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# PETROLEUM CSG

## HSE MANAGEMENT SYSTEM CONTROL

<b>ENVIRONMENT CONTROLS</b>
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<b>Petroleum HSE Control No:</b> PHSE-CO-MS15-01-PET	
<b>Reference:</b> HSE Management System Element 15 - Environment	
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<b>Originator:</b> Jesse Roberts, Environmental Engineering Manager	
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## INTRODUCTION

### Purpose

The Petroleum Environment Controls specify prescriptive requirements to eliminate or minimize environmental impacts at Petroleum-controlled operations. The intent of the Environment Controls is to establish how Petroleum complies with applicable environmental, legal and other requirements. The Petroleum Environment Controls form part of the Petroleum HSE Management System<sup>(1)</sup> and define the mandatory requirements for the implementation of controls for each environmental aspect. *Where a conflict exists between the requirements in the Environment controls and applicable local environmental laws, the more stringent must be applied.*

The existence of these Controls does not presume coverage of all HSE impacts or risks faced by our operations, but they address the key environmental impacts and risks, many of which are the focus of environmental targets and key performance indicators for Petroleum and the Company. Other risk areas that fall outside these Controls are addressed through the risk management process that is a key element of the Petroleum HSE Management System<sup>(1)</sup> (Element 3 Hazards and Risks).

### Application and Scope

These Petroleum Environment Controls apply at all BHP Billiton Petroleum-controlled sites and controlled activities, and to all BHP Billiton employees, contractors and visitors when involved in controlled activities. Table 1 outlines the scope of the Environment Controls. The Petroleum Environment Controls apply to the entire lifecycle of Petroleum's activities, processes and products, including exploration and planning, development, operation, closure (decommissioning, remediation and rehabilitation), marketing and acquisitions and divestments. To the extent that the requirements apply, they must be followed. However, requirements specific to design do not apply to existing facilities until the next scheduled opportunity for equipment replacement or retrofit.

Petroleum-monitored activities should have equivalent controls in place that meet the intent of this document. Partners, suppliers and contractors are expected to adopt these Environment Controls while engaged in activities with Petroleum sites, operations and activities.

### Responsibility

Unless otherwise stated, managers and supervisors responsible for controlled activities are accountable for the implementation of the Environment Controls specified in this document.

Personnel must comply with the requirements in the document, and the expectations detailed in [Petroleum HSE Management System<sup>\(1\)</sup>](#) including associated Policies, Standards and Procedures.

## ENVIRONMENT CONTROLS

This document defines the requirements for managing environmental aspects within Petroleum and provides direction to related Petroleum HSE Policies, Standards, Procedures and associated documents. Sources of reference documentation include:

- The Petroleum HSE Management System<sup>(1)</sup> documentation (via the Petroleum HSE portal).
- The Petroleum HSE Controls (Fatal Risk Controls, Health and Hygiene Controls, Asset Protection and Security Controls, Aviation Controls and Marine Operations Controls, all accessible via the Petroleum portal).
- Other Petroleum Documents (via the Petroleum portal).

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**Table 1 Application of Environment Controls**

Control	Application
<b>Drilling Muds and Drilled Cuttings</b>	Drilling, completions, or well workover operations where drill fluids or cuttings may be discharged, including extended reach drilling, horizontal directional drilling or horizontal directional boring.
<b>Combustion Emissions</b>	Combustion of all fuels in engines, turbines and process equipment, including marine vessel engines associated with exploration, development and production.
<b>Flaring, Venting and Fugitive Emissions</b>	Onshore or offshore activities where flaring, venting or fugitive releases may occur, including venting and fugitive releases from storage tanks and ship/tanker loading and unloading operations.
<b>Produced Water Formation (PFW)</b>	Onshore and offshore treatment and discharge of all PFW co-produced with oil and gas.
<b>Wastes</b>	Waste material, both hazardous and non-hazardous, that is associated with Petroleum exploration, construction, production or closure activities. Where a hazardous material is involved, the Fatal Risk Controls <sup>(1)</sup> apply.
<b>Physical Disturbance</b>	Onshore and offshore oil and gas exploration, construction, installation and production activities, and all associated infrastructure (e.g., roads, shore bases).
<b>Marine Noise</b>	Offshore oil and gas activities and operations.

The mandatory requirements of these Controls are signified by the use of the word “must.” The word “should” indicates that the primary intent is to comply with the full requirements as if they were mandatory. However, there will be circumstances where local conditions may demonstrate that the requirement is either not applicable or an alternative approach is necessary. In cases where “should” has been used in a requirement, variation can only be considered as compliance if the most Senior Manager of the operation approves it based on an evaluation of the risk. The risk management approach adopted must be consistent with the performance requirements of Petroleum HSE Management System<sup>(1)</sup> (Element 3 Hazards and Risks), and follow the appropriate Hierarchy of Controls (Waste Management Hierarchy of Controls and/or **Risk Management Hierarchy of Controls**) as shown below. A number of these options may be considered and applied individually, or in combination.

- **Eliminate:** The complete elimination of the hazard
- **Substitute:** Replacing the material or process with a less hazardous one
- **Redesign:** Redesigning the plant, equipment or work processes
- **Separate:** Isolating the hazard by guarding or enclosing it
- **Administrative:** Providing control, such as training, procedures, etc.
- **Pollution control device:** Using appropriate pollution control equipment where other controls are not practical; pollution control devices include impact minimization equipment such as spill clean-up material or dust suppression measures

When discussing emissions, discharges and wastes, the **Waste Management Hierarchy of Controls** must be applied in the following order<sup>(2)</sup>:

- **Eliminate:** The complete elimination of the waste; also includes management measures that result in no direct impact to the terrestrial, marine or atmospheric environment
- **Reduce:** Generating less waste through more efficient practices
- **Reuse/recycle:** Reusing material in its original form, or recycling the waste product by extracting energy from it or converting it into usable materials
- **Treatment:** Destroying, detoxifying or neutralizing waste by biological, thermal, chemical or physical methods, e.g., incineration
- **Disposal:** Releasing to the atmosphere, marine dumping or landfill of the waste

The remainder of this document describes the intent of each Control and provides a set of corresponding mandatory performance requirements.

## ENVIRONMENT CONTROL 1 – DRILLING MUDDS AND DRILLED CUTTINGS

### INTENT

To eliminate or minimize adverse environmental impacts resulting from the discharge of drilling muds and cuttings. Adverse impacts due to toxicity may occur to offshore water quality or marine life, or to onshore groundwater, wildlife or local populations if these materials are not managed properly. Offshore, riser-less drilling or seafloor discharges of cuttings may cause smothering of seafloor life, due to accumulations of cuttings.

### PERFORMANCE REQUIREMENTS

#### Plant and Equipment

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| <p>1.1. Where a synthetic based mud (SBM) or oil based mud (OBM) system is used, separation equipment that is capable of ensuring the volume of SBM or OBM retained on drilled cuttings is no more than 10% by dry weight must be used.</p> <p>1.2. Onshore treatment of drill fluids and cuttings should include consideration of injection disposal wells, thermal drying, bioremediation and incineration, or recycle back to supplier for reuse.</p> <p>1.3. Onshore, pits associated with drilling and completion operations must be constructed to prevent unauthorized access and in a manner to eliminate leaching, leakage or unauthorized discharge of pit contents into the surrounding environment, unless justified by risk assessment. These pits must be sized to ensure that overflow associated with rainfall will not occur.</p> | <p>1.8. Use of freshwater WBM must be used when drilling through known and potential freshwater aquifer formations.</p> <p>1.9. The selection of base drilling fluids, drilling muds and completion fluids, including chemicals and additives, must be based on a risk assessment (Petroleum HSE Management System,<sup>(1)</sup> Element 3 Hazards and Risks). The assessment must consider the HSE impacts and ecotoxicity, as well as performance, cost, efficiency, capability and availability.</p> <p>1.10. Where the consequence associated with the potential impacts of combustion emissions is assessed as intermediate or higher as defined in the Petroleum HSE Risk Matrix<sup>(7)</sup>, additional controls must be implemented.</p> <p>1.11. Offshore, excess or surplus dry bulk cement must not be discharged overboard, unless specifically allowed by local regulations.</p> <p>1.12. Ecotoxicity testing (acute, sublethal and/or chronic) must be conducted on any fluid to be discharged. This may be a prior test conducted on a generic mud composition for the well, or it may be a test on the actual mud in use during the drilling operation.</p> <p>1.13. Hydrodynamic modelling to predict the extent of impacts to offshore habitat must be conducted on any drilling mud and drilled cuttings discharge that may impact shoreline, near shore areas or areas protected for the purposes of conservation. Baseline benthic monitoring data must be gathered to predict the extent of impacts of benthic habitat as a result of any drilling mud and drilled cuttings discharge.</p> |
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#### Procedures

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| <p>1.4. A plan(s) that incorporates the applicable performance requirements of this Control must be prepared and maintained to manage and control the relevant impacts to land, water, biodiversity and air. Guidance on the preparation of a management plan is provided in Appendix A.</p> <p>1.5. The Waste Management Hierarchy of Controls (Table B1, Appendix B) must be considered during the design of new facilities and when establishing control measures. Any deviation to a lower level of control must demonstrate that the higher options cannot be implemented. Any level of control which has the potential to result in a community or reputation consequence rated as intermediate or higher as defined in the Petroleum HSE Risk Matrix<sup>(7)</sup> must be approved by a Division President prior to implementation.</p> <p>1.6. Low toxicity water based muds (WBM) should be evaluated for all drilling activities except for hole sections where technical justification for use of SBM or OBM is provided<sup>(3)</sup>.</p> <p>1.7. Overboard discharge of OBM or OBM-contaminated cuttings must not be allowed<sup>(4)</sup>.</p> | <p><b>People</b></p> <p>1.14. An environmental awareness program for drilling personnel and contractors associated with equipment or procedures specific to drilling muds or drilled cuttings must be conducted prior to commencement of activities. The program must include:</p> |
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- Methods for storage, handling and disposal of drilling muds and cuttings.
- Specific temporal (e.g., migration), or spatial (e.g., habitat) sensitivities and adverse impacts due to toxicity.
- Management controls to reduce environmental impacts.
- Response to an unplanned or unauthorized drilling fluid release.

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## ENVIRONMENT CONTROL 2 – COMBUSTION EMISSIONS

### INTENT

To eliminate or minimize the adverse environmental impacts resulting from the emission of products of combustion including carbon dioxide (CO<sub>2</sub>), carbon monoxide, sulphur dioxide (SO<sub>2</sub>), nitrogen oxides (NO<sub>x</sub>), particulates and unburned hydrocarbons. Emissions may lead to degradation of local air quality and may contribute to global warming.

### PERFORMANCE REQUIREMENTS


#### Plant and Equipment

- 2.1. Carbon pricing must be conducted in capital decisions on assets of US\$100 million or more or those that emit greater than 50,000 tonnes of CO<sub>2</sub> equivalent (CO<sub>2</sub>e) per year. During project selection, the BHP Billiton Carbon Pricing Protocol must be applied to the selection decisions<sup>(5)</sup>.
- 2.2. Natural gas must be the preferred fuel at production facilities. Where natural gas is not available, diesel may be used for fuel.
- 2.3. Where diesel is used as the fuel source, low sulphur diesel (containing sulphur equal to or less than 500 ppm) must be used. If low sulphur diesel is unavailable, SO<sub>2</sub> controls (e.g., flue gas desulphurization equipment) should be considered for major emissions sources (equipment operated continuously, e.g., power generator turbines or engines).
- 2.4. Where energy is required from power grid sources, power from renewable sources should be evaluated.
- 2.5. In new projects and for new equipment purchases, the options of single-source powered equipment versus multiple sources (i.e., dual fuel) of gas and electric equipment should be evaluated, (considering lifecycle fuel costs and the relative contributions to the overall environmental impact from atmospheric pollutants, greenhouse gasses (GHG) and fuel efficiency).
- 2.6. Waste heat recovery must be undertaken for new facilities or opportunistic retrofit if emissions are greater than 50,000 tonnes per year of CO<sub>2</sub> equivalent.
- 2.7. Non-carbon energy sources should be evaluated for use for non-critical equipment on fixed or permanent installations.
- 2.8. Electronic controls should be evaluated for use to optimize air-to-fuel ratios on Petroleum-owned engines.
- 2.9. Clean/lean burn technology, including controls such as Selective Catalytic Reduction and oxidation catalyst, should be evaluated for use on BHP Billiton-owned new or replacement equipment for control of NO<sub>x</sub>, carbon monoxide and volatile organic compounds.
- 2.10. On engines rated 3MWth-50MWth (megawatt thermal, i.e., heat input based on high heating value) owned by Petroleum, NO<sub>x</sub> emissions must not exceed the following: 200 mg/m<sup>3</sup> from spark ignition gas engines; 400 mg/m<sup>3</sup> from dual fuel engines; or 1600 mg/m<sup>3</sup> from compression ignition gas engines (at dry gas oxygen content of 15 percent)<sup>(6)</sup>.
- 2.11. Variable speed drivers should be considered to optimize mechanical and energy efficiency in BHP Billiton-owned equipment.

#### Procedures

- 2.12. A plan(s) that incorporates the applicable performance requirements of this Control must be prepared and maintained to manage and control the impacts to land, water, biodiversity and air. Guidance on the preparation of a management plan is provided in Appendix A.
- 2.13. The Waste Management Hierarchy of Controls (Table B1, Appendix B) must be considered during the design of new facilities or when establishing control measures. Any deviation to a lower level of control requires demonstration that the higher options cannot be implemented. Any level of control which has the potential to result in a community or reputation consequence rated as intermediate or higher as defined in the Petroleum HSE Risk Matrix<sup>(7)</sup> must be approved by a Division President prior to implementation.
- 2.14. The following leading management practices must be implemented for combustion sources, and must be incorporated into the Management Plan:

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- Reduce emissions of air pollutants by technological or operational methods (e.g., particle traps to reduce particulate matter).
- Ensure diesel-powered construction equipment is properly tuned and maintained and shut off when not in direct use.
- Prohibit engine tampering to increase horsepower.
- Locate engines, motors and equipment as far as possible from residential areas or living quarters and sensitive receptors (e.g., schools, day care centers and hospitals).
- Use engine types such as electric, liquefied gas, hydrogen fuel cells and/or alternative diesel formulations, where available.
- Emissions from combustion sources on controlled marine vessels (e.g., incinerators), must comply with the requirements of MARPOL 73/78 Annex VI<sup>(16)</sup>.

**People**

2.20. An environmental awareness program for personnel and contractors associated with equipment or procedures specific to combustion emissions must be conducted prior to and during activities to discuss environmental impacts and proposed management measures to reduce impacts of combustion emissions. The program must include:

- Specific temporal (e.g., migration) or spatial (e.g., habitat) sensitivities and adverse impacts from the emissions of products of combustion.
- Effects of climate change and reduced air quality from these emissions.
- Management controls to reduce environmental impacts.

- 2.15. Energy efficiency improvement goals and action plans must be established annually to reduce emission levels from operations on a normalized year-by-year basis and must be included in the management plan.
- 2.16. An assessment of energy efficiency must be conducted during the selection of new or replacement equipment for fixed or permanent installations. Energy efficiency evaluations are case-specific for the selection of the required parameters to conduct a lifecycle analysis.
- 2.17. Where the consequence associated with the potential impacts of combustion emissions is assessed as intermediate or higher as defined in the Petroleum HSE Risk Matrix<sup>(7)</sup>, additional controls must be implemented.
- 2.18. Personnel working at Petroleum sites must implement a risk-based preventative maintenance program for onsite internal combustion engines or external combustion burners to reduce and minimize the impact of air emissions from combustion sources.
- 2.19. Carpool shuttles and vans should be evaluated for transport of construction workers to and from construction sites and of workers to operations sites to eliminate some single-occupancy vehicle trips and reduce combustion emissions. Strategies to minimize construction-related trips of workers and equipment should also be evaluated.

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## ENVIRONMENT CONTROL 3 – FLARING, VENTING AND FUGITIVE EMISSIONS

### INTENT

To eliminate or minimize the adverse environmental impacts resulting from the flaring, venting or fugitive release of natural gas or liquid hydrocarbons or CO<sub>2</sub> venting from an acid gas removal system at LNG processing facilities.

### PERFORMANCE REQUIREMENTS

#### Plant and Equipment

- 3.1. Carbon pricing must be conducted in capital decisions on assets of US\$100 million or more or those that emit greater than 50,000 tonnes of CO<sub>2</sub> equivalent (CO<sub>2</sub>e) per year. During project selection, the BHP Billiton Carbon Pricing Protocol must be applied to the selection decisions<sup>(5)</sup>.
- 3.2. Where flaring is undertaken on facilities or drilling rigs, high-efficiency flare equipment must be utilized<sup>(8)</sup>.
- 3.3. Smokeless flare equipment should be evaluated for use at all production facilities<sup>(8)</sup> so that any smoke from flaring does not obscure an observer's view in excess of the opacity shown on the Ringelmann Chart No. 1<sup>(9)</sup>, or equivalent measurement.
- 3.4. Use of ground flares should be evaluated as an alternative to tower flares. Utilization of ground flare versus tower flare must be weighed alongside safety factors when considering as an alternative.
- 3.5. Vapor recovery equipment should be evaluated for new facilities or opportunistic retrofit for all planned or steady state venting sources.
- 3.6. To minimize releases to a flare system, utilization of low or no-bleed pneumatic devices to regulate pressure and control valves should be evaluated for use.
- 3.7. Electronic igniters should be evaluated for use as a means of lighting flares in lieu of permanent pilots. Flare gas recovery systems should be evaluated for new facilities or opportunistic retrofit.
- 3.8. Compressed air should be evaluated for use instead of natural gas for powering instruments and controllers.
- 3.9. Flash gas and vent gas should be evaluated for fuel use at new facilities or at opportunistic retrofit.
- 3.10. During design, a bypass or closed-loop system should be evaluated for new facilities or opportunistic retrofit to eliminate excessive flaring associated with commissioning and start-up activities.

- 3.11. Process upsets should be piped to a flare, rather than cold vent, except where risk assessment indicates otherwise.

#### Procedures

- 3.12. A plan(s) that incorporates the applicable performance requirements of this Control must be prepared and maintained to manage and control the relevant impacts to land, water, biodiversity and air. Guidance on the preparation of a management plan is provided in Appendix A.
- 3.13. The Waste Management Hierarchy of Controls (Table B1, Appendix B) must be considered during the design of new facilities and when establishing control measures. Any deviation to a lower level of control must demonstrate that the higher options cannot be implemented. Any level of control which has the potential to result in a community or reputation consequence rated as intermediate or higher as defined in the Petroleum HSE Risk Matrix<sup>(7)</sup> must be approved by a Division President prior to implementation.
- 3.14. Where the consequence associated with the potential impacts of flaring, venting or fugitive emissions is assessed as intermediate or higher as defined in the Petroleum HSE Risk Matrix<sup>(7)</sup>, additional controls must be implemented.
- 3.15. There must be no intentional flaring of liquids from production facilities. Collection of hydrocarbons from well clean-up and well test activities should be considered for onshore sale/disposal.
- 3.16. The quantities of gas vented and flared, excluding fugitive emissions, must be measured (preferably) or estimated (alternatively), recorded and reported internally<sup>(1)</sup>.
- 3.17. Where flared well tests are anticipated, drilling contractors must be selected on the basis of flare control equipment on the drilling rig being available.

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3.18. In the absence of any regulatory requirements, a decision process on whether to conduct flared well tests should evaluate the environmental impacts.

3.19. A preventive maintenance program must include procedures to ensure that gas leaks are not occurring and that control and flare equipment are working properly<sup>(8,10)</sup>.


3.20. If the volatile organic compound (VOC) emissions from tankers are regulated in ports or terminals under the jurisdiction of a party to the MARPOL 73/78 Protocol of 1997, selection of shipping / tanker contractors must ensure vessels are equipped with vapor return systems<sup>(10)</sup>.

- Effects of climate change and reduced air quality from these emissions.
- Management controls to reduce environmental impacts.

**People**

3.21. An environmental awareness program for site personnel and contractors associated with equipment or procedures specific to flaring, venting or fugitive emissions must be conducted prior to activities to discuss environmental impacts and proposed management measures to reduce the impacts of flaring, venting and fugitive emissions. The program must include:

- Specific temporal (e.g., migration) or spatial (e.g., habitat) sensitivities and adverse impacts from flaring, venting and fugitive emissions.

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## ENVIRONMENT CONTROL 4 – PRODUCED FORMATION WATER

### INTENT

To eliminate or minimize the adverse environmental impact resulting from the discharge of produced formation water (PFW). The physical characteristics and chemical composition of PFW give rise to the concerns for potential water and land degradation.

### PERFORMANCE REQUIREMENTS


#### Plant and Equipment

- 4.1. Offshore, inline oil-in-water analysers with shut-downs/auto-bypasses or manual sampling and testing must be used for all PFW overboard discharges to minimize the possibility of off-spec water being discharged.
- 4.2. Onshore, preference should be given to storage of PFW in tanks over pits/ponds. If tanks are used, they must be banded such that 110% of the volume of the largest single tank, or 25% of the total storage capacity (whichever is greater)<sup>(6)</sup>, is capable of being contained in the event of a tank release. If pits/ponds are used, they must be constructed to prevent unauthorized access and in a manner to eliminate leaching, leakage or unauthorized discharge of the pit/pond contents into the surrounding environment, including overflow from any weather-related event.
- 4.3. defined in the Petroleum HSE Risk Matrix<sup>(7)</sup>, additional controls must be implemented.
- 4.6. The selection and usage of chemicals associated with PFW should be evaluated, based on risk assessments and cost benefit analysis. These risk assessments must compare the HSE performance of the chemicals (utilizing Material Safety Data Sheets (MSDS) and an assessment of ecotoxicity data) against cost, efficiency, capability and availability. Where improved HSE performance of the chemical does not come at a grossly disproportionate cost, it must be selected.
- 4.7. Prior to initiating disposal or discharge of PFW, the baseline condition of the receiving medium and surrounding environment must be established. Modelling of the zone of effect from produced water must be undertaken and the results must be included in the environmental impact/risk assessment for the facility.

#### Procedures

- 4.3. A plan(s) that incorporates the applicable performance requirements of this Control must be prepared and maintained to manage and control the relevant impacts to land, water, biodiversity and air. Guidance on the preparation of a management plan is provided in Appendix A.
- 4.4. The Waste Management Hierarchy of Controls (Table B1, Appendix B) must be considered during the design of new facilities and when establishing control measures. Any deviation to a lower level of control must demonstrate that the higher options cannot be implemented. Any level of control which has the potential to result in a community or reputation consequence (e.g., marine disposal of NORM waste) rated as intermediate or higher as defined in the Petroleum HSE Risk Matrix<sup>(7)</sup> must be approved by a Division President prior to implementation.
- 4.5. The selection of an appropriate option must demonstrate consistency with the Waste Management Hierarchy of Controls; where the consequence associated with the potential impacts of PFW is assessed as intermediate or higher as
- 4.8. Baseline testing or annual monitoring must include a full analysis of PFW physical characteristics and chemical composition, including tests for hydrocarbons (total hydrocarbons, PAH and BTEX), heavy metals, hypersalinity, temperature, pH, NORMs and residual chemical concentrations. Baseline testing must also be triggered when conditions and flow streams change significantly, e.g., due to new wells, water breakthrough in old wells, changes in production chemicals used during oil/water separation, etc. Any significant variation from previously recorded levels must trigger a review of the environmental risk assessment for the facility (including re-running modelling).
- 4.9. For offshore discharges of PFW, the 24-hour average oil and grease concentration must not exceed 30 mg/l<sup>(11)</sup>. In cases where local regulations stipulate lower limits, the lower figure must apply. This requirement must be implemented for new facilities or for existing facilities at the next scheduled opportunity for equipment replacement or retrofit.


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- 4.10. Sampling procedures and laboratory tests must comply with internationally accepted standards and protocols, such as ISO 9377-2 (Mod) for determination of oil in PFW<sup>(12)</sup>.
- 4.11. The volumes of PFW discharges and oil-in-water concentrations must be recorded and reported internally and externally as required by local regulatory requirements.
- 4.12. On a daily basis, PFW treatment and disposal systems must be monitored and checked for proper performance to ensure compliance with regulations and applicable Company standards.
- 4.13. Where chemicals are used for PFW treatment and PFW is discharged overboard, records of usage must be maintained, including hazard class, concentrations and volumes discharged.
- 4.14. Ecotoxicity testing (acute, sub lethal and/or chronic) must be conducted on PFW as part of any impact/risk assessment associated with PFW discharge. Ecotoxicity testing must also be triggered when conditions and flow streams change significantly, e.g., due to new wells, water breakthrough in old wells, changes in production chemicals used during oil/water separation, etc.
- residual process chemicals commingled with the PFW.
- Management controls to reduce environmental impacts.

**People**

- 4.15. An environmental awareness program for site personnel and contractors associated with equipment or procedures specific to PFW must be conducted prior to activities to discuss environmental impacts and proposed management measures to reduce impacts of PFW discharge. The program must include:
- Specific temporal (e.g., migration) or spatial (e.g., habitat) sensitivities and adverse impacts, handling and disposal of PFW.
  - Effects of PFW including contaminants in the PFW such as hydrocarbons, heavy metals, total dissolved solids, pH, the presence of NORM and

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## ENVIRONMENT CONTROL 5 – WASTES

### INTENT

To eliminate or minimize the environmental impacts resulting from the production, storage, handling, transport, recycling and disposal of wastes.

### PERFORMANCE REQUIREMENTS

#### Plant and Equipment

- 5.1. The design and layout of plant facilities must include physical requirements for the handling, storage, treatment and transportation of waste.
- 5.2. Wastes in storage must be identified, segregated and stored according to waste, e.g., oily wastes, inert, putrescible (decaying / decomposing matter), recyclable, etc.
- 5.3. Hazardous material and hazardous waste storage areas must have secondary containment that are at least 110% of the largest single waste container, or 25% of the total storage capacity (whichever is greater)<sup>(6)</sup>.
- 5.4. Onshore, the pits used for the collection of rubbish or non-hazardous wastes must be constructed to prevent unauthorized access and in a manner to eliminate leaching, leakage or unauthorized discharge of the pit contents into the surrounding environment. Netting or covers must be used to prevent rubbish from blowing from the pit.
- 5.5. To prevent corrosion and leakage into the environment, waste drums and containers of metal construction must be placed such that water will not collect on tops and resting surfaces.


#### Procedures

- 5.6. A plan(s) that incorporates the applicable performance requirements of this Control must be prepared and maintained to manage and control the relevant impacts to land, water, biodiversity and air. This waste management plan must include a description and review of the wastes expected from the operation and prescribed practices for minimization, handling, storage and proper disposal of waste. The plan must also provide the names, locations and specific procedures regarding waste contractors, including handlers, transporters and disposal sites. Guidance on the preparation of a management plan is provided in Appendix A.
- 5.7. The Waste Management Hierarchy of Controls (Table B1, Appendix B) must be considered during the design of new facilities and when establishing control


measures. Any deviation to a lower level of control must demonstrate that the higher options cannot be implemented. Any level of control which has the potential to result in a community or reputation consequence (e.g., marine disposal of NORM waste) rated as intermediate or higher as defined in the Petroleum HSE Risk Matrix<sup>(7)</sup> must be approved by a Division President prior to implementation.

- 5.8. A Product Stewardship assessment must be conducted and controls established to minimize impacts associated with the production, storage, transportation, use, recycling and disposal of Petroleum's products (e.g., crude oil, natural gas, LPG, condensate, LNG). The scope of assessment must consider the Company's ability to influence impacts across the product supply chain. Controls must be communicated to relevant stakeholders as appropriate (e.g., personnel, customers and transporters). Sites can refer to a Petroleum assessment or use a local assessment which has been prepared or conducted where required by local regulations.
- 5.9. Where the consequence associated with the potential impacts of waste is assessed as intermediate or higher as defined in the Petroleum HSE Risk Matrix<sup>(7)</sup>, additional controls must be implemented.
- 5.10. Hazardous wastes must be disposed of to the more stringent of: 1) local, state, regional or national law and standards, or 2) the requirements of the United Nations Environment Programme "Basel Convention on the Control of Transboundary Movements on Hazardous Wastes and Their Disposal"<sup>(13)</sup>.
- 5.11. Waste management contractors should be subject to risk-based HSEC evaluation prior to final contractual arrangements, taking into account the nature of their services (access to appropriate waste management sites that are approved and permitted by statutory authorities or regulators) and demonstrated experience.

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- 5.12. Audits or assessments must be performed at least every two years, or more frequently according to the risk exposure and potential long-term liability, on waste management contractors to ensure their operating practices are appropriate and they continue to be permitted/licensed appropriately. Review must include the chain of custody of waste handling to ensure the final disposal point is at an approved and appropriate location.
- 5.13. Offshore, blackwater and grey water must be treated according to MARPOL 73/78 Annex IV<sup>(14)</sup>, and MARPOL 73/78 Annex V<sup>(15)</sup>, respectively, or comply with applicable permits prior to discharge, or otherwise be treated in a marine sanitation unit.
- 5.14. The selection and usage of process and production chemicals, materials and products should be evaluated using risk assessments and cost benefit analysis. The cost benefit analysis should consider BATNEEC (best available techniques not entailing excessive cost) and should consider environmental impacts throughout the product cycle from purchase of the material, through its use and ultimately to its discharge or disposal. These risk assessments must compare the HSE performance of the chemical, material or product (utilizing MSDS and include assessment of ecotoxicity data) against cost, efficiency, capability and availability. Where improved HSE performance of the chemical, material, or product does not come at a grossly disproportionate cost, it must be selected.
- 5.15. In the absence of more stringent state or local regulations, onshore hydrostatic test water must be injected into a disposal well or discharged to surface waters or land after meeting the following requirements<sup>(17)</sup>:
- Total hydrocarbon content: <10 mg/l
  - pH: 6 – 9
  - Biological Oxygen Demand (BOD): 25 mg/l
  - Chemical Oxygen Demand (COD): 125 mg/l
  - Total suspended solids (TSS): 35 mg/l
  - Phenols: 0.5 mg/l
  - Sulphides: 1 mg/l
  - Heavy metals total: 5 mg/l
  - Chlorides: 60 mg/l, average; 1200 mg/l, maximum
- 5.16. For offshore hydrostatic testing of pipelines, a hydrotest water disposal plan must be prepared that considers points of discharge, rate of discharge, chemical use and dispersion, environmental risk and monitoring. Disposal of hydrotest water into shallow coastal waters should be avoided unless risk evaluation indicates such disposal is acceptable.
- 5.17. Sediment control methods must be used to protect aquatic biota and water quality during discharge of hydrostatic test waters. For discharge to land, a site must be selected to prevent flooding, erosion or diminished agricultural capacity<sup>(17)</sup>.
- 5.18. At each facility, records of waste generation, transportation, storage, elimination, reduction, reuse, recycling, treatment and disposal must be maintained and reported internally.
- 5.19. A review of the cost-effectiveness of materials and products used in the production process must be conducted every two years; the review must include an evaluation of disposal costs and potential long-term liabilities.
- People**
- 5.20. An environmental awareness program for site personnel and contractors associated with equipment or procedures specific to waste management must be conducted prior to activities to discuss environmental impacts and proposed management measures to reduce impacts of waste discharge/ disposal. The program must include:
- Specific temporal (e.g., migration) or spatial (e.g., habitat) sensitivities and adverse impacts handling and disposal of waste.
  - The specific nature of hazardous and non-hazardous waste generated on the facility.
  - Effects of improper waste disposal.
  - Management controls to reduce environmental impacts.
  - Benefits of waste-reduction initiatives, including reduced energy and resource waste.
  - Understanding of product stewardship implications for the products generated on the facility.

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## ENVIRONMENT CONTROL 6 – PHYSICAL DISTURBANCE

### INTENT

To minimize the adverse impacts or footprint to terrestrial and submerged lands, flora, fauna, habitat and air and water quality generated by onshore and offshore oil and gas activities.

### PERFORMANCE REQUIREMENTS

#### Plant and Equipment

6.1. Vehicles, plant or equipment that will cause ground or seabed disturbance must be sized for minimal disturbance (meeting operational requirements and allowing safe operation).

#### Procedures

6.2. A plan(s) that incorporates the applicable performance requirements of this Control must be prepared and maintained to manage and control the relevant impacts to land, water, biodiversity and air. Guidance on the preparation of a management plan is provided in Appendix A.

6.3. The Risk Management Hierarchy of Controls (Table B2, Appendix B) must be considered during the design of new facilities and when establishing control measures. Any deviation to a lower level of control must demonstrate that the higher options cannot be implemented. Any level of control which has the potential to result in a community or reputation consequence rated as intermediate or higher as defined in the Petroleum HSE Risk Matrix<sup>(7)</sup> must be approved by a Division President prior to implementation.

6.4. Where the consequence associated with the potential impacts of physical disturbance is assessed as intermediate or higher as defined in the Petroleum HSE Risk Matrix<sup>(7)</sup>, additional controls must be implemented.

6.5. Physically disturbed sites or routes must be restored, remediated and/or rehabilitated to pre-disturbance condition (or better) as soon as practicable after physical disturbance occurs, and be consistent with pre-disturbance or alternate land uses developed in consultation with stakeholders. This may occur immediately following the disturbance (e.g., backfilling a pipeline trench after pipelay) or at the end of the useful life of the plant or equipment (e.g., restoration of a pad site once a gas plant has been removed). Minor seabed disturbances, such as grab samples, piston cores and seabed deep borings, are excluded from this requirement.

6.6. Controlled activities must not proceed in the following instances:

- a. Within the boundaries of World Heritage-listed properties; activities adjacent to these areas must be compatible with the outstanding universal values for which the properties have been listed.
- b. Within the boundaries of the International Union for the Conservation of Nature (IUCN) Protected Areas Categories I-IV, without an action plan that meets all relevant government requirements, delivers measurable benefits to biodiversity commensurate with the level of impacts and is approved by the Chief Executive, Petroleum.
- c. Where activities would directly impact threatened species listed by the IUCN with extinction.

6.7. Hydrodynamic modelling to predict the extent of impacts to offshore habitat must be conducted for any physical disturbance that may impact shoreline, near shore areas or areas protected for the purposes of conservation. Baseline benthic monitoring must be gathered to predict the extent of impacts of benthic habitat as a result of any physical disturbance.

6.8. All new liquid hydrocarbon storage tanks and pipelines must be constructed above ground unless a risk assessment determines below-ground or subaqueous construction will achieve a lower risk. Additionally, a risk assessment must be conducted for all existing below-ground or subaqueous liquid hydrocarbon storage tanks and pipelines to determine the likelihood of containment failure and any required controls.

#### People

6.9. An environmental awareness program for construction personnel and contractors associated with equipment or procedures specific


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to physical disturbance must be conducted prior to activities to discuss environmental impacts and proposed management measures to reduce impacts of physical disturbance. The program must include:

- Specific temporal (e.g., migration) or spatial (e.g., habitat) sensitivities and adverse impacts of physical disturbances.

- Importance of biodiversity protection.
- Management controls to reduce environmental impacts.

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## ENVIRONMENT CONTROL 7 – MARINE NOISE

### INTENT

To minimize the impact to marine fauna from underwater noise generated by oil and gas operations such as seismic evaluations, piling, drilling units, marine vessel and operating facilities.

### PERFORMANCE REQUIREMENTS

#### Plant and Equipment

7.1. All source vessels involved in seismic acquisition should consider the use of passive acoustic monitoring (PAM), particularly for use in areas where sensitive species are likely to inhabit the proposed survey location, or if visual observations discussed in this section can be obscured by darkness or poor visibility, such as fog.

#### Procedures

7.2. A plan(s) that incorporates the applicable performance requirements of this Control must be prepared and maintained to manage and control the relevant impacts to land, water, biodiversity and air. Guidance on the preparation of a management plan is provided in Appendix A.

7.3. The Risk Management Hierarchy of Controls (Table B2, Appendix B) must be considered during the design of new facilities and when establishing control measures. Any deviation to a lower level of control must demonstrate that the higher options cannot be implemented. Any level of control which has the potential to result in a community or reputation consequence rated as intermediate or higher as defined in the Petroleum HSE Risk Matrix<sup>(7)</sup> must be approved by a Division President prior to implementation.

7.4. Where the consequence associated with the potential impacts of marine noise is assessed as intermediate or higher as defined in the Petroleum HSE Risk Matrix<sup>(7)</sup>, additional controls must be implemented.

7.5. Timing of offshore seismic, drilling, construction, installation or other activities must be such that known marine mammal calving areas are avoided during marine mammal calving periods.

7.6. Timing of offshore seismic, construction, drilling, installation or other activities should be such that known migratory pathways are avoided wherever practicable during known marine mammal migratory periods.

7.7. Controlled activities must not proceed in the following instances:

7.8. Within the boundaries of World Heritage-listed properties; activities adjacent to these areas must be compatible with the outstanding universal values for which the properties have been listed.

7.9. Within the boundaries of the International Union for the Conservation of Nature (IUCN) Protected Areas Categories I-IV, without an action plan that meets all relevant government requirements, delivers measurable benefits to biodiversity commensurate with the level of impacts and is approved by the Chief Executive, Petroleum.

7.10. Where activities would directly impact threatened species listed by the IUCN with extinction.

7.11. Where seismic activities and/or operations take place in known (i.e., regulated, designated or otherwise indicated by regulatory authorities) marine mammal migratory pathways, seismic vessel crews must continually watch for marine mammals during passage. All operational seismic vessels must carry at least one qualified Marine Mammal Observer (MMO) to provide a 360-degree view and watch for and alert vessel crews of the presence of marine mammals during seismic activities<sup>(19)</sup>.

7.12. For seismic operations, the MMO must begin watch 30 minutes prior to the soft start<sup>(18, 19)</sup> and must carefully make a visual check from a suitable high observation platform to see if there are any marine mammals within 500 meters (measured from the centre of the array).

a. If marine mammals are seen within 500 meters of the centre of the array, the seismic source must be shut down until they have moved away, allowing adequate time after the last sighting for the animals to move away, at least 20 minutes<sup>(18)</sup>.

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- b. After shut down of the seismic source, or if all airguns have stopped and not restarted for at least five minutes, the soft-start procedures must be conducted, including a visual check for marine mammals within 500 meters of the centre of the array<sup>(18)</sup>.
  - c. Where marine mammals are congregating around a drilling or production platform, seismic activities must begin at least 500 meters from the platform.
  - d. Two MMOs should be utilized when daylight hours exceed 12 hours per day to ensure cetacean monitoring is undertaken during all daylight hours and that an observer is always available to undertake a pre-start-up search for the required 30 minutes<sup>(18)</sup>.
- 7.13. During seismic operations, the sound power intensity of seismic shots must be built up gradually ("soft start") over a 20- to 40-minute period<sup>(18, 19)</sup> when entering a new area for acquisition.
- 7.14. During seismic operations, soft start of the source array must not begin unless conditions allow the sea surface to be visually inspected for marine mammals for 30 minutes prior to commencement of soft start (unless PAM is used). Thus, soft start must not begin after dark or in conditions that prohibit visual inspection (fog, rain, etc.) of the 500-meter area<sup>(19)</sup> unless PAM is in use and it can be determined that no marine mammals are present within the 500-meter area. In areas where cetaceans are not expected and in the absence of PAM systems, good judgement must be used to ensure an area is free from cetaceans prior to the soft start<sup>(18)</sup>.
- 7.15. Contractors should address noise reduction measures in their bid proposals. This should include details on the extent to which they will use engines with lower noise ratings, how activities will be phased to reduce simultaneous operations of engines and all other practices to reduce equipment noise emissions.

**People**

- 7.16. A prerequisite for an MMO must include attendance of a short course Joint Nature Conservation Committee Guidelines for Minimising Acoustic Disturbance to Marine Mammals from Seismic Survey<sup>(18)</sup>. The course can be either taught by third parties or operators may develop their own training

program, which must be equivalent to the following requirements<sup>(19)</sup>:

- Brief overview of the marine mammal protection and endangered species regulations for the region of operations as they relate to seismic acquisition and protection of marine mammals for the region of operations.
- Brief overview of seismic acquisition operations in the region of operations.
- Overview of seismic mitigation measures and the MMO program in the region of operations.
- Discussion of the role and responsibilities of the MMO, including legal requirements, professional behaviour, integrity, authority to call for shut-down of seismic acquisition operations, assigned duties, and reporting of violation and coercion.
- Identification of marine mammals and sea turtles, with emphasis on whales.
- Cues and search methods for locating marine mammals.
- Data collection and reporting requirements.

7.17. During observations, the following personnel requirements must be followed<sup>(19)</sup>:


- Other than brief alerts to bridge personnel of maritime hazards, additional duties must not be assigned to the MMO during the observation watch.
- If conditions warrant more vigilant look-outs when navigating around or near maritime hazards, additional personnel must be used to ensure that watching for protected species remains the primary focus of the MMO.
- An observer must not be allowed more than four consecutive hours on watch.
- A break time of no less than two hours must be allowed before an MMO begins another watch rotation. (Break time means no assigned observational duties.)
- A person (crew or third party) on watch as an MMO must not be assigned a combined watch schedule of more than 12 hours in a 24-hour period. Due to the concentration and diligence required during visual observation watches, operators who choose to use trained crew members in these positions must select only

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those crew members who demonstrate willingness and ability to perform these duties.

7.18. An environmental awareness program for site personnel and contractors associated with equipment or procedures specific to marine noise must be conducted prior to activities to discuss environmental impacts and proposed management measures to reduce impacts of marine noise. The program must include:


- Specific temporal (e.g., migration) or spatial (e.g., habitat) sensitivities and adverse impacts of marine noise
- Importance of biodiversity protection
- Management controls to reduce environmental impacts.

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## REFERENCES

1. BHP Billiton. 2009. Petroleum HSE Management System. August 2009.
2. E&P Forum. 1993. Exploration and Production (E&P) Waste Management Guidelines. Report No. 2.58/196. September 1993.
3. Australian Petroleum Production and Exploration Association Limited (APPEA). 1996. Code of Environmental Practice. Drilling Program Planning Section 4.3.1, p. 22 and Section 5.3.1, p. 50.
4. BHP Billiton Petroleum. 2007. Waste Management Manual Gulf of Mexico, Revision 10. August 8, 2007.
5. BHP Billiton. Carbon Price Protocol. [updated quarterly]
6. International Finance Corporation. 2007. Environmental, Health, and Safety General Guidelines. World Bank Group, April 30, 2007.
7. BHP Billiton. 2009. Petroleum HSE Risk Matrix. October 2009.
8. International Finance Corporation. 2007. Environmental, Health, and Safety Guidelines for Offshore Oil and Gas Development. World Bank Group, April 30, 2007.
9. U.S. Department of Interior, Bureau of Mines. 1967. Ringelmann Smoke Chart (Revision of IC 7718). May 1967.
10. International Maritime Organization. 2006. International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 (MARPOL 73/78), Annex VI, Regulation 15 Volatile Organic Compounds.
11. Oslo and Paris Commission (OSPAR). 2006. OSPAR Convention for the Protection of the Marine Environment of the North-East Atlantic. OSPAR Recommendation 2001/1 adopted by OSPAR 2001 (OSPAR 01/18/1, Annex 5), Amended by OSPAR Recommendation 2006/4 (OSPAR 06/23/1, Annex). OSPAR Recommendation 2001/1 for the Management of Produced Water from Offshore Installations.
12. OSPAR. 2005. Agreement 2005/15. OSPAR Reference Method of Analysis for the Determination of the Dispersed Oil Content in Produced Water. (Reference number: 2005-15). Replaces Agreement 1997-16 from 1 January 2007.
13. United Nations Environment Programme. 1992. Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal.
14. International Maritime Organization (IMO). 2006. International Convention for the Prevention of Pollution from Ships (MARPOL). MARPOL Annex IV: Regulations for the Prevention of Pollution by Sewage from Ships. London: IMO, consolidation edition, 2006.
15. International Maritime Organization (IMO). 2006. International Convention for the Prevention of Pollution from Ships (MARPOL). MARPOL Annex V: Regulations for the Prevention of Pollution by Garbage from Ships. London: IMO, consolidation edition, 2006.
16. International Maritime Organization (IMO). 2006. International Convention for the Prevention of Pollution from Ships (MARPOL). MARPOL Annex VI: Regulations for the Prevention of Air Pollution from Ships. London: IMO, consolidation edition, 2006.
17. International Finance Corporation. 2007. Environmental, Health, and Safety Guidelines for Onshore Oil and Gas Development. World Bank Group, April 30, 2007.
18. Joint Nature Conservation Committee (JNCC). 2004. Guidelines for Minimising Acoustic Disturbance to Marine Mammals from Seismic Surveys. April 2004.
19. U.S. Department of the Interior. 2007. Minerals Management Service (MMS) Gulf of Mexico (GOM) OCS Region. Notice to Lessees and Operations (NTL) of Federal Oil, Gas, and Sulphur Leases in the Outer Continental Shelf, Gulf of Mexico OCS Region. Implementation of Seismic Survey Mitigation Measures and Protected Species Observer Program. NTL No. 2007-G02. February 7, 2007.

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## APPENDIX A: GUIDANCE ON THE PREPARATION OF MANAGEMENT PLANS

### PURPOSE

This document provides guidance for the preparation of a management plan. A management plan is defined as “A document which either contains or provides direction to information that is required to manage a HSEC aspect. It may cover multiple aspects, multiple entities or be contained within another plan.”

### APPLICATION AND SCOPE

A separate management plan may not be needed if the required information is already contained in other, existing documents, including Plans prepared to meet regulatory requirements or submitted to regulatory authorities. Where existing documents fulfil these performance requirements, a summary document may be prepared that specifically points or maps to the existing documents. This summary and the backup documents may then be used as evidence that the requirement has been met.

In situations where an environmental aspect is not present or does not apply (e.g., sites with no air emissions or sensitive areas, no contaminated sites, etc.) , a management plan may be not be required, provided that an analysis or study is provided in a summary document to support the position that the environmental aspect is not present.

### CONTENT OF A MANAGEMENT PLAN

This guidance provides a generic structure and content for a management plan. Additional sections may be added as necessary but a management plan should, at a minimum, include the following elements:

1. Introduction
2. Inventory or Baseline Assessment
3. Impact Assessment
4. Controls
5. Monitoring and Review
6. References and Appendices

Information regarding the contents of each of these sections is provided below:

#### 1. Introduction

Discuss the purpose of the management plan. List the objectives of the management plan. For example, the objectives might include:

- Demonstrate compliance with regulations
- Demonstrate understanding of how the operations interact with the environment
- Demonstrate that environmental effects and risk are as low as reasonably practicable
- Ensure implementation of commitments in the Environmental Impact Assessment (EIA), Environment Management Plan (EMP) or similar documents

Describe the site or project, including references to existing documents. For example, an EIA, EMP or other documents may contain information or data that may support or meet the requirements for the management plan.

#### 2. Inventory or Baseline Assessment

The management plan must include an inventory or baseline assessment against the existing environment. The existing environment includes the physical, biological or socioeconomic conditions. Physical conditions refer to climate and meteorology, oceanography, geology/hydrology, air quality and noise, and water resources/water quality. Biological

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conditions refer to terrestrial and marine biology, species of concern and areas of conservation. Socioeconomic conditions refer to the local or affected population, employment, housing, public services, infrastructure and land use.

The term "baseline assessment" is defined as: *"An evaluation of environmental conditions that exist prior to commencement of controlled activities so that there is a means of determining the potential and actual impacts of controlled activities."* If an EIA is available for the site, the baseline assessment or inventory would be fulfilled by reference to the appropriate section of the EIA (e.g., "Description of the Affected Environment").

Baseline assessments are required for land use, biodiversity values and water quality for all environments potentially impacted. The baseline assessment may include a physical field survey and may also include historic studies referenced in an EIA. An EIA would cover biological resources such as: 1) deepwater benthic communities, marine mammals, coastal and marine birds, fisheries; 2) rare, threatened or endangered species of flora and fauna; 3) water quality; 4) the location of owned, leased or managed land, freshwater and marine areas; and 5) designated protected areas and areas of high conservation value.

If the site is located near a protected area or area of high conservation value, reference an EIA or equivalent document that describes the area. Conversely, if the facility is not located in a protected area or area of high conservation value, then a reference must be made to the finding, discussion, analysis, assessment or survey that indicates there are no sensitive environmental, cultural and community receptors.

The inventory for greenhouse gas (GHG) emissions or other emissions that could impact sensitive receptors are based on combustion sources, as well as flaring, venting and fugitive emissions sources. Historic six monthly HSEC questionnaires may be referenced, as they contain the calculated values for NO<sub>x</sub>, SO<sub>x</sub> and other air emissions. An EIA may be referenced if an inventory of air emissions is included in its Air Quality section. Any emissions inventory that was generated for internal or regulatory purposes may be referenced. Inventories for noise and vibration sources may be similar to the air emissions inventory.


The inventories for waste consist of the type, source and volume of wastes, and the storage and disposal locations, and may be documented by waste or shipping manifests. Similarly, product stewardship may be addressed by a waste management plan, the Chem Alert inventory or MSDS for products created, generated or produced (e.g., oil, natural gas, condensate) and products used (e.g., chemicals, lube oils).

### 3. Impact Assessment

The management plan must include an assessment of potential impacts to the resource and quantify the environmental impacts acceptable by the site, while accounting for regulatory and community expectations. Risk assessment, baseline surveys, monitoring and/or modelling results may be referenced to satisfy the impact assessment requirement, with full results provided in an appendix of the Plan. Alternatively, they may be referenced to a document that contains the impact assessment. This would be the section of an EIA typically entitled "Environmental Consequences" or "Environmental Impacts." For example, an EIA may include impact assessments for 1) land use; 2) coastal infrastructure; 3) physical disturbance to topographic features and live bottoms; 4) impacts to seafloor; 5) sediment displacement; or other physical resources that may be impacted.

The assessment of the potential impacts to land use and biodiversity values may be a summary of results from benthic monitoring or hydrodynamic modelling to predict the extent of impacts to offshore habitat, shoreline, near shore areas or protected areas.

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An air management plan would include an impact assessment if sensitive receptors are located near the site. A noise and vibration assessment could include noise measurements taken for the purpose of evaluating noise exposure (such as baseline industrial hygiene surveys) or by a noise contour diagram showing an assessment of noise from the main sources of noise and vibration. Conversely, if the plan has documented that no sensitive receptors are located near the site, an impact assessment for air emissions, noise or vibration would not be required.

Waste management plans should include an impact assessment of the waste management practices.

Product stewardship plans may refer to 1) Management of Change procedures which ensure that the selection and use of processes and production chemicals, materials and products are evaluated based on risk assessment and cost/benefit analysis; and 2) ISO14001 "Environmental Aspects and Impacts" where products have been evaluated.

**4. Controls**

Controls must also be identified and implemented to mitigate or minimize impacts. If controls are already in place to minimize impacts, these should be referenced. Controls to reduce impacts may not be required if there are findings, analyses, assessments or surveys concluding that there are no sensitive environmental, cultural and community receptors.


Controls for GHG and air emissions are addressed by regular maintenance programs (e.g., Leak Detection and Repair), mandatory specifications by regulatory authorities or by site energy and GHG management plans. The Petroleum Environment Controls contain performance requirements for the control of combustion emissions and flaring, venting and fugitive emissions. These would also control GHG and air emissions and should be referenced in the plan, if applicable.

Controls to reduce impacts to biodiversity and land use values would include (in addition to any controls imposed by regulatory authorities): 1) an Oil Spill Response Plan; 2) effluent discharge permit conditions; and 3) applicable performance requirements under the Petroleum Environment Controls for drilling muds and drilled cuttings, produced formation water, waste, and physical disturbance and marine noise. A register of HSEC statutory requirements and commitments to stakeholders (e.g., Statutory Requirements and Approvals Register, Stakeholder Commitments Register) may meet this requirement, as might permits, environmental licenses, EIA or EMP. Reference may be made to baseline studies and investigations that were required, or agreements made for rehabilitation of disturbed areas through stakeholder consultation.

Controls to minimize impacts to water resources would include applicable water discharge permit limits. Controls applicable to drilling muds and drilled cuttings, produced formation water, wastewater and physical disturbance should be referenced from the Petroleum Environment Control. Where controlled activities use greater than 250 mega-litres of high quality water per annum, or if water (supply) is a material risk, the plan must include a quantitative water balance model and an identification, evaluation and implementation of water use reduction initiatives.

Controls for waste management practices and product stewardship should include prescribed practices for minimization, handling, storage and proper disposal of waste. Cite the biennial audits conducted of waste management contractors, and the initial risk assessment conducted prior to their becoming approved contractors, which identifies them as complying with the Petroleum HSE Management System.

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**5. Monitoring and Review**

A monitoring and review program is intended to assess the impacts and verify the effectiveness of controls in reducing the impacts from the operation.

Management plans for GHG and energy, air, noise and vibration may include a condition or requirement to monitor equipment (e.g., a continuous preventative maintenance program to ensure rigorous leak detection, repair to minimize emissions from leaks and fugitive emissions).

Monitoring to assess the impacts to water, land use and biodiversity values and effectiveness of controls may include: 1) species population counts, flora and fauna surveys, and photographic surveys; 2) ecotoxicity testing for discharges; 3) baseline benthic monitoring data; 4) percentage of non-aqueous drilling muds retained on drilled cuttings; 5) hydrodynamic modelling; and 6) annual testing of produced formation water. Produced formation water and hydrotest water have monitoring requirements specified in the Petroleum Environment Controls. Water discharge permit testing results should be cited.

For waste monitoring and product stewardship, reference waste manifests and audits of waste receiving facilities.

For air emissions monitoring, reference stack testing or source testing results and other permit conditions required on a regular basis by regulatory authorities. Reference fugitive emissions leak detection results/repairs, testing, ISO14001 audits and other work programs. Cite the engine monitoring required by Petroleum Environment Control for combustion emissions.

**6. References and Appendices**

Include references of all source documents cited in the plan.



APPENDIX B: HIERARCHY OF CONTROLS

Table B1 Waste Management Hierarchy of Controls

Hierarchy	Drilling Muds and Drilled Cuttings <sup>(8,17)</sup>	Combustion Emissions <sup>(6)</sup>	Flaring, Venting and Fugitive Emissions <sup>(3, 8)</sup>	Produced Water <sup>(8,11)</sup>	Formation Wastes <sup>(2, 3, 6)</sup>
<b>Eliminate</b>	Inject muds and cuttings downhole.	Utilize non-carbon or renewable energy.	Utilize vapor recovery.  Reinject gasses into the producing formation.	Shut in high water producing wells.  Reinject into a non-fresh water-bearing formation (new projects to be evaluated for zero-discharge options).	Eliminate the waste through process design.  Inject wastes underground into an approved, contained formation.
<b>Reduce</b>	Reduce hydrocarbon concentrations in drilling muds.  Use WBM or SBM instead of OBM.  Substitute alternative chemicals with low toxicity chemicals.	Incorporate higher efficiency equipment and processes.  Switch to cleaner fuels (e.g., lower sulphur diesel or natural gas).  Use clean-burn technology (e.g., optimize air-to-fuel ratio).  Implement preventative maintenance program.	Utilize efficient flare tips.  Reduce source gas  Modify operating conditions (e.g., minimize flaring from purges & pilots, reduce over-pressure events with high integrity instrument pressure protection systems, etc.)  Implement Leak Detection & Repair (Inspection & Maintenance) Program.	Minimize water production by well completion or work over of high water producing wells.  Use downhole fluid separation and water shutoff techniques.	Reduce the quantity of the products used or the quantity of the resultant waste (e.g., use bulk containers instead of drums).  Use good inventory control and timely product usage are important to avoid loss of product effectiveness or spoilage.
<b>Reuse/recycle</b>	Clean and condition muds for use in multiple wells.	Utilize process heat integration or heat recovery.	Utilize natural gas onsite for energy or export to nearby markets.	If freshwater, use for irrigation, dust control or cooling water.	Reuse, recycle or reclaim (e.g., recycle paper goods, drums, scrap metals, glass and lube oil).  Return unused products and containers to vendor.  Use oily wastes or cleaned drill cuttings for road

					<p>construction and stabilization.</p> <p>Recover oil from tank bottoms and produced water.</p>
<b>Treatment</b>	<p>Separate mud from cuttings.</p> <p>Utilize physical, chemical or biological treatment to reduce solids, remove hydrocarbons (e.g., thermal desorption) or adjust pH.</p>	<p>Apply emission control technology (e.g., flue gas treatment).</p>	<p>Maintain burners to control visible smoke</p> <p>Use reliable pilot ignition system.</p> <p>Optimize flare fuel/air rates to maximize combustion efficiency, etc.</p>	<p>Use gravity or mechanical separation and chemical treatment</p> <p>Use multistage separation system - skim tank, parallel plate separator, gas flotation cell or hydrocyclone.</p>	<p>Neutralize the pH of waste liquids destined for disposal.</p> <p>Destruct, detoxify or neutralize residues using biological methods (e.g., composting, tank-based degradation), thermal methods or physical methods (e.g., filtration, centrifuge).</p>
<b>Disposal</b>	<p>Transport to shore for treatment and disposal, or treat and discharge overboard to marine.</p>	<p>Emit via exhaust stack to atmosphere.</p>	<p>Release to atmosphere; flaring is preferable to venting.</p>	<p>Discharge to sea.</p> <p>If onshore, discharge to evaporation pits.</p> <p>If onshore, utilize third party disposal site.</p>	<p>Dispose using an approved process, contractor and site. Possible methods include landfilling, burial, surface discharge, land spreading or land farming, incineration.</p>

References provided in References section.

**Table B2 Risk Management Hierarchy of Controls**

Hierarchy	Physical Disturbance <sup>(6, 8, 17)</sup>	Marine Noise <sup>(18, 19)</sup>
Eliminate	Postpone (wait until a more favorable time) or cancel the operation.	Postpone wait until a more favorable time) or cancel the operation.
Substitute	Replace the material, process or hazard with a less hazardous one (e.g., trench-less pipeline crossings; directional or extended reach drilling; closed loop systems; shot-hole methods in lieu of vibroseis; low impact seismic techniques; etc.)	Replace the material, process or hazard with a less hazardous one
Redesign	<p>Schedule activities to avoid sensitive temporal or breeding, migratory or spawning periods, or periods of heavy rainfall.</p> <p>Reroute to avoid hard bottom, riparian or sensitive habitats.</p> <p>Employ erosion and sediment control, slope stabilization measures and noise reduction measures.</p>	<p>Schedule activity outside sensitive temporal periods.</p> <p>Employ noise reduction measures.</p>

Separate	Isolate the hazard by guarding or enclosing it (e.g., berms, mufflers, noise barriers, enclosures).	Isolate the hazard by guarding or enclosing it, (e.g., sound enclosures, baffles, etc.).
Administrative	Provide training and procedural control.	Employ Passive Acoustic Monitoring (PAM), Marine Mammal Observers (MMO) training, soft start procedures, etc.
Pollution control devices	Use appropriate impact minimization equipment such as spill clean-up material or dust suppression measures.	Use appropriate control equipment to minimize impacts.

References provided in References section.