Section 14 Marine Facilities - Environmental Management Plan

14.1 Introduction

The purpose of this preliminary Environmental Management Plan (EMP) prepared for the GLNG Project is to propose environmental protection commitments to protect the environmental values that may be affected by the development of the project and to assist the administering authorities to decide the appropriate approval conditions for the project.

EMPs are designed to be dynamic documents, which will be reviewed and revised as the project progresses through public consultation, detailed design, to construction, operational and decommissioning phases. It is envisaged that the final EMPs for each component of the project will provide additional, more detailed guidance for construction and operational personnel, regulators and stakeholders prior to the application for the respective environmental authorities.

The following five preliminary EMPs were prepared as part of the EIS process for the GLNG Project;

- Coal Seam Gas Fields EMP;
- Gas Transmission Pipeline EMP;
- LNG Facility EMP;
- Marine Facilities EMP; and
- Access Road and Bridge EMP.

Each EMP has been prepared as a 'standalone' document, to be used as the basis for actively managing activities as the project progresses. The EMPs outline the overarching performance criteria, control strategies, monitoring, auditing and corrective actions proposed in accordance with the TOR.

Each of the preliminary EMPs have incorporated the Santos Environmental Health and Safety Management System (EHSMS) that will provide the overarching management system for all of the project's activities.

This preliminary EMP relates to construction and operation of the GLNG Project marine facilities which include a product loading facility (PLF), a materials off-loading facility (MOF), a dredging program and a dredge material placement facility.

This preliminary EMP has been structured to satisfy the requirements of the relevant EPA guidelines and related operational policies. Information obtained during the preparation of this EIS has provided the basis for preparing this EMP. The EMP proposes environmental management strategies to prevent or minimise environmental harm while allowing for environmentally sustainable development. Monitoring, corrective actions and reporting requirements form part of this EMP, which will ensure that the proposed management strategies are being properly implemented.

The final marine facilities EMP will be used to support an application for one or more development approvals, environmental authorities or permits under the relevant legislation.

14.2 Objectives

The objectives of this EMP are to provide:

- Evidence of practical and achievable plans to ensure that the project's environmental requirements are complied with;
- An integrated plan for monitoring, assessing and controlling potential impacts;
- Local, State and Commonwealth authorities with a common focus for approval conditions and compliance with policies and conditions; and
- The community with evidence that the construction and operation of the marine facilities will be managed in an environmentally acceptable manner.

This EMP will be reviewed and updated, to reflect knowledge gained during the course of the assessment of the GLNG Project. Changes to the EMP will be made in consultation with the relevant authorities where necessary.

14.3 Links to EIS

Potential environmental issues requiring management and monitoring were identified during the impact assessment process and are detailed throughout the GLNG EIS.

This EMP has been structured to provide a link between the proposed authorised activities, the receiving environment and the selection of appropriate management strategies to prevent or minimise any potential environmental harm arising from the development of the GLNG Project. The EMP also incorporates monitoring and corrective actions to ensure compliance with the commitments made in the EIS and the conditions of any statutory approvals. The management strategies outlined within this EMP were selected after detailed investigations of potential environmental impacts.

A number of other key aspects of construction, operation and commissioning phases for the marine facilities have been included such as dredging, emergency response procedures and incident management.

14.4 Legislation

Section 1 of this EIS specifies the legislation and policies controlling the approval process for the GLNG Project. Appendix C provides a list of the development approvals required for the GLNG Project including the marine facilities.

Environmental requirements of all relevant legislation are addressed within the EMP. The requirement of local government, the community and other stakeholders have also been addressed.

14.5 Santos Environmental Health Safety Management System (EHSMS)

Santos has a company-wide EHSMS which provides a structured framework for effective environmental and safety practice across all of its activities and operations (see Section 1.2.3.3). The framework has been developed to ensure compliance with AS/NZS ISO 14001:1996 *Environmental Management Systems – Specification* with guidance for use and Australian Standard 4801:2000 *Occupational Health and Safety Management Systems – Specification* with guidance for use.

The EHSMS framework consists of multiple layers, the key components being management and hazard standards that have been developed as part of the EHSMS. These standards guide the implementation of the EMPs. The management standards define the requirements necessary to ensure that environmental (health, safety and process safety) risk is systematically managed.

Hazard standards detail the controls required to manage the risks of specific hazards to acceptable levels. These apply to all Santos operations. They contain specific requirements for planning and undertaking activities and include checklists and references to internal and external approvals and controls.

The environment hazard standards that have been developed under the Santos EHSMS are shown in Table 14.5.1. These standards (where applicable) will apply to the construction and operation of the marine facilities.

Table 14.5.1 EHSMS Management, Hazard and Environment Standards

(Version 3.0 September 2007)

Standard	Title
Management Standards	
EHSMS01	Environment, Health and Safety Policies
EHSMS02	Legal and Other Obligations
EHSMS03	Objectives and Targets
EHSMS04	Improvement Plans
EHSMS05	Responsibility and Accountability
EHSMS06	Training and Competency
EHSMS07	Consultation and Communication
EHSMS08	Document and Record Management
EHSMS09	Hazard Identification, Risk Assessment and Control
EHSMS10	Contractor and Supplier Management
EHSMS11	Operations Integrity
EHSMS12	Management of Change
EHSMS13	Emergency Preparedness
EHSMS14	Monitoring, Measuring and Reporting
EHSMS15	Incident and Non-Conformance Investigation, Corrective and Preventative Action
EHSMS16	Management System Audit and Assessment
EHSMS17	Management Review
Environment Hazard Standards	
EHS01	Land Disturbance
EHS02	Underground and Secondary Containment Systems
EHS03	Produced Water Management
EHS04	Waste Management
EHS05	Air Emissions
EHS06	Greenhouse Gas Management
EHS07	Energy Efficiency
EHS08	Contaminated Site Management
EHS09	Weed and Pest Animal Control
EHS10	Water Resource Management
EHS11	Indigenous Cultural Heritage Management (for Australian Operations)
EHS12	Noise Emissions

14.6 Responsibilities

Santos will be responsible for ensuring that this EMP is implemented. The assignment of roles, responsibilities and accountability will be in accordance with the Santos Management Standard EHSMS 05.

All Santos and contractor staff will be responsible for the environmental performance of their activities and for complying with the general environmental duty as outlined in the *Environmental Protection Act 1994*

(EP Act). Section 319(1) of the EP Act states that *"a person must not carry out any activity that causes, or is likely to cause, environmental harm unless the person takes all reasonable and practical measures to prevent or minimise the harm."*

Santos staff and contractors will be responsible for implementing the final EMP and for undertaking all work in a manner which complies with all relevant environmental standards, adheres to all legislative requirements, and ensures that all environmental objectives associated with the work are achieved. Contract documents will include the necessary environmental specifications and commitments and require compliance with the EMP, construction specifications, technical drawings and the general environmental duty.

14.6.1 Construction Phase

The Construction Manager will be responsible for the environmental management of the project's construction and for ensuring compliance with the EMP for the marine facilities.

The construction contractor will be responsible for implementing the construction phase of the EMP and for undertaking work in a manner which complies with all relevant environmental procedures, adheres to all legislative requirements, and ensures that all environmental objectives associated with the contract are achieved. Contract documents will include the necessary environmental specifications and commitments and will require compliance with the EMP, construction specifications, technical drawings and the general environmental duty.

Compliance audits will be conducted by Santos against the requirements of the EMP, the construction procedures, relevant legislation, license and permit conditions and industry standards.

14.6.2 Operational Phase

The LNG Facility Manager will be responsible for ensuring that all environmental commitments are complied with for the operation of the marine facilities. An Environmental Manager will be appointed to be responsible for the day-to-day implementation of the operations phase of the EMP and will report on its implementation and performance to the LNG Facility Manager.

14.7 Monitoring Programs

Monitoring of the marine facilities will be in accordance the Santos Management Standard EHSMS14 and regulatory requirements. This standard requires that environmental monitoring, measuring and reporting be considered and where appropriate implemented.

Routine environmental monitoring of marine facilities will be conducted to ensure performance standards put in place are met. Monitoring, undertaken by Santos operational and corporate personnel and specialist service providers, will be periodically conducted in accordance with site-specific monitoring plans.

Specialist studies to investigate particular aspects of the environment (e.g. flora and fauna, weeds, hydrological risk) will be periodically commissioned when a need is determined during environmental review and risk assessment.

14.8 Reporting and Auditing

Compliance audits will be conducted by Santos in accordance with Santos Management Standards EHMS 14 and 16, against the requirements against the requirements of this EMP the construction procedures, relevant legislation, license and permit conditions and industry standards.

All inspection and audit reports of environmental performance will be stored in the Audit and Inspection Manager (AIM). AIM is an electronic database that is used to enable corrective actions identified during the inspection / auditing process to be recorded, tracked and closed out. The information will be made available to the relevant regulatory authorities as required.

In addition to the monitoring and reporting requirements documented in the relevant sections of the EMP, the following auditing regime will be implemented:

- During construction, internal audits will be undertaken at regular intervals to verify that all work is proceeding in accordance with the EMP;
- A post-construction audit of the marine facilities will be conducted; and
- During operations, internal audits of environmental compliance will be undertaken on a regular basis.

Any environmental incident, hazard, near miss, non-conformance or third party complaint will be managed in accordance with Santos Management Standard EHMS 15. Unwanted events will be recorded and managed by the Santos Incident Management System (IMS). In the case of non-conformances identified during an audit or inspection, the notification and rectification of the non-conformance shall be managed through the Santos AIM.

Regulatory agencies will be notified of any reportable environmental incident or non-conformance with statutory approvals within the appropriate timeframe and as soon as practicable.

Relevant records supporting inspections and audits (in addition to monitoring and other critical aspects of the management system) will be generated and maintained. In accordance with the various statutory approvals required for the project, Santos will report to the administering authorities on the petroleum activities undertaken during the previous period.

14.9 Training and Communications

In accordance with Santos Management Standard EHSMS06, all Santos personnel, contractors and visitors are required to undertake appropriate environmental training and induction programs.

All managers and supervisors will be responsible for ensuring that personnel under their control have the requisite competencies, skills and training to carry out their assigned tasks in accordance with the requirements of the EMP. They will also be responsible for identifying additional training and competency requirements.

All staff will complete a comprehensive project induction. The induction will include a comprehensive review of environmental requirements and standards, safety, and access protocols. All project supervisors and managers will have additional detailed training on the use and implementation of the EMP.

All managers and supervisors will hold regular toolbox meetings with personnel to discuss issues associated with their scheduled work. This will include highlighting and discussing relevant environmental issues.

14.10 Review

This EMP will be a dynamic document. The EMP will be reviewed regularly and revised to reflect project changes and new developments. Revisions will include, but not be limited to:

- Inclusion of final organisational structures for construction and operational staff and the allocation of responsibilities in line with the organisational structure;
- Inclusion of relevant approval conditions arising from the project's approval and subsequent permits, authorities and/or licences; and
- Inclusion of any site-specific elements relevant to new developments as they occur during the life of the project.

Additional revisions will occur on an as-needed basis, including revisions to address items identified during incident investigations, inspections or audits.

Santos will be responsible for the regular review of the EMP to achieve continuous improvement in environmental performance.

14.11 Description of the Proposed Marine Facilities

Sections 3 and 8 of this EIS provide a detailed description of the marine facilities that will be part of the GLNG Project. The marine facilities will consist of the following:

- Product Loading Facility;
- A Materials Off-Loading Facility;
- Dredging Program; and
- Dredge Material Placement Facility.

14.11.1 Product Loading Facility

The PLF will include:

- Access trestle – approximately 700 m piled structure to connect the onshore plant to the offshore loading platforms, of which 400 m will be over open water with the balance being onshore;
- Loading platform (with four loading arms) for loading of LNG;
- Marine operations platform - for housing the marine terminal, which may be moved to onshore at a later stage in design;
- Building, electrical room, firewater pumps and stand-by generators, which may be moved to onshore at a later stage in design and the firewater supplied from an onshore tank; and
- Six mooring and four breasting dolphins.

The access trestle, loading platform and berthing dolphins will load LNG to specially designed LNG tankers for shipment to markets.

14.11.2 Materials Off-loading Facility

The MOF will be constructed at Hamilton Point West to enable the transportation of construction material, equipment and personnel to the site. The MOF is expected to consist of:

- Three separate berths to accommodate wide range of construction vessels and personnel ferries;
- Wharf structures, mooring and breasting dolphins; and
- Material, equipment and module lay down areas including vehicle manoeuvring areas.

The MOF will comprise berths suitable for the following type of vessels:

- Heavy lift semi-submersible vessels;
- Vessels offloaded by lift-on lift-off operations;
- Ro-Ro barges, landing craft and personnel; and
- Ferries.

A haul road will connect the MOF to the LNG facility site for the delivery of off-loaded materials.

14.11.3 Dredging Program

The proposed capital dredging program will include the dredging of an approach channel off the existing Targinie Channel, berthing pockets and a swing basin, to a design depth of 14.0 -mLAT. This will allow the safe passage, docking and loading of LNG bulk carriers, with a margin of safety between vessel keel and the seabed. The estimated *in-situ* volume of material to be dredged to lower the seabed to 14 -mLAT

is approximately 8,000,000 m^3. Dredging is likely to be undertaken using a conventional cutter suction dredge, with all material pumped as a water/sediment slurry from the dredge, through a floating discharge line to the dredge material placement facility. An additional 100,000 m^3 of material will be dredged at the MOF to a design depth of 8 –mLAT.

14.11.4 Dredge Material Placement Facility

In the absence of a port-wide dredge materials placement facility being available, the GLNG Project will include a purpose-built facility on Curtis Island. The facility will be an engineered placement facility to contain both capital and maintenance dredge materials and manage water associated with the dredge material.

A Dredge Management Plan (required under the *Coastal Protection and Management Act*) will be prepared as part of the application process for approvals to undertake dredging activities.

14.12 Description of Environmental Values, Potential Impacts and Proposed Management Strategies

Section 8 of this EIS provides a detailed description of the environmental values of the environment where the facilities will be located, the potential impacts from the proposed activities, environmental protection objectives and management strategies to mitigate those impacts.

The assessment of the beneficial or adverse effects has included an assessment of the following aspects:

- Magnitude or relative size of impact in relation to the environmental value being affected;
- Severity of any adverse effect or scale of beneficial outcome;
- Duration of the effect, for example the impact may range from a seasonal change, or it may end with the petroleum activity or extend beyond cessation of the petroleum activity; and
- An indication of the level of uncertainty and any assumptions used to address the uncertainty in any of the data or proposed commitments to protect the environmental values.

In relation to Sections 14.11 and 14.12 of this EMP, the EIS provides appropriate maps, plans and/or aerial photographs to identify the location of the marine facilities, related infrastructure and environmentally sensitive areas.

14.13 Rehabilitation Program and Financial Assurance

This EMP incorporates a rehabilitation program and decommissioning plan for the marine facilities. Sections 3 and 8 of this EIS outline the rehabilitation objectives, performance criteria and strategies that will be employed for rehabilitating the areas disturbed during the construction phase for the marine facilities.

The requirement to lodge financial assurance for the marine facilities will be determined in consultation with the relevant State government agencies. Should financial assurance be required, Santos will calculate the required amount financial assurance for the initial construction as part of the application process for the relevant development approvals. The financial assurance will be calculated using the appropriate EPA guidelines and will be reviewed in accordance with any statutory requirements.

14.14 Marine Facilities Environmental Management Plan Overview

This preliminary marine facilities EMP contains both construction and operational elements. The following elements have been incorporated into this EMP:

- Dredging Management;
- Water Quality Management;

- Acid Sulfate Soils;
- Flora and Fauna Management;
- Marine Pests;
- Shipping;
- Marine Noise;
- Waste Management;
- Mosquito Management;
- Emergency Response;
- Cultural Heritage;
- Incidents and Complaints; and
- Rehabilitation and Decommissioning.

14.15 Environmental Management Plans

14.15.1 Dredging Management

Element/Issue	Dredging Management
Operational Policy or Management Objective	To protect the marine values of Port Curtis from the effects of the project's dredging and dredge material placement.
Performance Criteria	• Minimal disturbance of the marine ecology of Port Curtis. • Compliance with the project's environmental authority approval conditions. • Continued protection of the area's World Heritage values.
Implementation Strategy	In accordance with the requirements of the *Coastal Protection and Management Act*, the dredge contractor will prepare a dredge management plan (DMP) in accordance with the EPA document *Approval of a Dredge Management Plan Guideline* and relevant environmental authority approval conditions. The DMP will describe the activities and the management measures to be implemented.
Monitoring and Auditing	• Monitoring and auditing will be conducted in accordance with EHSMS14 (*Monitoring, Measuring and Reporting*) and permit conditions. • Dredge material discharge flow rate will be measured continually. • Dredge plume (suspended solids) within Port Curtis measured daily. • Dredge material placement facility discharge: – Flow rate measured. – Suspended solids, pH oil and grease measured. – Metals and biological parameters measured. • Regional monitoring coordinated with the Port Curtis Integrated Monitoring Program.
Reporting and Corrective Action	Monitoring and auditing will be conducted in accordance with EHSMS14 (*Monitoring, Measuring and Reporting*) and permit conditions. Reporting, investigation and management of corrective actions associated with environmental events (including incidents, hazards, near misses, non-compliance events and third party complaints) will be conducted in accordance with EHSMS15 (*Incident and non-Conformance Investigation, Corrective and Preventative Action*). Records and results of the monitoring program to be retained and made available to the relevant regulatory agencies as required. The following will constitute a non-compliance or incident; • Dredge management plan not prepared or approved. • Discharge water quality standards not met.

	• Regional water quality monitoring shows unacceptable impact from GLNG Project. Should an incident or failure to comply occur, one or more of the following will be taken: • Dredge management plan amended and approval sought. • Contingency measures employed to improve the quality of the facility discharge. • Dredging operations modified.

14.15.2 Water Quality Management

Element/Issue	Water Quality Management
Operational Policy or Management Objective	To protect the water quality of Port Curtis from the effects of the project's dredging and dredge material disposal.
Performance Criteria	• Minimal disturbance of the water quality of Port Curtis. • Compliance with the project's environmental authority approval conditions. • Continued protection of the area's World Heritage values.
Implementation Strategy	In accordance with the requirements of the *Coastal Protection and Management Act*, the dredge contractor will prepare a dredge management plan (DMP) in accordance with the EPA document *Approval of a Dredge Management Plan Guideline* and relevant environmental authority approval conditions. The DMP will describe the activities and the management measures to be implemented.
Monitoring and Auditing	• Monitoring and auditing will be conducted in accordance with EHSMS14 (*Monitoring, Measuring and Reporting*) and permit conditions. • Dredge material discharge flow rate will be measured continually. • Dredge plume (suspended solids) within Port Curtis measured daily. • Dredge material placement facility discharge: – Flow rate measured. – Suspended solids, pH oil and grease measured. – Metals and biological parameters measured. • Regional monitoring coordinated with the Port Curtis Integrated Monitoring Program.
Reporting and Corrective Action	Monitoring and auditing will be conducted in accordance with EHSMS14 (*Monitoring, Measuring and Reporting*) and permit conditions. Reporting, investigation and management of corrective actions associated with environmental events (including incidents, hazards, near misses, non-compliance events and third party complaints) will be conducted in accordance with EHSMS15 (*Incident and non-Conformance Investigation, Corrective and Preventative Action*). Records and results of the monitoring program to be retained and made available to the relevant regulatory agencies as required. The following will constitute a non-compliance or incident: • Dredge management plan not prepared or approved. • Discharge water quality standards not met. • Regional water quality monitoring shows unacceptable impact from GLNG Project. Should an incident or failure to comply occur, one or more of the following will be taken: • Dredge management plan amended and approval sought. • Contingency measures employed to improve the quality of the facility discharge. • Dredging operations modified.

14.15.3 Acid Sulfate Soils

Element/Issue	Acid Sulfate Soils
Operational Policy or Management Objective	To control acid generation from the in-situ soils and to minimise the potential for on-site and off-site environmental impacts.
Performance Criteria	• No net increase in existing soil acidity due to oxidation of in-situ or excavated materials. • No direct or indirect release of runoff waters or leachate that do not meet the established water quality parameters.
Implementation Strategy, Monitoring and Auditing	If potential ASS become exposed during construction, actions will be undertaken in accordance with the requirements of: • *Environmental Protection Act 1994.* • Environmental Protection (Water) Policy 1997. • State Planning Policy (SPP2/02) – Planning and Managing Development involving ASS. **ASS Management and Treatment** If ASS material is excavated, the material will be trucked to a designated area and spread out in loose layers approximately 300 mm thick for moisture conditioning and subsequent lime treatment if required. Non-ASS material (residual or alluvial) will be stockpiled separately to estuarine ASS material. Prior to placing the material, a low bund will be constructed around the perimeter of the stockpile to prevent overland flows entering the area and/or to contain runoff or leachate from exiting the treatment area. Bunds will comprise non-ASS materials and will be approximately 0.5 m to 1 m high. The surface of the treatment pad will comprise a layer of imported (non-PASS) fill 0.3-0.5 m thick, compacted to effectively restrict infiltration into the substrate soils. A surface layer of Aglime applied at a rate of 5 kg/m^2 will be worked into the soil surface to act as a guard layer to neutralise any leachate from the materials being treated on the treatment area. **Lime Treatment of Excavated Material** Lime will be blended into the material to neutralise any potential acid production. Proposed liming rates will be developed following testing of the material to be treated. Following placement and spreading of material, samples will be obtained for laboratory verification testing. Sample handling and transport will be in accordance with the ASS sampling and analysis guidelines – Ahern et al. (1998). Once the material is sufficiently dry, lime will be added at a rate of 1.5 times the theoretical amount necessary to neutralise the existing and potential acidity. The lime will be blended thoroughly using a rotary hoe, disk plough or other approved alternative method. **Validation Testing** Validation testing of the treated material will be carried out by obtaining a representative composite samples for laboratory testing using either the suspended peroxide oxidation-combined acidity and sulfate (SPOCAS) method or combined S_{CR} plus acid neutralisation capacity 9ANC) test method or other approved testing methods. A total potential acidity (TPA) test result of 0 mols H^+/t together with an average ANC value of 1.5 times the theoretical amount (of lime) necessary to neutralise the total of any existing and potential acidity, is the target for validation testing. If the testing indicates inadequate treatment, additional lime will be mixed with the soil material and further validation testing will be carried out until satisfactory results are achieved. **Self-Neutralising Soils** Some sediments contain naturally occurring calcium or magnesium carbonates in the form of crushed shell (shell-grit) coral and foraminifera, and when present in appreciable quantities, the oxidisable sulphur (%S) levels determined from the SPOCAS or the chromium reducible sulphur (CRS) suite of tests, may be reduced to reflect the self

Element/Issue	Acid Sulfate Soils
	neutralising capability of the sediments. Where appropriate, the SPOCAS or combined CRS plus ANC test methods will be carried out to determine the inherent soil self-neutralising capacity of the sample being tested. **Other Monitoring** Monitoring to be undertaken includes: • Inspection of the bunds around the lime treatment area (should ASS treatment be necessary). • Inspection of site for evidence indicating the occurrence of untreated ASS. • Water pH in retention ponds.
Reporting	Reporting of environmental performance data will be conducted in accordance with EHSMS14 (*Monitoring, Measuring and Reporting*). The Environmental Manager will report any occurrences of exposed ASS to the Construction Manager and provide regular updates on any ASS treatment. Reports will include: • The effectiveness of the operating strategies. • Problems in implementing the ASS management strategies. • Results and compliance with testing requirements, runoff control and materials handling. • Effectiveness of any corrective action adopted. • Deviations from the ASS management strategies. If lime treatment of PASS is unsuccessful or performance targets are not being met as indicated by the validation and water quality testing procedures, the earthworks schedule will be reassessed and action taken to determine the problems causing the breach of standards. Should results of verification testing indicate residual acidity outside allowable limits, the affected material will remain in place and additional lime added and the verification process repeated until performance criteria are met. If the problems are related to ineffective implementation of the ASS management plan then the plan will be audited to ensure improved implementation. Monitoring and testing will be increased to ensure compliance with the established standards. Any major changes to the management plan will be subject to discussions with and the approval of the relevant regulatory authorities.
Corrective Action	If lime treatment of PASS is unsuccessful or performance targets are not being met as indicated by the validation and water quality testing procedures, the earthworks schedule will be reassessed and action taken to determine the problems causing the breach of standards. Should results of verification testing indicate residual acidity outside allowable limits, the affected material will remain in place and additional lime added and the verification process repeated until 'Performance Criteria' are met. If the problems are related to ineffective implementation of the ASS management plan then the plan will be audited to ensure improved implementation. Monitoring and testing will be increased to ensure compliance with the established standards. Any major changes to the management plan will be subject to discussions with and the approval of the relevant regulatory authorities.

14.15.4 Flora and Fauna Management

Element/Issue	Flora and Fauna Management
Operational Policy or Management Objective	To minimise and manage impacts to the ecological values of the marine facilities sites.
Performance Criteria	• Minimal disturbance of flora and fauna during construction of the infrastructure.

Element/Issue	Flora and Fauna Management
	• No unplanned or unapproved damage to flora and fauna. • Relevant permit is in place before removing any protected species.
Implementation Strategy	• All works will be conducted in accordance with the Queensland Government's operational policy for the removal or disturbance of marine plants in accordance with the *Fisheries Act 1994* including obtaining the necessary permits to remove, destroy or damage a marine plants. • Disturbance will generally be restricted to designated work areas. • Physical barriers will be installed around significant (landward) vegetation areas in order to restrict unauthorised access and avoid disturbance. • Clearing and disturbance in intertidal areas and wetland/water body areas will be minimised to that necessary to safely construct the site and meet other environmental requirements (e.g. dredge material placement facility, separation of stockpiles, erosion control). • Controls to prevent permanent barriers to fish and other fauna movement will be implemented. • Bushland and habitat surrounding construction areas will be managed to prohibit any unauthorised disturbance so as to maintain the area's habitat values as much as possible. • Where practicable, dead trees, stumps and hollow branches will be salvaged from the terrestrial areas to be cleared and relocated to the surrounding undisturbed areas to create compensatory shelter. • Where practicable, the timing of clearing operations will be selected to minimise impacts on breeding species. • Hollow bearing trees will be felled in a manner which reduces potential for fauna mortality. Felled trees will be inspected after felling and fauna (if identified and readily accessible) will be removed and relocated or rendered assistance if injured. After felling, hollow bearing trees will remain unmoved over-night to allow animals to move of their own volition. • The dredge areas will be inspected for the presence of marine megafauna and appropriate mitigation measures (such as 'soft-start') will be implemented.
Monitoring and Auditing	Monitoring and auditing will be conducted in accordance with EHSMS14 (*Monitoring, Measuring and Reporting*) and permit conditions. Ongoing monitoring will be undertaken to assess the success and integrity of construction and ensure appropriate follow-up rehabilitation measures are implemented. Routine inspections of undisturbed areas by the contractor's environmental representative to identify any evidence of habitat disturbance or feral pest presence. The contractor's environmental representative will monitor site clearing to ensure that: • Areas to be cleared are clearly defined. • There is no unauthorised disturbance of the surrounding habitat area. • Compensatory shelter is established where necessary. • Where necessary, an animal retrieval program is implemented.
Reporting and Corrective Action	• Reporting of environmental performance data will be conducted in accordance with EHSMS14 (*Monitoring, Measuring and Reporting*). • Reporting, investigation and management of corrective actions associated with environmental events (including incidents, hazards, near misses, non-compliance events and third party complaints) will be conducted in accordance with EHSMS15 (*Incident and non-Conformance Investigation, Corrective and Preventative Action*). • Non-compliance and incident reports will be closed out by senior management. • Any third party complaints will be recorded in the Santos complaints register (part of the EHSMS) and appropriate corrective actions will be implemented and closed out by the Environmental Manager.

14.15.5 Marine Pests

Element/Issue	Marine Pests
Operational Policy or Management Objective	To prevent the introduction and spread of introduced marine pests.
Performance Criteria	No sightings / evidence of introduced marine pests.
Implementation Strategy	• All vessels from overseas must obtain a quarantine ship clearance from Australian Quarantine and Inspection Service (AQIS). • All vessels from overseas must comply with AQIS controls on ballast water discharge. • A risk assessment of potential marine pest introductions will be carried out for each vessel proposed to be used on the GLNG Project. • For vessels that are considered high risk, inspections of the hulls and/or hoppers may be carried out, and, for overseas vessels, preferably before they depart for Australian waters. • Santos will promote that all chartered vessels adhere to the International Maritime Organisation's voluntary ballast water management guidelines.
Monitoring and Auditing	• Records of quarantine clearances and ballast water management will be maintained for ships servicing the GLNG Project. • Records of hull inspections of all high risk ships will be maintained. • The marine facilities' marine monitoring program will include surveys for potential introduced marine pests.
Reporting and Corrective Action	Reporting of environmental performance data will be conducted in accordance with EHSMS14 (*Monitoring, Measuring and Reporting*). Reporting, investigation and management of corrective actions associated with environmental events (including incidents, hazards, near misses, non-compliance events and third party complaints) will be conducted in accordance with EHSMS15 (*Incident and non-Conformance Investigation, Corrective and Preventative Action*). Non-compliance and incident reports will be closed out by senior management. Any third party complaints will be recorded in the Santos complaints register (part of the EHSMS) and appropriate corrective actions will be implemented and closed out by the Environmental Manager. Should an incident or failure to comply occur, a selection of the following actions will be taken: • Ship operators will be instructed regarding the correct quarantine and/or ballast management procedures. • Additional reporting and surveillance measures will be introduced.

14.15.6 Shipping

Element/Issue	Shipping
Operational Policy or Management Objective	To prevent the occurrence of environmental incidents related to the project's shipping activities.
Performance Criteria	No environmental incidents related to project shipping.
Implementation Strategy	• All vessels exporting LNG from the facility will comply with the following design requirements: – Ships will be double hulled to provide additional protection. – The LNG tanks will be double insulated to minimise the amount of gas boil off. – The on-board storage tanks will contain inner structures to absorb stress

Element/Issue	Shipping
	fluctuations resulting from wind, wave, cargo load and temperature changes. – Gas that vapourises during shipment will typically be collected, compressed and used as fuel in the ship's propulsion system. • Ships entering and leaving Port Curtis will navigate in accordance with the port rules as established by the Gladstone Ports Corporation. • All vessels chartered for LNG export will be required to comply with the International Convention for the Protection of Pollution from Ships 1973/78 (MARPOL 73/78) under the provisions of the Commonwealth Government's *Protection of the Sea (Prevention of Pollution from Ships) Act 1983* and the *Navigation (Protection of the Sea) Amendment Act 1983.* • While operating in Queensland coastal waters ships will comply with Queensland's *Transport Operations (Marine Safety) Act 1994* and *Transport Operations (Marine Pollution) Act 1995.* • Santos will promote that all chartered vessels adhere to the International Maritime Organisation's voluntary ballast water management guidelines. • The LNG vessels will manoeuvre in Port Curtis under the following preliminary operational limits: – Wind in any direction up to 25 knots. – Waves up to 2.5m. – Visibility limit set to see at least two navigational beacons ahead of the LNGC ship in motion. – Minimum under-keel clearance is 10% of the vessel's draught. • The LNG vessels will be under active tug escort as they transit through Port Curtis. • No deep draught vessels will be permitted to pass an LNG vessel (either overtake or move in the opposite direction) whilst it is in transit through the Gladstone Port. • Whilst a vessel is on berth a safety and security zone will be declared around the vessel through which other craft should not transit. Whilst a vessel is on berth a standby tug shall also be deployed to patrol the edge of the zone and to warn other craft of the existence of the zone and to discourage vessels from entering this zone. The tug shall also be outfitted with full fire fighting and rescue capability such that it can render assistance in the unlikely event that an incident occurs. • The size of the safety and security zone is yet to be confirmed but is conservatively assumed to be a circle of 250 m radius.
Monitoring and Auditing	• Records of quarantine clearances and ballast water management will be maintained for ships servicing the GLNG Project. • Records of hull inspections of all high risk ships will be maintained. • The marine monitoring program will include surveys for potential introduced marine pests.
Reporting and Corrective Action	• Reporting of environmental performance data will be conducted in accordance with EHSMS14 (*Monitoring, Measuring and Reporting*). • Reporting, investigation and management of corrective actions associated with environmental events (including incidents, hazards, near misses, non-compliance events and third party complaints) will be conducted in accordance with EHSMS15 (*Incident and non-Conformance Investigation, Corrective and Preventative Action*). • Non-compliance and incident reports will be closed out by senior management. • Should an incident or failure to comply occur, a selection of the following actions will be taken: – Ship operators will be instructed regarding correct port operating procedures. – Ship operators will be instructed regarding the correct quarantine and/or ballast management procedures. – Additional reporting and surveillance measures will be introduced.

14.15.7 Marine Noise

Element/Issue	Marine Noise
Operational Policy or Management Objective	To ensure that no significant impacts occur to marine ecology due to underwater noise impacts.
Performance Criteria	No environmental harm due to underwater noise impacts.
Implementation Strategy	• To prevent a startle response from dugong or dolphin at the start of dredging or impact piling in deeper water (>3m) observations will be made of the work area before commencement on any day or after an extended time when work has stopped. • If dugong or dolphin is observed within the area then commencement of impact piling will be delayed until they clear the area. Alternatively, a soft start to piling will be considered. • Sonar devices on dredges will have operating frequencies above 200 kHz to minimise the impact upon dolphin and dugong.
Monitoring and Reporting	Marine mammal observations will be undertaken prior to the commencement of impact pile driving activities.
Corrective Action	The following will constitute a non-compliance or incident: • Mammal observations are not undertaken. • A soft start is not made in the event of positive mammal observations. Should an incident or failure to comply occur, a selection of the following actions will be under taken: • Mammal observations will be undertaken. • Initial piling operations will be modified.

14.15.8 Waste Management

Element/Issue	Waste Management
Operational Policy or Management Objective	To manage wastes from the construction and operation of the marine facilities in such a way that any potential impacts on the environment are minimised or avoided by incorporating the waste management hierarchy.
Performance Criteria	• Minimal waste generated by construction and operation activities. • No inappropriate disposal or management of waste. • No contamination of soil, air or water as a result of waste disposal activities. • Compliance with the waste management requirements of the Santos environment, health and safety management system.
Implementation Strategy	**Construction** A waste management plan will be developed for the construction stage that includes elements such as: • Opportunities and actions to be taken to implement the waste management hierarchy. • Waste management procedures. • Training and management. • A monitoring and reporting program. The following tasks will be undertaken during the construction phase to achieve the performance requirement: • Careful planning will be employed when ordering materials. Where practical, any excess materials and used chemical containers and packaging will be returned to the supplier or to a local consumer. • Preference will be given to materials that will result in no, or low, levels of waste (from both the materials and the packaging).

Element/Issue	Waste Management
	• Waste streams will be separated into various components where these are produced. Waste separation at source will be achieved by providing bins for re-useable and recyclable materials. For large quantities of waste, an area on site will be allocated for the collection of materials. • Recyclable building wastes will be collected separately and re-used or recycled, e.g.: – Timber from concrete formwork can be recovered and reused. – Scrap steel and off-cuts can be recycled. – Plastics can be recycled. – Oils can be collected and sent for refining. • Wastes that cannot be re-used or recycled will be disposed of at an approved landfill. • All wastes leaving the site will be tracked in accordance with the requirements of the Environmental Protection (Waste Management) Regulation 2000 Schedule 2. **Operation** • All vessels chartered for LNG export will be required to comply with the International Convention for the Protection of Pollution from Ships 1973/78 (MARPOL 73/78) under the provisions of the Commonwealth Government's Protection of the Sea (Prevention of Pollution from Ships) Act 1983 and the Navigation (Protection of the Sea) Amendment Act 1983. • While operating in Queensland coastal waters ships will comply with Queensland's Transport Operations (Marine Safety) Act 1994 and Transport Operations (Marine Pollution) Act 1995. • Santos will promote that all chartered vessels adhere to the International Maritime Organisation's voluntary ballast water management guidelines. • Requirements for ship's garbage reception will be reviewed by Santos in association with the Gladstone Ports Corporation, with the aim of ensuring that project vessels will be permitted to off-load solid wastes. • No vessel will be allowed to discharge treated or untreated sewage into port waters.
Monitoring and Auditing	• Construction waste streams to be monitored. • Housekeeping checks to ensure waste is being stored correctly and that no littering is occurring. • Records of quarantine clearances and ballast water management will be maintained for ships servicing the GLNG Project.
Reporting and Corrective Action	• Reporting of environmental performance data will be conducted in accordance with EHSMS14 (*Monitoring, Measuring and Reporting*). • Reporting, investigation and management of corrective actions associated with environmental events (including incidents, hazards, near misses, non-compliance events and third party complaints) will be conducted in accordance with EHSMS15 (*Incident and non-Conformance Investigation, Corrective and Preventative Action*). • Non-compliance and incident reports will be closed out by senior management. The following will constitute a non-compliance or incident: • Construction waste management plan not prepared or implemented. • Ships' wastes (ballast, garbage or sewage) not being discharged according to relevant protocols and requirements. Should an incident or failure to comply occur, a selection of the following actions will be under taken: • Construction waste management plan to be prepared and/or implemented. • Ship operators will be instructed regarding correct waste management procedures.

14.15.9 Mosquito Management

Element/Issue	Mosquito Management
Operational Policy or Management Objective	To prevent the occurrence of potential mosquito breeding sites and the presence of adult mosquitoes.
Performance criteria	Minimal number of potential mosquito breeding sites created on-site by preventing water from ponding. Mosquito management will be conducted in accordance with Santos' EHS09 (*Weed and Pest Animal Control*).
Implementation Strategy	The following strategies will be implemented: • Depressions in the ground surface (such as wheel ruts) will be filled as soon as practicable to prevent the ponding of water. • Pools of stagnant water will be drained and/or the depressions filled. • Storage containers capable of ponding water will be either discarded after use or stored in an inverted position (care will be taken to ensure that ponding does not occur in waste storage areas). • Erosion and washdown practices will be controlled to prevent the formation of standing water pools in natural water courses adjacent to the sites.
Monitoring and Auditing	The LNG Facility Environmental Manager will liaise with Queensland Health and the relevant local councils for assistance in choosing a suitable method of laviciding/eradication should this be necessary.
Reporting and Corrective Action	The following represent an incident or failure to comply in regard to mosquito management: • An increase in the numbers of potential mosquito breeding sites on-site. • An increase in the numbers of larvae and/or mature mosquitoes on-site. • Significant incidences of mosquito bites are reported. • Mosquito management strategies are not implemented. Should an incident or failure to comply occur, a selection of the following actions will be taken: • An investigation will be undertaken into why directives are not being carried out. • Employees will be re-educated on desired practices. • Work policies and procedures will be reviewed and modified to improve the situation.

14.15.10 Emergency Response

Element/Issue	Emergency Response
Operational Policy or Management Objective	To ensure that project personnel can respond effectively and efficiently in the event of an emergency associated with construction or operation of the marine facilities.
Performance Criteria	Emergency plans are developed and in place for both construction and operational activities. Compliance with the relevant requirements of: • *Dangerous Goods and Safety Management Act 2001.* • *Fire and rescue Authority Act 1990.* Emergency response preparedness will be undertaken in accordance with Santos' EHSMS 13 (*Emergency Preparedness*). All personnel familiar with emergency procedures and their role in the event of emergency, and drills undertaken.
Implementation Strategy	Santos will prepare a detailed emergency response plan during the detailed design phase. The plan will include consideration of the following:

Element/Issue	Emergency Response
	• Response procedures in the event of a fire, chemical release, spill, LNG leak, accident, explosion, equipment failure, bomb threat, natural disaster (including severe storm, bushfire or flood events) or any other likely emergency. • Communication arrangements and contact details. • Roles and responsibilities of responsible personnel. • Emergency controls and alarms. • Evacuation procedures. • Emergency response equipment. • Leak detection and control points. • Training requirements. • Site access and security.
Monitoring and Auditing	The effectiveness of the emergency response plan will be regularly tested and audited.
Reporting and Corrective Action	Reporting, investigation and management of corrective actions associated with emergency response events (including incidents, hazards, near misses, non-compliance events and third party complaints) will be conducted in accordance with EHSMS 13 (*Emergency Preparedness*) and EHSMS15 (*Incident and Non-Conformance Investigation, Corrective and Preventative Action*). Non-compliance and incident reports will be closed out by senior management. The following constitute incidents or failure to comply: • Emergency response plan is not prepared or implemented. • Emergency response equipment is not provided. • Emergency response training is not undertaken. • Emergency response procedures not followed in the event of an incident. In the event of an incident or failure to comply, one or more of the following actions will be undertaken as appropriate: • Prepare or implement the emergency response plan. • Provide the necessary equipment or training. • Investigate why the emergency response procedures were not followed and implement mitigating measures.

14.15.11 Cultural Heritage

Element/Issue	Cultural Heritage
Operational Policy or Management Objective	To protect the cultural heritage values of the marine facilities sites.
Performance Criteria	Compliance with the requirements of the *Aboriginal Cultural Heritage Act 2003* and the relevant Cultural Heritage Management Plan (CHMP). No disturbance of any place on the Queensland Heritage Register in accordance with the requirements of the *Queensland Heritage Act 1992*.
Implementation Strategy	• Santos will develop and implement a CHMP in consultation with the relevant Aboriginal Party. Protection, management and mitigation measures will be agreed after cultural heritage surveys are complete, and will be incorporated in the Santos cultural heritage management system. • Protection of indigenous cultural heritage will be conducted in accordance with EHS11 (Indigenous Cultural Heritage Management) and agreed CHMP. • Where potential non-indigenous heritage material is identified and likely to be disturbed, Santos will determine the significance of the site in consultation with the EPA and undertake relocation / preservation of the material. A project specific conservation management plan will be prepared to establish mitigation, management

Element/Issue	Cultural Heritage
	and approval procedures. • Include cultural heritage issues in the project induction program for staff and contractors, and involve representatives from the Aboriginal Party in the development and implementation of such programs.
Monitoring and Auditing	Monitoring of the construction operations will be undertaken by traditional owner monitors. Auditing of compliance with the CHMP in accordance with the processes defined within the CHMP.
Reporting and Corrective Action	Any signs of disturbance of artifacts will be reported to the Construction Manager and the relevant indigenous stakeholders. Any of the following will constitute an incident or failure to comply: • Failure to prepare and/or implement a CHMP. • Unauthorised disturbance of any artifacts. In the event of an incident or failure to comply, the commitment that has not been undertaken will be reviewed and modifications implemented as appropriate.

14.15.12 Incidents and Complaints

Element/Issue	Incidents and Complaints
Operational Policy or Management Objective	To manage and respond to any environmental or social incidents and complaints from the community regarding the marine facilities.
Performance Criteria	Incidents and complaints regarding environmental and social issues will be minimised and mitigation measures implemented to reduce the incidence of complaints.
Implementation Strategy	All incidents and complaints will be documented in the Santos Incident Management System (IMS - part of the EHSMS) and will be guided by EHSMS15 (*Incident and Non-Conformance Investigation, Corrective and Preventative Action*). The complaints form will document at least the following information: • Time, date and nature of complaint. • Type of communication (telephone, letter, email, visit). • Name, contact address and contact number (if provided). • Response and investigation undertaken as a result of the complaint. • Action taken and signature of person investigating complaint. Each complaint will be investigated as soon as practicable and, where appropriate, corrective action taken to remedy the cause of the complaint.
Monitoring and Auditing	The LNG Facility Environment Manager will maintain the IMS complaints register and ensure all complaints are resolved. The complaint form will be checked within two weeks of complaint receipt to ensure follow-up action has been taken to resolve the issue.
Reporting and Corrective Action	All complaints and incidents are to be reported to senior management. The complainant will be advised of what action, if any, has been taken as a result of the complaint. Should further incidents occur or complaints be received in relation to previous occurrences, an appropriate selection of the following corrective actions will be undertaken: • Additional environmental awareness training of the workforce with respect to the procedures to be followed for environmental incidents or complaints. • Investigation into why the incident/complaint was not addressed within the specified time frame. • Incident/complaint follow-up according to the results of the investigation. • Where required, work place practices will be reviewed.

14.15.13 Rehabilitation and Decommissioning

Element/Issue	Rehabilitation and Decommissioning
Operational Policy or Management Objective	To ensure that the marine facilities are effectively rehabilitated and/or decommissioned in an environmentally sustainable manner.
Performance Criteria	• The marine sites contain no long term environmental hazards. • Risks to the public are to be mitigated to acceptable levels. • The sites are returned to a state suitable for other uses in the future.
Implementation Strategy	**Rehabilitation** The dredge material placement facility will be rehabilitated once it is no longer required for the disposal of capital or maintenance dredge material. Rehabilitation procedures will include the following: • In consultation with the relevant authorities, assessment will be made of potential future uses of the site based on consideration of the nature of surrounding land uses, the availability of existing infrastructure, and the proximity to Port Curtis. • The dredge material stored within the facility will be left to dry and compact so that it can support rehabilitation equipment. • The bund walls will be designed and constructed to be stable against long-term failure and to provide adequate safety factors. • Drainage will be provided to manage surface water flows and control erosion across the landform. Drainage and landform design will be appropriate to promote structural integrity. • The facility will be designed to ensure that no permanent water pondage occurs on the surface and stormwater is removed from the landform as quickly as possible to minimise seepage. The drainage design will include a system of contour drains and rock-lined drainage channels and drop structures. The runoff collected from the surface will be discharged in a controlled manner. • Once the surface has been re-contoured, a low-permeability cover layer will be constructed. The cover will comprise a multi-layered system to maximise its long-term stability and to reduce the seepage of water through the dredged material. • A topsoil layer will then be placed on top of the low permeability layer to enable the site to be revegetated. • The surface of the facility will be revegetated using native grass and shallow-rooted shrub species to stabilise the cover surface, to assist in the removal of water stored within the cover following extended wet periods, and to provide habitat. Sterile exotic grasses that are quicker growing than native grasses may be used initially to assist in surface stabilisation. **Decommissioning** • In consultation with the Gladstone Ports Corporation and other relevant authorities, an assessment will be made of the potential future uses for the project's marine facilities. This will be based on consideration of the engineering integrity of the facilities, the nature of surrounding land uses, the availability of existing infrastructure, and the proximity to Port Curtis. • If alternative uses are to be made of the facilities, Santos will enter into a formal agreement with the parties who are to take over the facilities regarding ongoing ownership and responsibilities. • A decommissioning plan will be prepared detailing the decommissioning procedures and success criteria. • Any items not proposed for ongoing use will be dismantled and removed from the site for re-sale, re-cycling or disposal. • Unwanted wharves will be demolished and piles cut off at seabed level to minimise any long term risk to navigation. • Equipment will be removed for re-sale, re-cycling or disposal.

Element/Issue	Rehabilitation and Decommissioning
	• Phase 1 and 2 contaminated land assessments will be conducted on potentially contaminated land based areas of the facilities to standards prescribed by the *Environmental Protection Act 1994* or other appropriate legislation applicable at the time. Where necessary, decontamination or site remediation work will be undertaken. • The land based areas will then be re-contoured and rehabilitated to achieve a stable self-sustaining landform.
Monitoring and Auditing	A monitoring program that will assess the effectiveness of rehabilitation and decontamination efforts will be developed as part of the preparation of the final decommissioning plan. On-going environmental monitoring may be required for a period of time to ensure decontamination and rehabilitation procedures have been successful and there is no likelihood of any further contamination resulting from the site's previous activities.
Reporting and Corrective Action	Records will be kept of any areas where decontamination is required and the steps taken to accomplish this. The results of rehabilitation, decontamination and any monitoring programs will be kept and presented in a decommissioning report which will be submitted to the EPA. The following constitute an incident or failure to comply: • A decommissioning plan is not prepared or implemented. • Aspects of the decommissioning, remediation or rehabilitation do not satisfy the relevant regulatory authorities or other stakeholders in the project. • There is evidence of ongoing environmental harm following the completion of decommissioning activities. In the case of the occurrence of the above incidents, the decommissioning plan will be reviewed and revised in consultation with all relevant parties and the situation remedied.