Emergency spill response equipment on site. Spill response and clean up. Areas assessed for contamination and remediated where required on decommissioning. | LOW |
| | | | Explosion with purging and venting of hydrocarbon gases | H | L | H | L | H | 1 | No | Medium | Short | Confined | N/A | N/A | 2 | | LOW |
| Table 7-3 | | Ignition of fire along ROW during pipeline construction, operation and decommissioning activities | Localised reduction in air quality with generation of greenhouse gas emissions | H | L | H | L | L | 2 | No | Low | N/A | N/A | N/A | N/A | 1 | Operation under fire permit requirements. Personnel are trained to supervise and instruct individuals entering area to conduct work. Safe work permits and hot work permits must be obtained to ensure only indivudals with proper clearance can conduct works. Management plans and procedures for construction and decommissioning activities include fire management and firewatchers, as required. Safety, testing, maintenance and inspection procedures are implemented. Emergency response procedures contain a bushfire scenario. Implementation of appropriate emergency response procedures. Spill response and clean up. | LOW |

| REF | TYPE OF IMPACT | EVENT(S) | POTENTIAL CONSEQUENCES | SIZE | SCOPE | DURATION | FREQUENCY | STAKEHOLDERS | SIGNIFICANCE | AVOIDANCE | PROBABILITY | DURATION | SIZE AND SCOPE | CUMULATIVE EFFECTS | STAKEHOLDERS | SIGNIFICANCE | ASSOCIATED INFORMATION | Environmental significance |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Table 7-5 | | Loss of containment of hydrocarbons outside area designed to contain spills (pipe rupture, reliefs, fittings or leaks from plant or other sources) | Generation of greenhouse gas emissions, localised reduction in air quality, potential for fire/explosion | H | L | H | H | L | 1 | No | Medium | Short | Confined | N/A | N/A | 2 | Fit for purpose equipment. Consideration of proximity to surrounding infrastructure and implementation of a flare exclusion zone. Plant and equipment designed and constructed in accordance with Santos SMS and Engineering Standards (e.g. SMS11.2 Facilities Design and Construction), and relevant Australian/International Standards (e.g. AS 1210). Preferential use of diesel vehicles. Process safety and integrity management systems featured in the FFP. Minimising volume of flammable/combustible substances through all phases of works. Consideration of weather conditions i.e. wind direction. Safety, testing, maintenance and inspection procedures are implemented. Personnel are trained to supervise and instruct individuals entering site to conduct work. Continued competency assessment, eductation and training of individuals responsible for activities associated with satellilite facilities. Safe work permits must be obtained to ensure only individuals with proper clearance can conduct work at operational facilities. Hazardous area management criteria are followed. HAZOP reviews. Ignition sources are controlled via permit to work. Restricted access to site. Red alert days (additional checks and balances). Appropriate emergency response plans in place. Emergency response training for emergency response personnel. Emergency spill reponse equipment on site. Spill response and clean up. | LOW |
| | | | Localised reduction in air quality | H | L | H | H | H | 1 | No | Medium | Short | Confined | N/A | N/A | 2 | | LOW |
| Table 7-5 | | Fugitive emissions to atmosphere, venting of carbon dioxide, hydrogen sulphide and carbon monoxide, and flaring propane, butane, methane and ethane associated with satellite facilities operation | Generation of significant greenhouse gas emissions | H | L | H | H | L | 1 | No | Medium | Short | Medium | Yes | Yes | 3 | Restricted access to satellites and signage to inform public and third parties. Implementation of a preventative maintenance strategy to minimise fugitive releases. Consideration of reasonable and practicable measures to minimise greenhouse gas emissions in accordance with Santos' Climate Change Policy. Loss of containment is managed via the incident management system (IMS) and implementation of correction action is based on incident investigation. Gas detection is undertaken within operational areas in accordance with Santos' SMS. Equipment operated and maintained in line with manufacturer specifications. Remote location of satellite facilitites. Equipment designed, installed and operated and maintained to Australian standards, in line with manufacturer specifications. Minimise frequency and duration of venting. Emissions reported annually in accordance with National Pollution Inventory. Fit for purpose equipment. Use of separators and vertical flare stack to eliminate unburnt gases. Preventative maintenance mitigating amount of unnecessary flaring due to valve performance. Operator routine inspection and corrective maintenance. Flaring and venting activites are actively managed and minimised. Continual review and improvement of operations. Competent site personnel and contractors on site at all times. Continued competency assessment, eduction and training of individuals responsible for activities associated with satellite facilities. | MED |
| | | | Reduction in localised air quality | H | L | H | H | L | 1 | No | Medium | Short | Medium | Yes | Yes | 3 | | MED |
| Table 7-5 | | Loss of containment of hydrocarbons outside area designed to contain spills (pipe rupture, reliefs, fittings or leaks from plant or other sources) | Generation of greenhouse gas emissions, localised reduction in air quality, potential for fire/explosion | H | L | H | H | L | 1 | No | Medium | Short | Confined | N/A | N/A | 2 | Plant and equipment designed and constructed in accordance with Santos SMS and Engineering Standards (e.g. SMS11.2 Facilities Design and Construction), and relevant Australian/International standards (e.g. AS 1210). To minimise the potential for failure and optimise plant longevity, Santos uses an Integrity Management Program (IMP). The IMP provides a systematic approach to plant operation and maintenance activities in conjunction with the application of appropriate standards to minimise risk to public and third party safety, and the environment. Fit for purpose equipment. Operated under Reliability and Maintenance Management System (RAMMS) framework, Asset Integrity Management System (AIMS) and SMS standardd. Inline monitoring alarms, fusible loop system (in the event of a fire). Auto shutdown system. Identification of critical barriers and monitoring/maintenance using performance standards. Safety, testing, maintenance and inspection procedures are implemented. Personnel are trained to supervise and instruct individuals entering site to conduct work. Continued competency assessment, education and training of individuals responsible for activities associated with satellite facilities. Safe work permits must be obtained to ensure only individuals with proper clearance can conduct work on a lease. Hazardous area management criteria are followed. Restricted access to site. Loss of containment is managed via the incident management system (IMS) and implementation of corrective actions is based on incident investigation. Approvals planned to minimise hazardous situations, with controls in place to address risks. Regular review and exercise of response equipment and procedures. Emergency spill equipment on site. Emergency response training for emergency response personnel. Implementation of emergency/spill response procedures. Fencing of contaminated area if threat is posed to livestock or native fauna. | LOW |
| Table 7-8 | | Gas processing - co2 trains, Moomba North associated with greenhouse (and other) gas emissions, fire from loss of containment | Generation of greenhouse gas emissions and localised reduction in air quality | H | L | H | H | L | 1 | No | Medium | Short | Confined | N/A | N/A | 2 | Fit for purpose equipment. Plant and equipment designed and constructed in accordance with Santos SMS and Engineering Standards (e.g. SMS11.2 Facilities Design and Construction), and relevant Australian/International standards (e.g. AS 1210). Remote location of Moomba Gas Plant. Reliability and Maintenance Management System (RAMMS) framework. Asset Integrity Management System (AIMS) SMS standards. Authorised emissions. Dispersion monitoring and modelling. Routinely undertake stack monitoring. | LOW |
| Table 7-8 | | Failure of floating roof and fugitive venting of gases associated with Liquids processing (tank farm and truck load in) | Greenhouse gas emissions and localised reduction in air quality | H | L | L | H | H | 1 | No | Medium | Short | Confined | N/A | N/A | 2 | fit for purpose equipment. Plant and equipment designed and constructed in accordance with Santos SMS and Engineering Standards (e.g. SMS11.2 Facilities Design and Construction), and relevant Australian/International standards (e.g. AS 1210). Minimisation of vapour space between material stored and the roof of the floating storage tanks to limit production loss. Rempte location of Moomba Gas Plant. Santos continues to consider all reasonable and practicable measures to minimise greenhouse gas emissions from the operation of the Moomba Gas Plant, and in doing so, pursue strategies that address the issue of climate change, in accordance with Santos' Climate Change Policy. Reliability and Maintanance Management System (RAMMS) framework. Regular inspections. Upstream controls - total vapour pressure operating window. Installation of alarms in storage tanks to assist operators in identifying faults or failures of the floating rood. Emergency shutdown and response plans in place. | LOW |
| Table 7-8 | | Operation of flares associated with the Moomba Gas Plant | Localised reduction in air quality | H | H | H | H | H | 1 | No | Medium | Short | Confined | N/A | N/A | 2 | Fit for purpose equipment. Remote location of Moomba Gas Plant. Fuel, flare and vent monitoring and measuring - optimising flame quailty, minimising use of gas. Reliability and maintenance management system (RAMMS) framework Asset Integrity Management System (AIMS) and SMS standards. Authorised emissions. Dispersion monitoring and modelling. Where possible, liquids are diverted to the flare gas recovery compressor and recovered as fuel gas, in preferrence to being flared. | LOW |
| Table 7-8 | | Explosion, fire or flood event at Moomba Facility | Generation of greenhouse gas emissions and localised reduction in air quality | H | L | H | L | H | 1 | No | Medium | Short | Confined | N/A | N/A | 2 | Equipment design fit for purpose. Safety Case assessment and review undertaken every 5 years validating risk management systems, and identification and management of critical barriers through the relevant risk assessment/management process. Safety, testing, maintenance and inspection procedures are implemented. Continued competency assessment, education and training of individuals responsible for activities associated with operation of Moomba Plant. Safe Work Permit system implemented to ensure only individuals with proper clearance can conduct work on inside Moomba Plant. Hazardous area management criteria are continuously reviewed according to relevant Australian Standards and legislative requirements. Operated under Reliability and Maintenance Management System (RAMMS) framework, Asset Integrity Management System (AIMS) and SMS standards. Emergency response procedures are implemented in accordance with Regulation 31. Implementation of spill response procedures, which include immediate reporting of spills/leaks. Emergency spill response equipment maintained and tested on site. Emergency response procedures contain a bushfire scenario. No access to Moomba Gas Plant compound due to security and fencing. | LOW |
| Table 7-10 | | Ignition of fire along road corridor | Generation of greenhouse gas emissions and localised reduction in air quality | H | L | L | H | H | 1 | No | Medium | Short | Confined | N/A | N/A | 2 | Operation under fire permit requirements. No smoking or safe smoking areas away from equipment or activity. Personnel are trained to supervise and instruct individuals entering area to conduct work. Safe work permits must be obtained to ensure only individuals with proper clearance can conduct works. Petrol vehicles to be excluded from sites. Emergency response procedures contain a bushfire scenario. Safety, testing, maintenance and inspection procedures are implemented. | LOW |
| Table 7-13 | | Combustion of gas for steam and power supply | Generation of greenhouse gas emissions and localised reduction in air quality | H | L | H | H | H | 1 | No | Medium | Medium | Confined | Yes | Yes | 3 | Fit for purpose equipment. Remote location of Moomba Gas Plant. Plant and equipment designed and constructed in accordance with Santos. SMS and Engineering Standards (e.g. SMS11.2 Facilities Design and Construction), and relevant Australian/International standards (e.g. AS 1210). Reliability and Maintenance Management System (RAMMS) framework. Asset Integrity Management System (AIMS). SMS standards. Equipment and plant maintenance (preventative and corrective). Application of the waste hierarchy system (avoid, reduce, reuse, recycle, treat, dispose). Compliance to applicable licence and regulatory requirements. Waste streams are segregated on site where appropriate to maximise opportunities for waste recovery, reuse and recycling. Covered bins are provided for the collection and storage of wastes. Rubbish loads are covered during transport to a licensed waste facility. Wastewater Management Plan. | MED |
| Table 7-17 | | Explosion or uncontrolled fire at fire training ground | Generation of greenhouse gas emissions and localised reduction in air quality | H | L | H | H | H | 1 | No | Medium | Short | Confined | N/A | N/A | 2 | No smoking or safe smoking areas away from equipment or activity. Personnel are trained to supervise and instruct individuals entering area to conduct work. Safe work permits must be obtained to ensure only individuals with proper clearance can conduct works. Safety, testing, maintenance and inspection procedures are implemented. Spill response and clean up. Implementation of appropriate emergency/spill response procedures for explosion or fire. | LOW |
| | **Social Environment** | | | | | | | | | | | | | | | | | |

| REF | TYPE OF IMPACT | EVENT(S) | POTENTIAL CONSEQUENCES | SIZE | SCOPE | DURATION | FREQUENCY | STAKEHOLDERS | SIGNIFICANCE | AVOIDANCE | PROBABILITY | DURATION | SIZE AND SCOPE | CUMULATIVE EFFECTS | STAKEHOLDERS | SIGNIFICANCE | ASSOCIATED INFORMATION | Environmental significance |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Section 5 | Community Resource/ Existing Land Use Impacts | | | | | | | | | | | | | | | | The major land uses in the Cooper Basin are pastoralism, oil and gas production, conservation and tourism. Pastoralism, mainly in the form of cattle grazing, has a long history in the region, beginning in the late 1800s and continuing today. The floodplains surrounding the Cooper Creek in particular provide pasture and reliable water supplies in the form of permanent waterholes. While stocking rates are relatively low the region continues to support a substantial cattle production operation which is an important contributor to the local economy. Pastoral leases in the region include: Alton Downs, Bollards Lagoon, Clifton Hills, Cordillo Downs, Gidgealpa, Innamincka, Lindon, Merty Merty, Mulka, Mungeranie, and Pandie Pandie. There are a number of properties in the region that have achieved certification for organic beef production. Landholders in Beach's operations regions are also certified under Quality Assurance systems such as the Livestock Production Assurance program, which places emphasis on minimising the risk of chemical contamination, bruising and hide damage and ensuring effective herd management and improvement. Oil and gas exploration in the Cooper Basin commenced in 1954 and the Cooper Basin has become a major supplier of oil and gas in Australia since the discovery of gas reserves at Gidgealpa, near Moomba, in 1963. The actual area of land utilised for gas production is small, but the supporting infrastructure extends through much of the central and north eastern portion of the Cooper Basin in South Australia. Producing oil and gas fields are spread through pastoral lands and regional reserves and the Ramsar wetland declared area. The region contains some of South Australia's largest reserves dedicated under the National Parks and Wildlife Act 1972. The main parks and reserves of the broader region include the Innamincka Regional Reserve, Strzelecki Regional Reserve, Simpson Desert Regional Reserve and the Coongie Lakes National Park. The Innamincka, Coongie Lakes and Cooper Creek regions in north-eastern South Australia have increased in popularity over the past 30 years as a destination for tourists seeking a bush exploration experience. It has been previously estimated that annual visitation to Innamincka, forms part of the outback tourist highway between South Australia and Queensland. The Birdsville Track which connects the towns of Marree in South Australia and Birdsville in Queensland is also a major tourist route in the north-west of the region. The region is located in the unincorporated area of South Australia. Jurisdiction for the area falls under the responsibility of the Outback Communities Authority which provides limited local government-type support. The only township in the region is Innamincka, which has had a resident population in the order of 12 to 18 people. Infrastructure in the region is minimal. Unsealed roads service the district, with the Adelaide-Moomba Road and Dillions Highway being the major route through the region. | |
| Table 7-3, Table 7-5 | | Earthworks, including grading, trenching, backfilling, reinstating and stockpiling for pipeline and facility construction, operation and decommissioning activities | Dust generation | H | L | H | H | H | 1 | No | Medium | Short | Confined | N/A | N/A | 2 | Minimise vegetation disturbance, and plan construction to avoid areas of sensitive vegetation. Use existing routes/disturbed ground where practicable. Sensitive environments and Ramsar sites are considered during route selection. Avoid important or 'priority native vegetation where possible. Undertaking a Safety Management Study during the design process to address location and non-location specific threats and develop adequate controls to mitigate environmental and public/third party safety risk. Use of Santos systems for vegetation clearance approvals, which triggers further assessment where required. Prior to greenfield disturbance, or subsequent re-disturbance, a Santos Environmental Adviser and/or ecologist undertakes an environmental assessment in accordance with the relevant Santos standards, the SEO and recommendations based on field inspections, which includes a site inspection for potential sensitive receptors. Implementation of the Environmental Sensitivity Profile (ESP) tool to assess proposed pipeline routes for rare, vulnerable and endangered flora and fauna species before the commencement of construction and implement appropriate avoidance or mitigation measures. Stockpile and clear vegetation and respread following construction works to facilitate revegetation. Where possible trim vegetation rather than clearing. Unauthorised off-road or off-lease driving or creation of shortcuts is unacceptable. Relevant internal and external approvals (Notice of Entry) in place before work undertaken. Minimise impact by restricting earthworks to the minimum area necessary. Use existing routes/disturbed ground where practicable. Observation of procedures for location of services and infrastruture. Contractors are required to comply with Santos standards and procedures, which are incorporated into requirements of the procurement/tender process. Construction activities are undertaken in accordance with Santos standards and procedures. Unauthorised off-road and off-lease driving or creation of shortcuts is unacceptable. Sensitive gibber terrain is protected through appropriate construction and maintenance practices. Construction activities are not carried out on salt lakes as a preference. Off road/lease disturbance and first disturbance are undertaken in accordance with Santos standards. Management of sensitive areas (e.g. sloped areas or gibber) is detailed in scope of works, approval documents and company procedures. Dust suppression measures carried out where required to minimise safety hazards associated with poor visibility. Landholders are consulted as required where activities activities may affect pastoral operations and notified prior to survey, construction and undertaking of operations (pursuant to Regulations). Systems are in place for logging landholder complaints to ensure that issues are addressed as appropriate. Minimise the time that areas are open by undertaking progressive clearing and reinstatement of vegetation. Induscction of employee and contractor personnel with respect to pastoral landholders including issues such as use of gates, fencing and infrastructure. Reinstate construction areas as soon as possible. Respread top soil and stockpiled vegetation seedstock to facilitate revegetation. Assess the site for any contamination and remediate and validate where required. Minimise the time trench lines and excavations remain open, with a corresponding increase in the frequency of native fauna exist structures. Obtain excavation permits where required. Removal of waste to minimise visual impact and attraction of pests. Construction wastes are managed in accordance with relevant Santos standards, which includes the use of secure storage and transport of wastes. Application of the waste hierachy system (avoid, reduce, reuse, recycle, treat and dispose). Procurement processes and contracts manage contractor's activities. Assets decommissioning to be in accordance with SMS, which defines minimum mandatory requirements for the planning and management of asset decommissioning. | LOW |
| | | | Loss of visual amenity | H | H | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | | LOW |
| | | | Damage/disturbance to landholder/stakeholder infrastructure and activities and business reputation | H | H | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | | LOW |
| | | | Injury or loss of livestock | H | H | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | | LOW |
| | | Movement of heavy machinery and vehicles for pipeline and facility construction, operation and decommissioning activities | Damage to third party infrastructure | H | H | H | H | H | 1 | Yes | N/A | N/A | N/A | N/A | N/A | 1 | Rip areas of compacted soils (except on gibber or tablelands environments) where required. Consultation with landholders in relation to proposed routes. Minimise the creation of new access tracks. Undertaking a Safety Mangement Study during the design process to address loction and non-location specific threats and develop adequate controls to mitigate environmental and public/third party safety risk. Driving on designated area only (i.e. lease and access tracks). Unathorised off-road or off-lease driving or creation of shortcuts is unacceptable. Signage and road closures where appropriate. Communication of heavy vehicle movement and other potential hazards to safety associated with pipeline operations to potentially affected parties prior to commencement of operations. Dust suppression as required. Adherence to applicable road safety and transport legislation. Induction of employees and contractor personnel with respect to road use and driver behaviour, conservation and tourism. Implementation of a traffic management plan where required. Internal approvals system. | LOW |
| | | | Disruption to land use (e.g. grazing and recreation) | H | H | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | | LOW |
| | | | Dust generation | H | L | H | H | H | 1 | No | Medium | Short | Confined | N/A | N/A | 2 | | LOW |
| | | | Collision with livestock or native fauna resulting in injury or loss | L | H | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Pipeline operations are undertaken at locations where public access is restricted. Undertaking a Safety Management Study during the design process to address location and non-location specific threats and develop adequate controls to mitigate environmental and public/third party safety risk. Active promotion of appropriate road use behaviours. Induction of employees and contractor personnel with respect to road use and driver behaviour. Use of In Vehicle Monitoring System (IVMS) to track speed, route and harsh breaking for entire workforce, including contactors and/or other appropriate journey management systems. Setting of appropriate speed limits for Santos personnel and contractors. Driver awareness training mandatory for company and contractor personnel. Policy of driving with vehicle lights on. Minimising night-time driving to the greatest extent possible. Signage throughout the Cooper Basin to warn of possible hazards on the road. Driving on designated areas only (i.e. access tracks and designated lease areas). Procurement and contract management includes Environmental and Workplace Health and Safety Management Plan pre-qualification. Implementation of a construction management plan for contractors. Reporting system in place for reporting injuries and accidents. | LOW |
| Table 7-3 | | Loss of containment of gas, sludge or oil from pipeline | Impacts or injury to, or loss of, livestock | L | L | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Fit for purpose equipment. Installation of emergency isolation valves where required. All new Santos pipelines are designed, tested and constructed in general accordance with AS 2885 requirements to have sufficient strength, ductility and toughness to withstand design loads to which it may be subjected during cons truction, testing and operation. Undertaking a Safety Management Study during the design process to address location and non-location specific threats and develop adequate controls to mitigate environmental and public/third party safety risk. Safety, testing, maintenance and inspection procedures are implemented according to the IMP. Prestart-up checklist prior to commissioning and decommissioning activities. Pipeline construction integrity verification e.g. hydrotest (records maintained). Supported above ground pipelines are inspected to minimise the potential for contact with surface soils as a result of sand/sand drift or failure of pipe supports. Adherence to Santos standards and implemetation of management systems to monitor infrastructure. Santos safety checks, inspections and risk assessments. QA/QC checks prior to hydrocarbon introduction into pipe. Continued competency assessment, education and training of individuals responsible for activities with pipeline construction and operation. Personnel are trained to supervise and instruct individuals entering lease to conduct work. Safe work permits must be obtained to ensure only individuals with proper clearance can conduct work on a lease. Hazardous area management criteria are followed. Monitoring of weather conditions. Restrictred access to site. Loss of containment is managed via the incident management system (IMS) and implementation of corrective actions is based on incident investigation. Pipeline HC removal (via pigging) prior to decommissioning. Regularly educate staff on emergency response procedures. Appropriate emergency response plans are in place. Annual review and exercise of response equipment and procedures to ensure preparedness. Emergency spill response equipment on site. Spill response and clean up. Areas assessed for contamination and remediated where required on decommissioning. | LOW |
| | | | Impacts to stakeholder business reputation | L | L | L | H | L | 2 | No | Low | N/A | N/A | N/A | N/A | 1 | | LOW |
| | | | Potential impacts to third party groundwater users | H | L | L | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | | LOW |
| Table 7-3 | | Loss of containment of chemicals, fuel or hydrotest water associated with pipeline construction, operation and decommissioning activities | Exposure of contaminants to livestock | L | L | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Undertaking a Safety Management Study during the design process to address location and non-location specific threats and develop adequate controls to mitigate environmental and public/third party safety risk. Fuel, oil and chemical storage and handling in accordance with the Safety Data Sheet (SDS), Santos' SMS, EPA Bunding Guidelines and AS 1940. Regularly educate staff of product, review and monitor chemical and fuel storage, including signage/labelling, proper packing and tie downs. Regularly educate staff on emergency response procedures. Use of biocides and corrosion inhibitor chemicals are kept to a minimum and where practicable biocides which degrade rapidly when exposed to UV are used. Management of water containing biocide, other chemicals or hydrocarbons, may either be into existing lines and fenced evaporation ponds, or to satellite facility pond systems. Loss of containment is managed via the incident management system (IMS) and implementation of corrective actions is based on incident investigation. Ecologcal assessment of new proposed lease sites to evaluate sensitivity, including habitat assessment. Storage fuels and chemicals in designated areas. Scheduled (and/or upon request) removal of waste from operational sites. Spill response and clean up. Pond construction to include steep sided edges to prohibit vegetation growth and /or creation of breaches which could attract birdlife. Erection of fencing around infrastructure to limit access by livestock and native fauna, where required. Regular and ongoing inspection by site operators to ensure integrity of site controls, such as fencing. Implementation of appropriate emergency/spill response procedures. Annual review and exercise of response equipment and procedures to ensure preparedness. Spill response and clean up. Fencing of impacted areas if threat is posed to native fauna or livestock. | LOW |
| | | | Impacts to third party groundwater users | L | L | H | H | L | 2 | No | Low | N/A | N/A | N/A | N/A | 1 | | LOW |
| | | | Impacts to stakeholder business reputation | L | L | L | H | L | 2 | No | Low | N/A | N/A | N/A | N/A | 1 | | LOW |
| Table 7-5 | | Earthworks associated with facility construction (e.g. clearing, grading) | Injury or death of stock in construction area | H | H | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Minimise environmental impact by appropriate site selection to avoid sensitive land systems, vegetation and cultural heritage sites. Use existing disturbed areas where possible. Liaise with landowners regarding notification and management of works and site issues including livestock management. Implement dust control measures where required, using water efficient or waterless techniques where feasible. Undertake vehicle and equipment wash-down before entering Cooper Basin or after operating in areas of known weed infestations. Records of vehicle inspections and wash down are kept where relevant. Minimise consequences to fauna by leaving excavated areas open for as little time as possible. Utilise earthen fauna ramps to facilitate the movement of fauna out of excavations. Regularly inspect excavations for trapped fauna. Reinstate temporary construction areas (e.g. laydown) as soon as possible. Restore borrow pits or re-use as evaporation or water storage ponds where appropriate. Remove waste to minimise visual impact. | LOW |
| | | | Significant damage to third party infrastructure | H | H | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | | LOW |
| | | | Disruption to land use (e.g. grazing and recreation) | H | H | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | | LOW |

| REF | TYPE OF IMPACT | EVENT(S) | POTENTIAL CONSEQUENCES | SIZE | SCOPE | DURATION | FREQUENCY | STAKEHOLDERS | SIGNIFICANCE | AVOIDANCE | PROBABILITY | DURATION | SIZE AND SCOPE | CUMULATIVE EFFECTS | STAKEHOLDERS | SIGNIFICANCE | ASSOCIATED INFORMATION | Environmental significance |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Temporary loss of visual amenity | H | H | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | | LOW |
| Table 7-3 | | Ignition of fire along ROW during pipeline construction, operation and decommissioning activities | Damage to third party infrastructure | H | L | H | H | L | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Operation under fire permit requirements. Personnel are trained to supervise and instruct individuals entering area to conduct work. Safe work permits and hot work permits must be obtained to ensure only indivudals with proper clearance can conduct works. Management plans and procedures for construction and decommissioning activities include fire management and firewatchers, as required. Safety, testing, maintenance and inspection procedures are implemented. Emergency response procedures contain a bushfire scenario. Implementation of appropriate emergency response procedures. Spill response and clean up. | LOW |
| Table 7-5 | | Loss of containment of hydrocarbons outside area designed to contain spills (pipe rupture, reliefs, fittings or leaks from plant or other sources) | Impacts to third party groundwater users | H | L | H | H | L | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Fit for purpose equipment. Consideration of proximity to surrounding infrastructure and implementation of a flare exclusion zone. Plant and equipment designed and constructed in accordance with Santos SMS and Engineering Standards (e.g. SMS11.2 Facilities Design and Construction), and relevant Australian/International Standards (e.g. AS 1210). Preferential use of diesel vehicles. Process safety and integrity management systems featured in the FFP. Minimising volume of flammable/combustible substances through all phases of works. Consideration of weather conditions i.e. wind direction. Safety, testing, maintenance and inspection procedures are implemented. Personnel are trained to supervise and instruct individuals entering site to conduct work. Continued competency assessment, eductation and training of individuals responsible for activities associated with satellilite facilities. Safe work permits must be obtained to ensure only individuals with proper clearance can conduct work at operational facilities. Hazardous area management criteria are followed. HAZOP reviews. Ignition sources are controlled via permit to work. Restricted access to site. Red alert days (additional checks and balances). Appropriate emergency response plans in place. Emergency response training for emergency response personnel. Emergency spill reponse equipment on site. Spill response and clean up. | LOW |
| | | | Impacts to stakeholder business reputation | L | L | L | H | L | 2 | No | Low | N/A | N/A | N/A | N/A | 1 | | LOW |
| | | | Impacts to third party assets, includign livestock | H | L | L | H | L | 2 | No | Low | N/A | N/A | N/A | N/A | 1 | | LOW |
| Table 7-3, Table 7-5 | | Flooding fo surrounding floodplain/watercourses during construction, operation and decommissioning | Impacts to third party groundwater resources users | H | L | L | H | L | 2 | No | Low | N/A | N/A | N/A | N/A | 1 | Measures undertaken to reduce potential impacts of flooding where appropriate (e.g. installation of bunds, removal of contents prior to arrival of flood event, maintain a minimum freeboard in ponds). Monitoring and communicating Cooper Basin Flood Reports, when available. Works programs in floodplain areas scheduled to take into action seasonal conditions and rainfall/flood likelihood. Construction activity not undertaken during flood warning period. Fully containerised tanks used for on-site storage. Planning of installation of new satellite facilitities addresses flood risk. Implementation of flood response management plan. Fuel, oil and chemical storage and handling in accordance with the Safety Data Sheet (SDS), Santos' SMS, EPA Bunding Guidelines and AS 1940. Regularly educate staff of product, review and monitor chemical and fuel storage, including signage/labelling, proper packing and tie downs. Loss of containment is management via the incident management system (IMS) and implementation of corrective action is based on incident investigation. Manage upstream facilities/assets to mitigate potential hazards at the satellite. Fencing of contaminated areas if threat is posed to native fauna. | LOW |
| | | | Impacts to stakeholder business reputation | L | L | L | H | L | 2 | No | Low | N/A | N/A | N/A | N/A | 1 | | LOW |
| Table 7-15 | | Spills or leaks associated with chemical and fuel storage and handling | Potential impacts to third party groundwater users | H | H | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Fuel, oil and chemical storage and handling in accordance with the Safety Data Sheet (SDS), Santos' SMS, EPA Bunding Guidelines and AS 1940. Regularly educate staff of product, review and monitor chemical and fuel transportation, includnig signage/labelling, proper packing and tie downs. Driver training and use of in Vehicle Monitoring System (IVMS) to track speed, route and harsh braking. Use of Safety Data Sheets. Licensed operators and site induction process. Loss of containment is managed via the incident management system (IMS) and implementation of corrective actions is based on incident investigation. Logged incidents are reviewed and areas for improvement are identified for includino in furture improvement plans. Regular monitoring of control systems (including emergenlcy shutdown valaves) to ensure that protection levels are adequate. Appropriate emergency response plans in place. Emergency spill response equipment on site. Spill response and clean up. Fencing of affected areas if threat is posed to native fauna. | LOW |
| | | | Impacts to stakeholder business reputation | H | H | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | | LOW |
| | | | Injury to or loss of livestock through exposure | H | H | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | | LOW |
| Table 7-5 | | Loss of containment of hydrocarbons outside area designed to contain spills (pipe rupture, reliefs, fittings or leaks from plant or other sources) | Impacts to livestock | H | L | L | H | L | 2 | No | Low | N/A | N/A | N/A | N/A | 1 | Plant and equipment designed and constructed in accordance with Santos SMS and Engineering Standards (e.g. SMS11.2 Facilities Design and Construction), and relevant Australian/International standards (e.g. AS 1210). To minimise the potential for failure and optimise plant longevity, Santos uses an Integrity Management Program (IMP). The IMP provides a systematic approach to plant operation and maintenance activities in conjunction with the application of appropriate standards to minimise risk to public and third party safety, and the environment. Fit for purpose equipment. Operated under Reliability and Maintenance Management System (RAMMS) framework, Asset Integrity Management System (AIMS) and SMS standardd. Inline monitoring alarms, fusible loop system (in the event of a fire). Auto shutdown system. Identification of critical barriers and monitoring/maintenance using performance standards. Safety, testing, maintenance and inspection procedures are implemented. Personnel are trained to supervise and instruct individuals entering site to conduct work. Continued competency assessment, education and training of individuals responsible for activities associated with satellite facilities. Safe work permits must be obtained to ensure only individuals with proper clearance can conduct work on a lease. Hazardous area management criteria are followed. Restricted access to site. Loss of containment is managed via the incident management system (IMS) and implementation of corrective actions is based on incident investigation. Approvals planned to minimise hazardous situations, with controls in place to address risks. Regular review and exercise of response equipment and procedures. Emergency spill equipment on site. Emergency response training for emergency response personnel. Implementation of emergency/spill response procedures. Fencing of contaminated area if threat is posed to livestock or native fauna. | LOW |
| | | | Impacts to stakeholder business reputation | L | L | L | H | L | 2 | No | Low | N/A | N/A | N/A | N/A | 1 | | LOW |
| | | | Potential impacts to third party groundwater users | H | L | L | H | L | 2 | No | Low | N/A | N/A | N/A | N/A | 1 | | LOW |
| 4.5.3, Table 7-6 | | Storage and disposal of PFW at production facilities | Impacts to third party groundwater users | H | L | L | H | L | 2 | No | Low | N/A | N/A | N/A | N/A | 1 | PFW facilities are designed and constructed in accordance with the relevant standards of the day (e.g. EPA Wastewater Lagoon Construction Guidelines) and may include use of synthetic and/or clay liners. PFW pond systems design, includes detailed planning and consideration of flood risks, proximity to floodplains, waterways and other sensitive receptors. As per standard day-to-day operations, routine inspection of hose lines, connections, high pressure equipment and trip systems are undertaken to identify operational faults and ensure design limits are not compromised during operation. Where required, emergency shutdown systems are installed to prevent uncontrolled releases. Water Quality Monitoring as required. Pond skimming and hydrocarbon recovery. Seepage monitoring (visual or physical i.e. soil sampling). Pond level/capacity monitoring. Pond systems are designed in such a way that concentration of Total Recoverable Hydrocarbons (TRH) in the final-stage pond of any PFW pond system should not exceed: 30 mg/L in an engineered evaporation pond or 10 mg/L in a free-form evaporation pond. PFW plant and pond system maintenance and inspection schedules. | LOW |
| | | | Impacts to stakeholder business reputation | L | L | L | H | L | 2 | No | Low | N/A | N/A | N/A | N/A | 1 | | LOW |
| | | | Injury to or loss of livestock through exposure | L | L | L | H | H | 2 | No | Low | N/A | N/A | N/A | N/A | 1 | | LOW |

| REF | TYPE OF IMPACT | EVENT(S) | POTENTIAL CONSEQUENCES | SIZE | SCOPE | DURATION | FREQUENCY | STAKEHOLDERS | SIGNIFICANCE | AVOIDANCE | PROBABILITY | DURATION | SIZE AND SCOPE | CUMULATIVE EFFECTS | STAKEHOLDERS | SIGNIFICANCE | ASSOCIATED INFORMATION | Environmental significance |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Table 7-3, Table 7-5 | | Flooding fo surrounding floodplain/watercourses during construction, operation and decommissioning | Exposure of livestock to contaminants | H | L | H | H | L | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | PFW pond systems designed, which includes detailed planning and consideration of floow risks, proximity to floodplains, waterways and other sensitive receptors. Measures undertaken to reduce potential impacts of flooding where appropriate (e.g. installation of bunds, removal of contents prior to arrival of flood event, maintain a minimum freeboard in ponds). PFW plant and pond system maintenance and inspection schedules. Monitoring and communicating Cooper Basin Flood reports, when available. | LOW |
| 4.5.3, Table 7-6 | | Secondary use of PFW associated with production facility | Exposure of livestock to contaminants | H | H | H | H | L | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Relevant external approvals obtained where required. Liaise with landowners where required. Reuse is managed in accordance with relevant water quality criteria (e.g. Australian Water Quality Guidelines for Fresh and Marine Waters (ANZECC 2000)) and risk assessment outcomes. Risk to sensitive receptors is minimised by implementation of Santos standards and internal approvals processes. | LOW |
| Table 7-7 | | Loss of containmant of Improved/Enhanced Oil Recovery reinjection water (PFW water containing chemicals including biocide) | Livestock access to contaminants | H | L | L | H | L | 2 | No | Low | N/A | N/A | N/A | N/A | 1 | Plant and equipment designed and constructed in accordance with Santos SMS and Engineering Standards (e.g. SMS11.2 Facilities Design and Construction), and relevant Australian/International standards (e.g. AS 2885). Injection surface infrastructure (pumps, flowlines, filtration, chemical dosing facilities) equipped with automatic overpressure shut downs and telemetry monitoring. Quality control of pond construction including above ground earthen bunds to prevent surface water ingress. Ponds designed with liners, as required. Equipment designed and operated in accordance with relevant standards and guidelines. Injection fluid is transferred lines that are rated and tested to meet project requirements. Injection surface infrastructure equipped with shut downs and injection monitoring. Makeup water stored in designated ponds. Maintain minimum pond freeboard. Regular inspection and maintenance of pond walls. Transfer lines tested and maintained to design conditions. Pipeline monitored for leaks (pressure gauges and visual inspection) as per Santos standards. Tracers (if used) are added to the fluid injection well under controlled conditions by specialist contractors in a sealed/closed system Loss of containment is managed via the incident management system (IMS) and implementation of corrective actions is based on incident investigation. Loss of containment is managed via the incident management system (IMS) and implementation of corrective actions is based on incident investigation. | LOW |
| | | | Impacts to stakeholder business reputation | L | L | L | H | L | 2 | No | Low | N/A | N/A | N/A | N/A | 1 | | LOW |
| Table 7-7 | | Improved/Enhanced Oil Recovery fracture propagation out of target zone | Inability of third party groundwater users to undertake their respective activities | L | L | L | H | L | 2 | No | Low | N/A | N/A | N/A | N/A | 1 | Reservoir modelling for injection scheme design. Completion design for injection wells. Use of Fit for purpose equipment. Integrity of the well bore and packer are routinely tested. Cement bond logs run to test for poor cement bonds where appropriate. Real time pressure monitoring on injection wells and over pressure protection. Injection operating guidelines. Ongoing monitoring of reservoir response to injection. Well integrity management system, testing, maintenance and inspection procedures are implemented. Ensure individuals in areas of responsibility are trained to handle events | LOW |
| Table 7-8 | | Loss of containment of Moomba Plant oil/oily water or sour water (west flow) including Moomba North, LRP, PFW, RGCP/Benfield Trains | Impacts to third party groundwater users | H | H | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Equipment design fit for purpose. Ponds are lined in accordance with applicable standards. Interceptor ponds skimmed. Regular operator checks, inspection and maintenance. Minimum freeboard maintained in storage ponds. Integrity management plans implemented for below and above ground pipelines. Monitoring (and response to) upstream and downstream activities, and response, that might cause overflow. Continued competency assessment, education and training of individuals responsible for activities associated with operation of Moomba Plant. Safe work permits must be obtained to ensure only individuals with proper clearance can conduct work. Loss of containment is managed via the incident management system (IMS) and implementation of corrective actions is based on incident investigation. Level alarms in sumps provide real time monitoring to inform incident response. Implementation of spill response procedures, which include immediate reporting of spills/leaks. Emergency spill response equipment maintained and tested on site. Greater Moomba Area is fenced. | LOW |
| Table 7-8 | | Operation of flares associated with the Moomba Gas Plant | Loss of visual amenity | H | H | H | H | H | 1 | No | Medium | Short | Confined | N/A | N/A | 2 | Fit for purpose equipment. Remote location of Moomba Gas Plant. Fuel, flare and vent monitoring and measuring - optimising flame quailty, minimising use of gas. Reliability and maintenance management system (RAMMS) framework Asset Integrity Management System (AIMS) and SMS standards. Authorised emissions. Dispersion monitoring and modelling. Where possible, liquids are diverted to the flare gas recovery compressor and recovered as fuel gas, in preferrence to being flared. | LOW |
| Table 7-8 | | Loss of containment and inappropriate management of Moomba waste streams and wastewaters (sour water east flow) | Exposure of livestock to contaminants | H | L | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Approximately 2000 $m^3$/day of sour water is transferred to an engineered waste lagoon referred to as 'Lake Brooks'. Data from 2013 showed that sour water had a high salinity and elevated levels of aluminium and boron that can affect native fauna and native vegetation. Studies are undertaken to investigate wastewater management options for the Moomba Gas Plant to identify modifications that could be implemented based on operational requirements and constraints. Implementation of Wastewater Management Plan. Licenced contractors and waste trucks contracted; and applicable WTCs completed in accordance with regulations, as required. Loss of containment is managed via the incident management system (IMS) and implementation of corrective actions is based on incident investigation Response. Loss of containment is reported and investigated. Emergency response procedures are implemented and emergency spill response equipment maintained and tested on site. Segregation and applicable storage of waste and wastewater streams. Licenced landfill operated in accordance with licence conditions and landfill environmental managment plan. | LOW |
| | | | Potential impact to stakeholder business reputation | L | L | L | H | L | 2 | No | Low | N/A | N/A | N/A | N/A | 1 | | LOW |
| Table 7-8 | | Explosion, fire or flood event at Moomba Facility | Impacts to third party assets | H | L | L | H | L | 2 | No | Low | N/A | N/A | N/A | N/A | 1 | Equipment design fit for purpose. Safety Case assessment and review undertaken every 5 years validating risk management systems, and identification and management of critical barriers through the relevant risk assessment/management process. Safety, testing, maintenance and inspection procedures are implemented. Continued competency assessment, education and training of individuals responsible for activities associated with operation of Moomba Plant. Safe Work Permit system implemented to ensure only individuals with proper clearance can conduct work on inside Moomba Plant. Hazardous area management criteria are continuously reviewed according to relevant Australian Standards and legislative requirements. Operated under Reliability and Maintenance Management System (RAMMS) framework, Asset Integrity Management System (AIMS) and SMS standards. Emergency response procedures are implemented in accordance with Regulation 31. Implementation of spill response procedures, which include immediate reporting of spills/leaks. Emergency spill response equipment maintained and tested on site. Emergency response procedures contain a bushfire scenario. No access to Moomba Gas Plant compound due to security and fencing. | LOW |
| | | | Impacts to stakeholder business reputation | H | L | L | H | L | 2 | No | Low | N/A | N/A | N/A | N/A | 1 | | LOW |
| Table 7-3, Table 7-5, Table 7-10 | | Vegetation clearing for construction and maintenance activities | Short to medium term loss of visual amenity | H | H | H | H | L | 1 | No | Medium | Medium | Confined | Yes | Yes | 3 | Minimise vegetation disturbance, and plan construction to avoid areas of sensitive vegetation. Use existing routes/disturbed ground where practicable. Sensitive environments and Ramsar sites are considered during route selection. Avoid important or 'priority' native vegetation where possible. Undertaking a Safety Management Study during the design process to address location and non-location specific threats and develop adequate controls to mitigate environmental and public/third party safety risk. Use of Santos systems for vegetation clearance approvals, which triggers further assessment where required. Prior to greenfield disturbance, or subsequent re-disturbance, a Santos Environmental Adviser and/or ecologist undertakes an environmental assessment in accordance with the relevant Santos standards, the SEO and recommendations based on field inspections, which includes a site inspection for potential sensitive receptors. Relevant internal and external approvals in place before work undertaken. Implementation of the Environmental Sensitivity Profile (ESP) tool to assess proposed pipeline routes for rare, vulnerable and endangered flora and fauna species before the commencement of construction and implement appropriate avoidance or mitigation measures. Stockpile and clear vegetation and respread following construction works to facilitate revegetation. Where possible trim vegetation rather than clearing. Unauthorised off-road or off-lease driving or creation of shortcuts is unacceptable. Relevant internal and external approvals in place before work undertaken. Compliance with SEB offset obligations. | MED |
| Table 7-10 | | Earthworks and heavy vehicle movement relating to road construction and maintenance | Dust and noise generation | H | L | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Relevant internal and external approvals in place before work undertaken. Consider alternate routes, locations and construction methods during planning and scouting phase to minimise environmental impacts. Use existing routes/disturbed areas where practicable. Off-road or off-lease driving or creation of shortcuts is prohibited. Sensitive gibber terrain is protected through appropriate construction and maintenance practices which include - selecting routes that avoid sloping land is preferable (to minimise the requirements for large cut and fill or importation of borrow material to level the site), - constructing erosion control measures where appropriate (i.e. diversion banks or berms), - rolling of gibber terrain, is preferable, where possible, - avoiding environmentally sensitive and restricted areas, such as important native vegetation and fauna habitat, where possible. Construction activities are not carried out on salt lakes. First disturbances (such as location scouting) are undertaken in accordance with Santos standards. Management of sensitive areas (e.g. sloped areas or gibber) is detailed in scope of works, approval documents and company procedures. Erosion is controlled by appropriate placement, batter slopes and construction of water flow diversion banks. The location of new borrow pits considers: minimisation of impacts to the environment (e.g. native vegetation and landforms), minimising water retention, avoidance of sites of cultural and heritage significance, stakeholder engagement to minimise impact to third party operations, minimisation of visual impacts from construction activities by using native vegetation and landforms for screening, maintenance of applicable clearance distances between borrow pits and infrastructure (e.g. facilities, fences, homesteads, roads and airstrips) to minimise risk associated with livestock, safety, erosion, and visual impacts. Road construction in heavily wooded areas, such as Coolibah woodland, is minimised as far as practicable. Where pest plants are identified, contaminated material will not be moved to another location. Monitoring and pest plant control measures are implemented where required. Vegetation clearance is minimised as far as practicable.Roads are located and constructed to maintain pre-existing water flows (e.g. channel contours are maintained on floodplains and at creek crossings). Roads constructed at (or not significantly above) the natural surface as a minimum standard. Culverts and floodways are installed where required to maintain water flows, drainage and surface runoff. Where required, detailed hydrological assessment is undertaken for structures such as roads in floodplains or creek crossings to ensure no significant impacts on surface water flows or aquatic fauna (e.g. fish passage must be maintained). Sensitive land systems (e.g. wetlands) are avoided wherever possible. Where activities are undertaken in or near these areas, appropriate review, assessment and mitigation measures are in place to ensure that surface water flows are maintained and contamination of surface water and groundwater resources is avoided. Monitoring of erosion and drainage patterns post-construction and corrective actions implemented where required. Reinstate construction areas as soon as practicable. Rip areas of compacted soil (except on gibber plains and tableland environments). Respread topsoil and stockpiled vegetation. Total or partial restoration of borrow pits as soon as practicable. Restore natural contours to minimise impacts to natural drainage patterns. Dust suppression measures carried out where required to minimise safety hazards associated with poor visibility. Landholders are consulted as required where activities may affect pastoral operations and notified prior to survey, construction and undertaking of operations (pursuant to Regulations). Induction of employee and contractor personnel with respect to pastoral landholder requirements such as use of gates and infrastructure. Systems are in place for logging stakeholder complaints to ensure that issues are addressed as appropriate. | LOW |
| | | | Loss of Visual Amenity | H | L | H | H | H | 1 | No | Medium | Short | Confined | N/A | N/A | 2 | | LOW |
| | | | Disturbance to stakeholder infrastructure and activities | L | L | H | H | L | 2 | No | Low | N/A | N/A | N/A | N/A | 1 | | LOW |
| | | | Damage to third party infrastructure | H | H | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | | LOW |
| | | | Disturbance or collision with livestock | L | H | H | H | L | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | | LOW |

| REF | TYPE OF IMPACT | EVENT(S) | POTENTIAL CONSEQUENCES | SIZE | SCOPE | DURATION | FREQUENCY | STAKEHOLDERS | SIGNIFICANCE | AVOIDANCE | PROBABILITY | DURATION | SIZE AND SCOPE | CUMULATIVE EFFECTS | STAKEHOLDERS | SIGNIFICANCE | ASSOCIATED INFORMATION | Environmental significance |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Table 7-10 | | Ignition of fire along road corridor | Injury or loss of livestock | L | H | H | H | L | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Operation under fire permit requirements. No smoking or safe smoking areas away from equipment or activity. Personnel are trained to supervise and instruct individuals entering area to conduct work. Safe work permits must be obtained to ensure only individuals with proper clearance can conduct works. Petrol vehicles to be excluded from sites. Emergency response procedures contain a bushfire scenario. Safety, testing, maintenance and inspection procedures are implemented. | LOW |
| | | | Disruption to land use (e.g. grazing and recreation) | H | L | H | H | L | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | | LOW |
| | | | Impacts to stakeholder business reputation | L | L | H | H | L | 2 | No | Low | N/A | N/A | N/A | N/A | 1 | | LOW |
| Table 7-11 | | Storage and transport of general waste | Impacts to stakeholder business reputation | H | H | H | H | H | 1 | Yes | N/A | N/A | N/A | N/A | N/A | 1 | Designed and engineered facilities in accordance with EPA requirements. Application of the waste hierarchy system (avoid, reduce, reuse, recycle, treat, dispose). Waste management is undertaken in accordance with applicable regulatory requirements and licences. Compliance with EPA licence conditions and requirements of the Environment Protection Act 1993 and relevant regulations. Periodic auditing of waste management facilities for compliance against licence and regulatory requirements. Waste streams are segregated on site where appropriate to maximise opportunities for waste recovery, reuse and recycling. Covered bins are provided for the collection and storage of wastes. Rubbish loads are covered during transport to a licensed waste facility. Waste Management Plan. Landfill Environmental Management Plan. Landfarm Management Plans. Inspections, monitoring and maintenance of facilities. | LOW |
| | | | Injury to or loss of livestock | H | L | H | H | L | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | | LOW |
| | | | Reduced Visual Amenity | H | L | H | H | L | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | | LOW |
| Table 7-11 | | Sewage treatment and effluent management | Impacts to stakeholder business reputation | H | H | H | H | H | 1 | Yes | N/A | N/A | N/A | N/A | N/A | 1 | Fit for purpose plant and equipment. Use of permanent septic systems with long term camps where possible. Secondary treated sewage wastewater is disposed of onto land well away from any place from which it is reasonably likely to enter any waters, and to minimise spray drift and ponding. Fencing installed where required around irrigation areas. Wastewater Management Plan. Periodic auditing of wastewater management facilities for compliance again licence and regulatory requirements. Department of Health and Ageing approved transportable aerated wastewater treatment plants for temporary purposes, such as camps. Wastewater (sewage and grey water) disposal where possible in accordance with the South Australian Public Health (Wastewater) Regulations 2013 and/or in consultation with the Department for Health and Ageing and/or in accordance with licenses/permits, if any. Appropriate controls for management of sewage effluent (developed in consultation with Department for Health and Ageing) implemented for situations where excursions outside effluent quality guidelines may occur (e.g. startup or system upset). Inspections, monitoring and maintenance of facilities. | LOW |
| | | | Injury to or loss of livestock | H | H | H | H | L | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | | LOW |
| | | | Reduced Visual Amenity | H | H | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | | LOW |
| Table 7-11 | | Management of Contaminated Soil | Exposure of livestock to contaminants | H | L | H | H | H | 1 | Yes | N/A | N/A | N/A | N/A | N/A | 1 | Suitably designed and engineered facility in accordance with EPA guidelines. Compliance with EPA licence conditions and regulatory requirements. Development and implementation of Landfarm Management Plan, which documents operational controls, management practices and Santos standards. | LOW |
| Table 7-11 | | Management of hazardous materials (chemicals, asbestos) | Impacts to stakeholder business reputation | H | H | H | H | L | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Designed and engineered containment facilities. Application of the waste hierarchy system (avoid, reduce, reuse, recycle, treat, dispose). Compliance to requirements of EPA licence conditions and requirements of the Environment Protection Act 1993 and relevant regulations. Waste streams are segregated on site where appropriate to maximise opportunities for waste recovery, reuse and recycling. Waste Management Plan. Landfill Environmental Management Plan. Disposal of asbestos containing material in accordance with the Work Health and Safety Act 2012 and the Work Health and Safety Regulations 2012. Inspection and maintenance of facilities. Transportation of chemicals, fuels and oils in accordance with the Safety Data Sheet (SDS), Santos' SMS, and relevant guidelines such as the ADG Code. Regularly educate staff of product, review and monitor chemical and fuel transportation, including signage/labelling, proper packing and tie downs. WTC documentation, use of licenced contractors. Loss of containment is managed via the incident management system (IMS) and implementation of corrective actions is based on incident investigation. SDSs available. | LOW |
| | | | Injury to or loss of livestock | L | H | H | H | L | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | | LOW |
| Table 7-12 | | Groundwater Use | Impacts to Groundwater users | H | H | H | H | L | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Use PFW as a water source where feasible. Minimise use of groundwater. Compliance with water licence and allocations where applicable. Utilisation of existing Santos groundwater bores where applicable. Installation of any new water bores is undertaken in accordance with all government regulations and licensing conditions. Installation of any new water bores in accordance with the Far North Prescribed Wells Area Water Allocation Plan (FNPWA WAP) and will include consultation as required. Installation of any new water bores will include an impact assessment of adjacent surface water systems (that are dependent on base flow). | LOW |
| Table 7-12 | | Extraction of water from Cooper Creek | Loss of visual amenity | H | L | L | H | L | 2 | No | Low | N/A | N/A | N/A | N/A | 1 | Approval for extraction is gained through internal Santos processes. Application will include estimated total volume of water required. A request to extract water from Cooper Creek must demonstrate that PFW and/or groundwater of an acceptable quality cannot be sourced within an economically viable haulage distance (maximum 2 hour return journey). Approved extraction occurs where potential risks to existing users downstream of Callyamurra have been assessed and impacts mitigated. Any approved extraction occurs where water flow at Callamurra is >= 2.15m (>= 0.1m flow at Innamincka Causeway) and rising. Water should not be extracted from permanent water refuges (e.g Callyamurra). Maps of approved surfacewater extraction points at Innamincka, Kudrieke and Mitchie Crossings are included in Appendix E. Extraction only occurs at these points, and does not involve permanent pumping stations. Cumulative extraction is capped at 15ML per year. Extraction volumes recorded in monitoring database and included in annual DEM reporting. | LOW |
| | | | Disruption to land use (e.g. grazing and recreation) | H | H | H | H | L | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | | LOW |
| Table 7-15 | | Loss of Containment from fuel and chemical storage - on- or off-site | Injury to or loss of livestock | H | H | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Transportation, storage and handling of chemicals, fuels and oils in accordance with the Safety Data Sheet (SDS), Santos' SMS, and relevant standards and guidelines such as the EPA Bunding Guidelines and AS 1940. Regularly educate staff of product, review and monitor chemical and fuel transportation, including signage/labelling, proper packing and tie downs. Cover dry chemicals during transportation. Chemical and fuel storage procedures, including signage, are reviewed and monitored in audit process in accordance with relevant Santos standard. Removal of fuel or chemicals from site where inundation or flooding is a risk. Loss of containment is managed via the incident management system (IMS) and implementation of corrective actions is based on incident investigation. Appropriate emergency/spill response procedures for loss of containment. Spill response and clean up. Fencing of affected areas if threat is posed to livestock or native fauna. Emergency response procedures are carried out in accordance with Regulation 31. | LOW |
| | | | Contamination of water resources | H | H | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | | LOW |
| | | | Impacts to stakeholder business reputation | H | H | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | | LOW |
| Table 7-16 | | Plane Accident at Moomba airport | Injury to or loss of livestock | H | H | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Foreign object debris (FOD) fencing. Airline provider has applicable licenses, registrations and safe track record. Airport is operated in accordance with Civil Aviation Safety Authority (CASA) standards. Jet A-1 fuel supply and storage meets industry standards. Restricted access to the airport and aerodrome. Management of vegetation and surface water ponding adjacent to the airport to minimise attraction of wildlife (e.g. Black Kites). Covered bins are provided for the collection and storage of wastes to minimise attraction of wildlife. Emergency response plans are in place for aircraft incidents. Implementation of emergency/spill response procedures. | LOW |
| Table 7-18 | | Loss of containment, innapropriate management of waste at camps, offices and contractor facilities | Reduced Visual Amenity | H | H | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Sewage (and grey water) is treated by septic or by the Moomba WWTP. Application of the waste hierarchy system (avoid, reduce, reuse, recycle, treat, dispose). Procurement processes to embed specific conditions in contracts, which includes a LTO. Compliance to applicable licence, Santos and regulatory requirements. Waste streams are segregated on site where appropriate to maximise opportunities for waste recovery, reuse and recycling. Covered bins are provided for the collection and storage of wastes. Waste is removed regularly. Waste Management Plan and Wastewater Management Plan. | LOW |
| Section 5 | Cultural & Heritage Impacts | | | | | | | | | | | | | | | | The north-east desert region historically sustained a significant Aboriginal population, particularly in the area surrounding Cooper Creek and its many channels (Santos 1998).The Cooper Creek region has been proclaimed a State Heritage Reserve because of its association with Aboriginal and European history as well as its environmental significance. The area encompasses Innamincka and a 1 km strip either side of Cooper Creek, totalling 120 km2. There are a number of sites of Aboriginal heritage including relics, camp sites, quarries and engravings with several unique designs located around Cullyamurra waterhole. Sites of Aboriginal heritage can be identified throughout the region and include features of spiritual and archaeological importance, for example, middens, artefact scatters, rock engravings, arrangement sites, burial sites and quarries (Blackley et al. 1996). Sand dunes have been found to contain the largest and most important archaeological sites in the Cooper Basin region. Clay covered floodplains contain small numbers of Aboriginal sites. Camp sites and burial sites have been found on sandy rises and isolated dunes in floodplains, while stone artefact scatters, shell middens and rock art are found near lakes and rivers (particularly Cooper Creek). Aboriginal heritage sites are also found in the pebble-covered gibber country. The dense bands of stone that cap mesas were often extensively quarried for making stone tools. Stone arrangements can be recognised from the combination of regular patterns of larger rocks in lines, circles and cairns. | |
| 7-3 | | Pipeline and satellite construction and decommissioning | Disturbance to sites of cultural or heritage significance | H | H | H | H | L | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Observation of procedures and guidelines for the identification, management and protection of sites of cultural and heritage significance. Consultation with stakeholders (i.e. native title groups, government agencies, landholders etc.) in relation to the possible existence of cultural and/or heritage sites. Appropriate cultural heritage training is provided for the level of access required (e.g. additional training for first disturbance or authorised off-road/off-lease activities). Sites of potential cultural and heritage significance are avoided during scouting. Inspections and checks of cultural heritage clearances areas. Use of Cultural Heritage Assessment Request (CHAR) process. Processes are in place to meet requirements of legislation and agreements with native title claimant groups with respect to protection and reporting of discovery of unknown heritage sites during pipeline construction and decommissioning activities. | LOW |
| Table 7-3, Table 7-5 | | Movement of heavy machinery and vehicles for pipeline and facility construction, operation and decommissioning activities | Disturbance or damage to sites of cultural and/or heritage significance | H | H | H | H | L | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Observation of procedures and guidelines for the identification, management and protection of sites of cultural and heritage significance. Consultation with stakeholders (i.e. native title groups, government agencies, landholders etc.) in relation to the possible existence of heritage sites. Appropriate cultural heritage training is provided for the level of access required (e.g. additional training for first distrubance or authorised off-road/off-lease activities). Sites of potential cultural and heritage signifcance are managed in liaison with relevant stakeholders. This may include avoiding a site during scouting activities. Signage to indicate public versus private roads and access tracks to discourage third party access to infrastructure, and/or sites of cultural or heritage significance. Audits of cultural heritage clearance areas. Driving on designated areas only (i.e. lease and access tracks). Unauthorised off-road and off-lease driving or creation of shortcuts is unacceptable. Use of Cultural Heritage Assessment Request (CHAR) process. Assets decommissioning to be in accordance with SMS, which defines minimum mandatory requirements for the planning and management of asset decommissioning. Processes are in place to meet requirements of legislation and agreements with native title claimant groups with respect to protection and reporting of discovery of unknown heritage sites during pipeline construction and decommissioning activities. | LOW |

| REF | TYPE OF IMPACT | EVENT(S) | POTENTIAL CONSEQUENCES | SIZE | SCOPE | DURATION | FREQUENCY | STAKEHOLDERS | SIGNIFICANCE | AVOIDANCE | PROBABILITY | DURATION | SIZE AND SCOPE | CUMULATIVE EFFECTS | STAKEHOLDERS | SIGNIFICANCE | ASSOCIATED INFORMATION | Environmental significance |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Table 7-10 | | Earthworks and heavy vehicle movement relating to road construction and maintenance | Disturbance or damage to sites of cultural and/or heritage significance | H | H | H | H | L | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Observation of procedures and guidelines for the identification, management and protection of site of cultural or heritage significance. Consultation with stakeholders (i.e. native title groups, government agencies, landholders etc.) in relation to the possible existence of heritage sites. Appropriate cultural heritage training is provided for the level of access required (e.g. additional training for first disturbance (scouting) or authorised off-road/off-lease activities). Known sites of potential cultural and heritage significance are avoided during scouting. Engage cultural heritage monitors ahead of or during first disturbance activities. Known sites of cultural or heritage significance are recorded. Audits of cultural heritage clearances areas. Signage to indicate public versus private roads and access tracks to discourage third party access to infrastructure. Processes are in place to meet requirements of legislation and agreements with native title claimant groups with respect to protection and reporting of discovery of unknown heritage sites during pipeline construction and decommissioning activities. | LOW |
| Table 7-10 | | Ignition of fire along road corridor | Disturbance or damage to sites of cultural and/or heritage significance | H | L | H | H | L | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Operation under fire permit requirements. No smoking or safe smoking areas away from equipment or activity. Personnel are trained to supervise and instruct individuals entering area to conduct work. Safe work permits must be obtained to ensure only individuals with proper clearance can conduct works. Petrol vehicles to be excluded from sites. Emergency response procedures contain a bushfire scenario. Safety, testing, maintenance and inspection procedures are implemented. | LOW |
| Table 7-12 | | Extraction of water from the Cooper Creek | Disturbance or damage to sites of cultural and/or heritage significance | H | L | L | H | L | 2 | No | Low | N/A | N/A | N/A | N/A | 1 | Approval for extraction is gained through internal Santos processes. Application will include estimated total volume of water required. A request to extract water from Cooper Creek must demonstrate that PFW and/or groundwater of an acceptable quality cannot be sourced within an economically viable haulage distance (maximum 2 hour return journey). Approved extraction occurs where potential risks to existing users downstream of Callyamurra have been assessed and impacts mitigated. Any approved extraction occurs where water flow at Callamurra is >= 2.15m (>= 0.1m flow at Innamincka Causeway) and rising. Water should not be extracted from permanent water refuges (e.g Callyamurra). Maps of approved surfacewater extraction points at Innamincka, Kudrieke and Mitchie Crossings are included in Appendix E. Extraction only occurs at these points, and does not involve permanent pumping stations. Cumulative extraction is capped at 15ML per year. Extraction volumes recorded in monitoring database and included in annual DEM reporting. | LOW |
| Table 7-3, Table 7-5, Table 7-10, Table 7-18 | | Personnel impacting sites of cultural or heritage significance adjacent to the camp or contractor facilities | Disturbance or damage to sites of cultural and/or heritage significance | H | L | H | H | L | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Observation of procedures and guidelines for the identification, management and protection of site of cultural or heritage significance. Consultation with stakeholders (i.e. native title groups, government agencies, landholders etc.) in relation to the possible existence of heritage sites. Appropriate cultural heritage training is provided for the level of access required. Known sites of potential cultural and heritage significance are avoided during scouting. Engage cultural heritage monitors ahead of or during first disturbance activities. Known sites of cultural or heritage significance are recorded. Audits of cultural heritage clearances areas. Where required, identified sites or cultural or heritage significance are signposted and/or exclusion zones implemented. Processes are in place to meet requirements of legislation and agreements with native title claimant groups with respect to protection and reporting of discovery of unknown heritage sites during pipeline construction and decommissioning activities. | LOW |
| Section 5 | Community Health & Safety Impacts | | | | | | | | | | | | | | | | The Cooper Basin region is located in the unincorporated (i.e. out of councils) area of South Australia. Jurisdiction for the area falls under the responsibility of the Outback Communities Authority which provides limited local government-type support. As discussed above, the major regional industries are pastoralism, oil and gas production and tourism. The only township in the region is Innamincka, which has had a resident population in the order of 12-18 people (Marree SCB 2004). The Innamincka Progress Association is responsible for managing many of the town's public facilities, including Town common camping area, the airstrip and public amenities. Moomba, Ballera and the satellite production facilities have accommodation and recreation facilities that house the petroleum industry workforce, which operates on a 'fly-in, fly-out' basis. Infrastructure in the region is minimal. Unsealed roads service the district, with the Adelaide-Moomba road and Dillon's Highway (which are generally referred to as the Strzelecki Track) being the major route through the region. The oil and gas fields in the region are serviced by a network of unsealed roads and tracks, which are generally not available for public access. Other public roads in the region include the Adventure Way, east of Innamincka, the Cordillo Road and Coongie Lakes track north of Innamincka, Fifteen Mile Track, west of Innamincka and the Walkers Crossing Public Access Route, north-west of Moomba. The Birdsville Track lies on the western edge of the region. | |
| Table 7-3, Table 7-5 | | Movement of heavy machinery and vehicles for pipeline and facility construction, operation and decommissioning activities | Potential impacts to public safety | H | H | H | H | L | 1 | No | Medium | Short | Confined | N/A | N/A | 2 | Pipeline operations are undertaken at locations where public access is restricted. Undertaking a Safety Management Study during the design process to address location and non-location specific threats and develop adequate controls to mitigate environmental and public/third party safety risk. Active promotion of appropriate road use behaviours. Induction of employees and contractor personnel with respect to road use and driver behaviour. Use of In Vehicle Monitoring System (IVMS) to track speed, route and harsh breaking for entire workforce, including contactors and/or other appropriate journey management systems. Setting of appropriate speed limits for Santos personnel and contractors. Driver awareness training mandatory for company and contractor personnel. Policy of driving with vehicle lights on. Minimising night-time driving to the greatest extent possible. Signage throughout the Cooper Basin to warn of possible hazards on the road. Driving on designated areas only (i.e. access tracks and designated lease areas). Procurement and contract management includes Environmental and Workplace Health and Safety Management Plan pre-qualification. Implementation of a construction management plan for contractors. Reporting system in place for reporting injuries and accidents. Assets decommissioning to be in accordance with SMS, which defines minimum mandatory requirements for the planning and management of asset decommissioning. | LOW |
| Table 7-4 | | Direct Air Capture – Personnel exposure to CO2 | Asphyxiation risk of any personnel in the area from high concentration CO 2 gas | H | L | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Safety shutdown systems included in the design, Routine use of gas detection by personnel in plant area. Existing personal gas detectors will detect oxygen deficiency, Personal CO 2 detectors will be introduced as part of the CCS project, CSIRO will provide personal CO 2 detectors for staff during the trial, Ensuring personal CO2 gas detectors are used by any personnel entering the unit's exclusion zone, Exclusion zones established around the unit while in operation based on dispersion modelling. | LOW |
| Table 7-3 | | Loss of containment of gas, sludge or oil from pipeline | Potential impacts ot public safety | H | L | H | L | L | 2 | No | Low | N/A | N/A | N/A | N/A | 1 | Fit for purpose equipment. Installation of emergency isolation valves where required. All new Santos pipelines are designed, tested and constructed in general accordance with AS 2885 requirements to have sufficient strength, ductility and toughness to withstand design loads to which it may be subjected during cons truction, testing and operation. Undertaking a Safety Management Study during the design process to address location and non-location specific threats and develop adequate controls to mitigate environmental and public/third party safety risk. Safety, testing, maintenance and inspection procedures are implemented according to the IMP. Prestart-up checklist prior to commissioning and decommissioning activities. Pipeline construction integrity verification e.g. hydrotest (records maintained). Supported above ground pipelines are inspected to minimise the potential for contact with surface soils as a result of sand/sand drift or failure of pipe supports. Adherence to Santos standards and implemetation of management systems to monitor infrastructure. Santos safety checks, inspections and risk assessments. QA/QC checks prior to hydrocarbon introduction into pipe. Continued competency assessment, education and training of individuals responsible for activities with pipeline construction and operation. Personnel are trained to supervise and instruct individuals entering lease to conduct work. Safe work permits must be obtained to ensure only individuals with proper clearance can conduct work on a lease. Hazardous area management criteria are followed. Monitoring of weather conditions. Restrictred access to site. Loss of containment is managed via the incident management system (IMS) and implementation of corrective actions is based on incident investigation. Pipeline HC removal (via pigging) prior to decommissioning. Regularly educate staff on emergency response procedures. Appropriate emergency response plans are in place. Annual review and exercise of response equipment and procedures to ensure preparedness. Emergency spill response equipment on site. Spill response and clean up. Areas assessed for contamination and remediated where required on decommissioning. | LOW |
| Table 7-3 | | Ignition of fire along ROW during pipeline construction, operation and decommissioning activities | Potential impacts to public safety | H | L | H | H | L | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Operation under fire permit requirements. Personnel are trained to supervise and instruct individuals entering area to conduct work. Safe work permits and hot work permits must be obtained to ensure only indivudals with proper clearance can conduct works. Management plans and procedures for construction and decommissioning activities include fire management and firewatchers, as required. Safety, testing, maintenance and inspection procedures are implemented. Emergency response procedures contain a bushfire scenario. Implementation of appropriate emergency response procedures. Spill response and clean up. | LOW |
| Table 7-5 | | Loss of containment of hydrocarbons outside area designed to contain spills (pipe rupture, reliefs, fittings or leaks from plant or other sources) | Impact to public safety | H | L | H | H | L | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Fit for purpose equipment. Consideration of proximity to surrounding infrastructure and implementation of a flare exclusion zone. Plant and equipment designed and constructed in accordance with Santos SMS and Engineering Standards (e.g. SMS11.2 Facilities Design and Construction), and relevant Australian/International Standards (e.g. AS 1210). Preferential use of diesel vehicles. Process safety and integrity management systems featured in the FFP. Minimising volume of flammable/combustible substances through all phases of works. Consideration of weather conditions i.e. wind direction. Safety, testing, maintenance and inspection procedures are implemented. Personnel are trained to supervise and instruct individuals entering site to conduct work. Continued competency assessment, eductation and training of individuals responsible for activities associated with satellilte facilities. Safe work permits must be obtained to ensure only individuals with proper clearance can conduct work at operational facilities. Hazardous area management criteria are followed. HAZOP reviews. Ignition sources are controlled via permit to work. Restricted access to site. Red alert days (additional checks and balances). Appropriate emergency response plans in place. Emergency response training for emergency response personnel. Emergency spill reponse equipment on site. Spill response and clean up. | LOW |
| Table 7-5 | | Fugitive emissions to atmosphere, venting of carbon dioxide, hydrogen sulphide and carbon monoxide, and claring propand, butane, methane and ethane associated with satellite facilities operation | Potential impacts to public safety due to fire or explosion | L | L | H | H | L | 2 | No | Low | N/A | N/A | N/A | N/A | 1 | Restricted access to satellites and signage to inform public and third parties. Implementation of a preventative maintenance strategy to minimise fugitive releases. Consideration of reasonable and practicable measures to minimise greenhouse gas emissions in accordance with Santos' Climate Change Policy. Loss of containment is managed via the incident management system (IMS) and implementation of correction action is based on incident investigation. Gas detection is undertaken within operational areas in accordance with Santos' SMS. Equipment operated and maintained in line with manufacturer specifications. Remote location of satellite facilitites. Equipment designed, installed and operated and maintained to Australian standards, in line with manufacturer specifications. Minimise frequency and duration of venting. Emissions reported annually in accordance with National Pollution Inventory. Fit for purpose equipment. Use of separators and vertical flare stack to eliminate unburnt gases. Preventative maintenance mitigating amount of unnecessary flaring due to valve performance. Operator routine inspection and corrective maintenance. Flaring and venting activites are actively managed and minimised. Continual review and improvement of operations. Competent site personnel and contractors on site at all times. Continued competency assessment, eduction and training of individuals responsible for activities associated with satellite facilities. Restricted access to satellites and signage to inform the public and third parties. Landowners notified of proposed operations and consultation process initiated to ensure appropriate procedures in place to mitigate impacts. Consideration of proximity to surrounding infrastructure and implementation of a flare exclusion zone. | LOW |
| Table 7-8 | | Gas processing - co2 trains, Moomba North associated with greenhouse (and other) gas | Disruption to gas supply | L | L | L | H | L | 2 | No | Low | N/A | N/A | N/A | N/A | 1 | Fit for purpose equipment. Plant and equipment designed and constructed in accordance with Santos SMS and Engineering Standards (e.g. SMS11.2 Facilities Design and Construction), and relevant Australian/International standards (e.g. AS 1210). Remote location of Moomba Gas Plant. Reliability and Maintenance Management System (RAMMS) framework. Asset Integrity Management System (AIMS) SMS standards. Authorised emissions. Dispersion monitoring | LOW |

| REF | TYPE OF IMPACT | EVENT(S) | POTENTIAL CONSEQUENCES | SIZE | SCOPE | DURATION | FREQUENCY | STAKEHOLDERS | SIGNIFICANCE | AVOIDANCE | PROBABILITY | DURATION | SIZE AND SCOPE | CUMULATIVE EFFECTS | STAKEHOLDERS | SIGNIFICANCE | ASSOCIATED INFORMATION | Environmental significance |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | emissions, fire from loss of containment | Impacts to public safety | L | L | H | H | L | 2 | No | Low | N/A | N/A | N/A | N/A | 1 | and modelling. Routinely undertake stack monitoring. | LOW |
| Table 7-8 | | Loss of containment associated with storage of oil and tank farm and road tankers | Impact to public safety, if off-site movement of contaminants occurs | H | H | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Equipment design fit for purpose. Plant and equipment designed and constructed in accordance with Santos SMS and Engineering Standards (e.g. SMS11.2 Facilities Design and Construction), and relevant Australian/International standards (e.g. AS 1210). Instrumentation, high-level alarms and controls incorporated into tank design. Floating roof storage tanks individually bunded in accordance with relevant guidelines e.g. EPA Bunding Guidelines. Truck load-in area designed with sumps and pumps. Operated under Reliability and Maintenance Management System (RAMMS) framework, Asset Integrity Management System (AIMS) and SMS standards. Operator checks and monitoring. Internal and external inspections of tanks as per applicable standards and industry guidelines. Continued competency assessment, education and training of individuals responsible for activities associated with operation of Moomba Plant. Safe work permits must be obtained to ensure only individuals with proper clearance can conduct work. Loss of containment is managed via the incident management system (IMS) and implementation of corrective actions is based on incident investigation. Emergency response procedures are implemented in accordance with Regulation 31. Implementation of spill response procedures, which include immediate reporting of spills/leaks. Emergency spill response equipment maintained and tested on site. Fencing minimises entry of livestock and the public. | LOW |
| Table 7-8 | | Loss of containment and inappropriate management of Moomba waste streams and wastewaters (sour water east flow) | Impacts to public safety, if off-site movement of contaminants occurs | H | H | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Approximately 2000 $m^3$/day of sour water is transferred to an engineered waste lagoon referred to as 'Lake Brooks'. Data from 2013 showed that sour water had a high salinity and elevated levels of aluminium and boron that can affect native fauna and native vegetation. Studies are undertaken to investigate wastewater management options for the Moomba Gas Plant to identify modifications that could be implemented based on operational requirements and constraints. Implementation of Wastewater Management Plan. Licenced contractors and waste trucks contracted; and applicable WTCs completed in accordance with regulations, as required. Loss of containment is managed via the incident management system (IMS) and implementation of corrective actions is based on incident investigation Response. Loss of containment is reported and investigated. Emergency response procedures are implemented and emergency spill response equipment maintained and tested on site. Segregation and applicable storage of waste and wastewater streams. Licenced landfill operated in accordance with licence conditions and landfill environmental managment plan. | LOW |
| Table 7-8 | | Explosion, fire or flood event at Moomba Facility | Impacts to public safety | H | L | H | H | L | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Equipment design fit for purpose. Safety Case assessment and review undertaken every 5 years validating risk management systems, and identification and management of critical barriers through the relevant risk assessment/management process. Safety, testing, maintenance and inspection procedures are implemented. Continued competency assessment, education and training of individuals responsible for activities associated with operation of Moomba Plant. Safe Work Permit system implemented to ensure only individuals with proper clearance can conduct work on inside Moomba Plant. Hazardous area management criteria are continuously reviewed according to relevant Australian Standards and legislative requirements. Operated under Reliability and Maintenance Management System (RAMMS) framework, Asset Integrity Management System (AIMS) and SMS standards. Emergency response procedures are implemented in accordance with Regulation 31. Implementation of spill response procedures, which include immediate reporting of spills/leaks. Emergency spill response equipment maintained and tested on site. Emergency response procedures contain a bushfire scenario. No access to Moomba Gas Plant compound due to security and fencing. No public access to Moomba Gas Plant compound due to security and fencing. | LOW |
| | | | Disruption to gas supply | L | L | L | H | L | 2 | No | Low | N/A | N/A | N/A | N/A | 1 | | LOW |
| Table 7-10 | | Earthworks and heavy vehicle movement relating to road construction and maintenance | Potential Impacts to public safety | H | H | H | L | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Signage to indicate public versus private roads and access tracks to discourage third party access to infrastructure. Active promotion of appropriate road use behaviours. Induction of employees and contractor personnel with respect to road use and driver behaviour. Setting of appropriate speed limits for Santos personnel and contractors. Use of In Vehicle Monitoring System (IVMS) to track speed, route and harsh braking and/or other appropriate journey management. Driver awareness training for company and contractor personnel. Policy of driving with vehicle lights on. Signage throughout the Cooper Basin to warn of possible hazards on the roads. Driving on designated areas only (i.e. access tracks and designated lease areas) – unauthorised off-road driving is prohibited. Necessary measures (e.g. signage/fencing) taken to prevent the public accessing restored areas. | LOW |
| | | | Generation of dust | H | L | H | H | H | 1 | No | Medium | Short | Confined | N/A | N/A | 2 | | LOW |
| | | | Increased public access to remote areas | H | H | H | L | L | 1 | No | Medium | Short | Confined | N/A | N/A | 2 | | LOW |
| Table 7-11 | | Storage and transport of general waste | Potential impacts to public safety due to fire or explosion | H | L | L | H | L | 2 | No | Low | N/A | N/A | N/A | N/A | 1 | Designed and engineered facilities in accordance with EPA requirements. Application of the waste hierarchy system (avoid, reduce, reuse, recycle, treat, dispose). Waste management is undertaken in accordance with applicable regulatory requirements and licences. Compliance with EPA licence conditions and requirements of the Environment Protection Act 1993 and relevant regulations. Periodic auditing of waste management facilities for compliance against licence and regulatory requirements. Waste streams are segregated on site where appropriate to maximise opportunities for waste recovery, reuse and recycling. Covered bins are provided for the collection and storage of wastes. Rubbish loads are covered during transport to a licensed waste facility. Waste Management Plan. Landfill Environmental Management Plan. Landfarm Management Plans. Inspections, monitoring and maintenance of facilities. | LOW |
| Table 7-11 | | Management of hazardous materials (chemicals, asbestos) | Potential impacts to public safety | H | H | H | H | H | 1 | Yes | N/A | N/A | N/A | N/A | N/A | 1 | Designed and engineered containment facilities. Application of the waste hierarchy system (avoid, reduce, reuse, recycle, treat, dispose). Compliance to requirements of EPA licence conditions and requirements of the Environment Protection Act 1993 and relevant regulations. Waste streams are segregated on site where appropriate to maximise opportunities for waste recovery, reuse and recycling. Waste Management Plan. Landfill Environmental Management Plan. Disposal of asbestos containing material in accordance with the Work Health and Safety Act 2012 and the Work Health and Safety Regulations 2012. Inspection and maintenance of facilities. Transportation of chemicals, fuels and oils in accordance with the Safety Data Sheet (SDS), Santos' SMS, and relevant guidelines such as the ADG Code. Regularly educate staff of product, review and monitor chemical and fuel transportation, including signage/labelling, proper packing and tie downs. WTC documentation, use of licenced contractors. Loss of containment is managed via the incident management system (IMS) and implementation of corrective actions is based on incident investigation. SDSs available. | LOW |
| Table 7-13 | | Combustion of gas for steam and power supply | Potential impacts to public safety due to fire or explosion | H | L | H | H | L | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Fit for purpose equipment. Remote location of Moomba Gas Plant. Plant and equipment designed and constructed in accordance with Santos. SMS and Engineering Standards (e.g. SMS11.2 Facilities Design and Construction), and relevant Australian/International standards (e.g. AS 1210). Reliability and Maintenance Management System (RAMMS) framework. Asset Integrity Management System (AIMS). SMS standards. Equipment and plant maintenance (preventative and corrective). Application of the waste hierarchy system (avoid, reduce, reuse, recycle, treat, dispose). Compliance to applicable licence and regulatory requirements. Waste streams are segregated on site where appropriate to maximise opportunities for waste recovery, reuse and recycling. Covered bins are provided for the collection and storage of wastes. Rubbish loads are covered during transport to a licensed waste facility. Wastewater Management Plan. | LOW |
| Table 7-15 | | Loss of Containment from fuel and chemical storage - on- or off-site | Potential impacts to public safety | H | L | L | H | L | 2 | No | Low | N/A | N/A | N/A | N/A | 1 | Transportation, storage and handling of chemicals, fuels and oils in accordance with the Safety Data Sheet (SDS), Santos' SMS, and relevant standards and guidelines such as the EPA Bunding Guidelines and AS 1940. Regularly educate staff of product, review and monitor chemical and fuel transportation, including signage/labelling, proper packing and tie downs. Cover dry chemicals during transportation. Chemical and fuel storage procedures, including signage, are reviewed and monitored in audit process in accordance with relevant Santos standard. Removal of fuel or chemicals from site where inundation or flooding is a risk. Loss of containment is managed via the incident management system (IMS) and implementation of corrective actions is based on incident investigation. Appropriate emergency/spill response procedures for loss of containment. Spill response and clean up. Fencing of affected areas if threat is posed to livestock or native fauna. Emergency response procedures are carried out in accordance with Regulation 31. | LOW |
| Table 7-16 | | Plane Accident at Moomba airport | Potential impacts to public safety due to fire or explosion | H | H | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | Foreign object debris (FOD) fencing. Airline provider has applicable licenses, registrations and safe track record. Airport is operated in accordance with Civil Aviation Safety Authority (CASA) standards. Jet A-1 fuel supply and storage meets industry standards. Restricted access to the airport and aerodrome. Management of vegetation and surface water ponding adjacent to the airport to minimise attraction of wildlife (e.g. Black Kites). Covered bins are provided for the collection and storage of wastes to minimise attraction of wildlife. Emergency response plans are in place for aircraft incidents. Implementation of emergency/spill response procedures. | LOW |
| Table 7-17 | | Explosion or uncontrolled fire at fire training ground | Potential impacts to public safety | H | H | H | H | H | 1 | No | Low | N/A | N/A | N/A | N/A | 1 | No smoking or safe smoking areas away from equipment or activity. Personnel are trained to supervise and instruct individuals entering area to conduct work. Safe work permits must be obtained to ensure only individuals with proper clearance can conduct works. Safety, testing, maintenance and inspection procedures are implemented. Spill response and clean up. Implementation of appropriate emergency/spill response procedures for explosion or fire. | LOW |