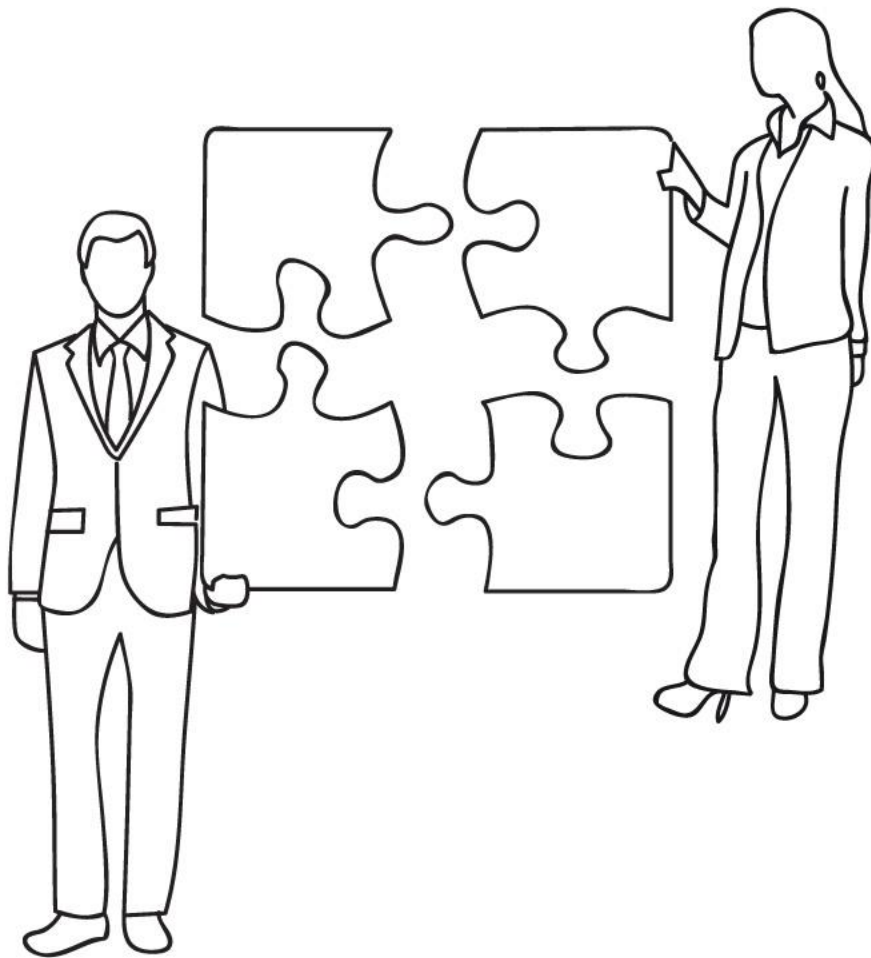


Plan

plan ms hse 010 eni Ghana - "Onshore Pollution Prevention and Control Management Plan"



TITLE:

ONSHORE POLLUTION PREVENTION AND CONTROL MANAGEMENT PLAN

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1. Purpose

eni Ghana has developed this Pollution Prevention and Control Management Plan (PPCMP) as part of its HSE-IMS and in line with its Environmental, Social and Health Management Plan (ESHMP).

This Plan aims to ensure the management and control of construction activities taking place onshore that may pose noise, air, soil and water pollution related risks. This Plan sets out potential impacts and consequences and describes how they will be mitigated. eni Ghana will use reasonable efforts to require contractors, to apply comparable standards. eni Ghana remains the ultimate responsible party for compliance with ESHIA commitments, and will establish means for monitoring/supervision of contractor's performance.

Pollution prevention and control measures related to drilling activities carried out offshore are presented in the following documents: Offshore Hazardous Material Management Plan, Offshore hydrotest Disposal Plan, and Oil Spill Contingency Plan.

The specific objectives of the Onshore Pollution Prevention and Control Management Plan are to:

- Control emissions to atmosphere such that they remain below harmful levels and legally accepted limits;
- Optimize equipment to reduce greenhouse gases;
- Reduce to an acceptable level noise and vibrations generated by the Project construction activities;
- Prevent the occurrence of onshore spills;
- Minimize any environmental impact derived from any accidental onshore spill;
- Avoid the use of chemicals and hazardous materials subject to international bans or phase-outs in onshore activities;
- Prevent the uncontrolled release of any hazardous materials during transportation, handling, storage and use in onshore activities; and
- Control that routine liquid discharges onshore remain below harmful and legally accepted levels.

Pollution related impacts can be mitigated by the implementation of standard best practices in terms of environmental controls and management practices during construction. These measures are detailed in this document, where the measures to be implemented are described.



Additionally and as far as practicable, the PPCMP considers the accumulated increase in pollution risk derived from the potential development of nearby projects at the same period of time.

The PPCMP is intended to be a 'live' document and therefore shall be regularly updated according to the needs as the construction evolves.

The construction contractor will also engage the communities with support of eni Ghana through the principal representative (Chief of each village) of the communities located in the vicinity of the Concession area, in the DAoI, and therefore are potentially affected by an increase in air, noise and water pollution levels, in order to develop awareness of the mitigation measures within the PPCMP.

The Pollution Prevention and Control Management Plan should be read in conjunction with the following Company plans:

- Pln ms hse 005 Eni Ghana - Waste Management Plan;
- Pln ms hse 002 Eni Ghana - Emergency Response Plan;
- plan ms hse 009 eni Ghana - "Environmental, Social and Health Management Plan - Construction and Development Drilling Phase";
- plan ms hse 011 Eni Ghana - "Offshore Hazardous Materials Management Plan";
- plan ms hse 017 Eni Ghana - "Water Management Plan";
- Plan ms hse 018 Eni Ghana - "Offshore and Onshore Environmental Monitoring Program".

Communications undertaken with the community within the AoI and relevant for this plan will be managed through the Stakeholder Engagement Plan and its associated Action Plans.

The provisions established in this Pollution Prevention and Control Management Plan are supplemented by requirements established in the HSE Management Plan.



2. Applicability

This Plan describes the requirements with regard to land-based project activities that can generate pollution, applicable to the construction and development drilling phase of the Offshore Cape Three Points (OCTP) Project.

This plan is also applicable to the Takoradi-Tema Inter-connection Pipeline (TTIP) project.

Health	Safety	Environment	Social / Sustainability
X		X	



3. References

3.1 Internal References

- Ghana OCTP Block Phase 1 Environmental, Social and Health Impact Assessment, ESL, June 2015. Doc. 000415_DV_CD.HSE.0208.000_00, Rev 04.
- Ghana OCTP Block Phase 2 Environmental, Social and Health Impact Assessment, ERM, Doc. 000415_DV_EX.HSE.0304.000_01, Rev 05.
- Plan ms hse 009 eni Ghana r00 - "Environmental, Social and Health Management Plan - Construction and Development Drilling Phase".

eni Ghana has established, apart from the Plans mentioned in Section 1, other Guidelines, Protocols, Manuals, Standards, Procedures, Work Instructions, Programs and Plans that are relevant to managing and implementing this Plan, including but not limited to:

- AMTE-TG-167- "Management of Gas Emissions in O&G Upstream";
- OPI SG HSE 012 EP -Professional Operating Instruction on Noise and Vibration Management;
- OPI SG HSE 013 EP Professional Operating Instruction on Guidelines for Oil Spill Contingency Planning Process;
- pro ms hse 005 Eni Ghana - "Incident Notification, Investigation and Reporting".

Table 3.1 presents a summary of the mentioned documents.



Table 3.1 Summary of eni document related to pollution prevention.

Title	Document	Purpose
AMTE-TG-167	Management of Gas Emissions in O&G Upstream	To ensure a good management and reduction of gas emissions from O&G upstream activities.
Pro ms hse 005 eni ghana r04	Incident Notification, Investigation and Reporting	To set the basic procedures that must be followed by all eni Ghana employees to ensure all types of incidents (including near misses, accidents and incidents) are reported and investigated.
opi-sg-hse-012-ep-r01	Professional Operating Instruction on Noise and Vibration Management	It sets the requirements for noise and vibration management to be applied during the development of the Project in order to minimize potential related effects to local communities and environment.
opi-sg-hse-013-ep-r01	Guidelines-for-Oil-Spill-Contingency-Planning	It defines the requirements an OSRP must include and serves as a support to it as a part of the Emergency Response Process

3.2 External References

- Ghana Legal, 2015, on <http://laws.ghanalegal.com/>, last accessed in November 2015;
- IFC 2012, WB 2012, and MIGA 2013 (hereby referred to as WBG) Performance Standard 3: Resource Efficiency and Pollution Prevention and Guidance Note 3. International Finance Corporation/World Bank Group, January 1, 2012;
- WB/IFC General EHS Guidelines. World Bank Group, 2007;
- WB/IFC EHS Guidelines for Onshore Oil and Gas Development. World Bank Group, 2007.



4. Acronyms

DAoI	Direct Area of Influence
ESHIA	Environmental, Social and Health Impact Assessment
ERP	Environmental Response Plan
ESHMP	Environmental, Social and Health Management Plan
GHG	Greenhouse Gases
HSE	Health and Safety and Environment
KPI	Key Performance Indicator
OSRP	Oil Spill Response Plan
PPCMP	Pollution Prevention and Control Management Plan

5. Legal Requirements

Various laws, policies, systems, standards and international good practice codes are applicable to the implementation of this Plan. Such requirements are outlined in Section 6 of the Framework ESHMP. Further detail is provided in Chapter 3 of the EIS document.

Ghana laws, regulations and guidelines of particular relevance for managing and implementing this Plan include, but are not limited to:

- Environmental Protection Agency Act (Act 490 of 1994): in place to establish the authority responsible for the formulation of environmental policy, issue of environmental permits and pollution abatement notices as well as to develop standards and guidelines. It also establish the Hazardous Chemicals Committee, which plays a vital role in the management of chemicals in Ghana;
- Water and Sewerage Corporation Act, 1965 (Act 310), amended in 1969: establishes the Ghana Water and Sewerage Corporation, which is authorized to formulate regulations regarding the prevention of water pollution;
- Environmental Quality Guidelines for Ambient Air (EPA);
- Sector Specific Effluent Quality Guidelines for Discharges into Natural Water Bodies (EPA);
- General Environmental Quality Standards for Industrial or Facility Effluents, Air Quality and Noise Levels (EPA); and
- Permit Conditions for Onshore Construction (EPA).

eni Ghana Guidelines, Protocols, Manuals, Standards, Procedures, Work Instructions, Programmes and Plans that are relevant to managing and implementing this Plan have been listed in Section 3.1, Internal References.

The limit values for air and noise emissions that apply to this Project (either from Ghanaian legislation or industry best practices including WBG EHS Guidelines Values) have been included in Appendix A and Appendix B to the current document.



6. Pollution Sources from Project Activities

During the onshore construction phase of the Project pollution can be generated from various sources and affect diverse receptors.

Air pollution could be the result of the emissions from the equipment used during site clearance activities and preparation, building construction, the movement of vehicles, equipment and personnel, trenching and laying of pipes, backfilling and reinstatement of the pipeline trench and land temporarily disturbed by construction, hydrostatic testing for pipeline and equipment. These activities could result therefore in an increase of atmospheric concentrations of air pollutants such as particles (PM₁₀ and PM_{2,5}) carbon monoxide (CO), nitrogen oxides (NO_x), sulphur dioxide (SO_x) and greenhouse gases (GHG) from exhaust emissions of vehicles, engine-driven machinery, compressors of hydrostatic testing and power generators. These could also result in an increase in atmospheric concentrations of dust particles, mainly from earthwork activities and vehicle movement.

During construction activities the main effects on the ambient noise environment are related to intermittent noise emissions from construction machinery and the pumps and compressors used during the hydrostatic testing with the potential to generate an overall increase in the background noise level of the area adjacent to the construction/work sites of the ORF and pipeline. Light emissions from construction activities and campsites have also the potential to affect the fauna.

Soil and water receptors could also be affected by pollution. No discharges of water effluents are envisaged during construction activities, so pollution will mainly be sourced from potential uncontrolled discharges to soil and from any spill or leak produced during construction activities. Potential sources for this spills and leaks include the hydrotesting and refuelling activities as well as from the storage and handling of hazardous products.

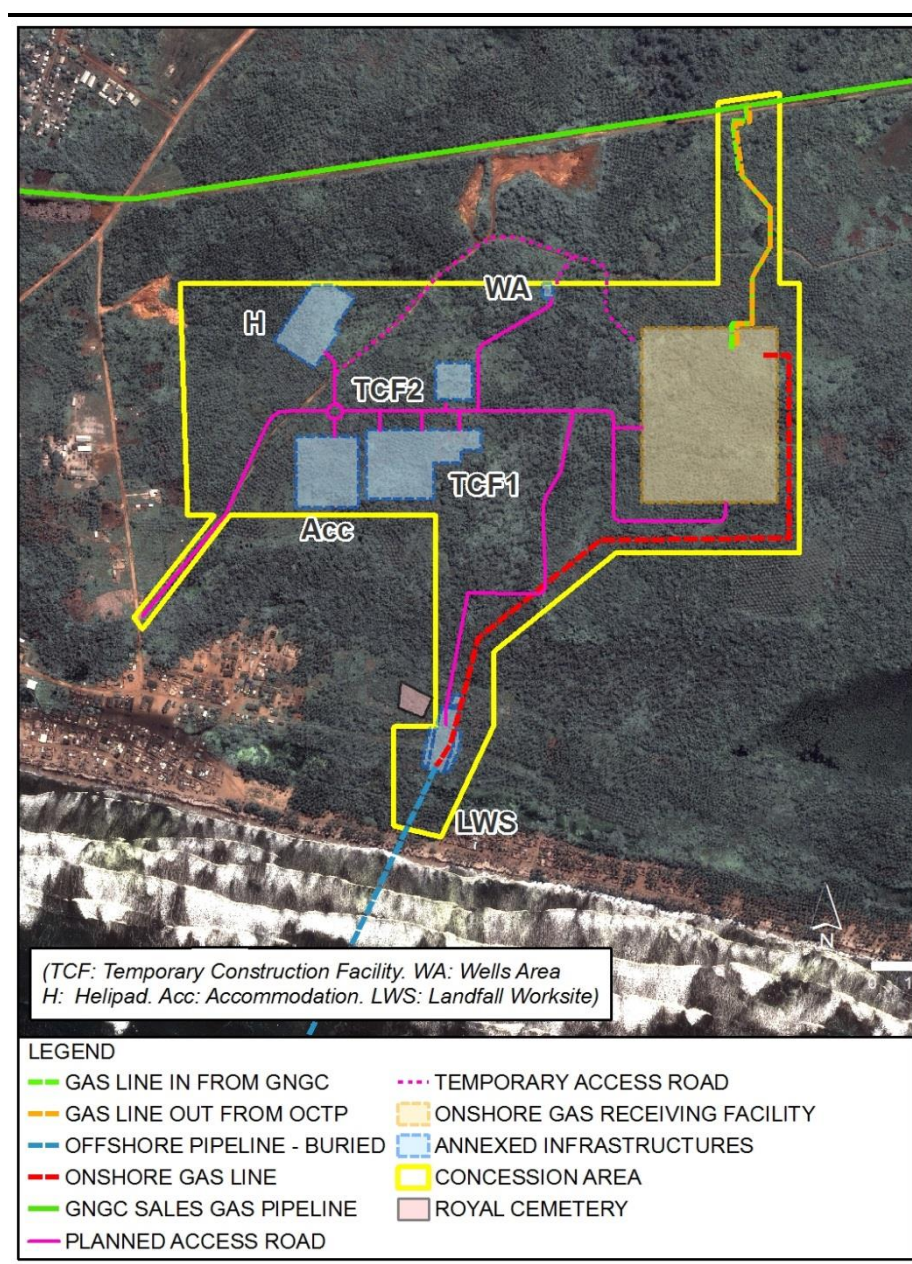
Waste management itself, and potential associated pollution is not included as part of the scope of the present management plan as it is covered by the waste management plan.



7. Management Plan

This Pollution Prevention and Control Management Plan covers the Construction phase of the Onshore section of the OCTP Project, that is, the pipeline landfall, the installation of the onshore section of the pipeline and the construction of the ORF and associated facilities, including the access road construction (*Figure 7.1*).

Figure 7.1 Temporary and Permanent Project Elements Affected by this Plan



Source: eni, 2017



Onshore construction activities involve several potential sources and types of pollution as indicated in the previous section. For this reason the PPCMP has been structured into six main components to address the different risks considered. These components are:

- Air Emissions;
- Noise Emissions;
- Light Emissions;
- Routine Water discharges;
- Hazardous Materials storage and handling;
- Spill Prevention and management.

As previously indicated other components likely to cause pollution are managed in different plans. That is the case of the wastes, considered in the Waste Management Plan.

The measures presented in this section apply equally to construction works to be developed within the Concession area (ORF construction, campsites preparation, etc.) and those to be carried out outside like the construction of the pipeline landfall, in all cases within the onshore section of the Project.

The key performance indicators outlined in *Table 7.1* have been designed to ensure the effective implementation of each of the commitments and are further detailed and explained in Section 11 of this document.

Mitigation measures in *Table 7.1* have been incorporated directly from the commitment register without being reworded. In those cases where it has been considered necessary to provide further clarity or more detailed information, additional text in italics has been included. When the same commitment (or very similar) applies to more than one type of pollution (i.e. air and noise emissions) it has been included only once in the table and the impact addressed has been added to the column "Potential ESH Impact". Any modification to the wording arising from the fusion of two commitments is included in italics.



Table 7.1 Management and Monitoring

Potential ESH Impact	IMPACT MANAGEMENT				IMPACT MONITORING			
	ESH Commitment	Responsible Party	Type	Source	Compliance Monitoring	Timing/ Frequency	Responsible Party	Key Performance Indicator
AIR EMISSIONS								
<p>Increased Vehicle and Equipment Emissions</p> <p><i>Certain commitments are also applicable for the following impacts:</i></p> <p>Degradation of Surface Water Quality due to Accidental Spillages of the Fuels and Chemicals;</p> <p>Degradation of Groundwater Quality Due to Spillages of Fuels and Chemicals (Unplanned Event)</p> <p>GHG Emissions</p>	<p>Fleet owners / operators will implement the manufacturer recommended engine maintenance programs.</p>	Vehicle owner (eni and contractor as required)	Avoidance	ESHIA Phase 2 Annex G Section G.4.1.3	<p>Audit of maintenance programs and works performed on vehicles.</p> <p>Audit of the selection and procurement of vehicles and equipment.</p> <p>Audit of the emissions control devices of vehicles and equipment.</p> <p>Audit of the fuel employed based on the receipts</p>	Prior to commencement of construction activities and monthly audits	eni HSE Field Team	<p>Records of maintenance Registry</p> <p>Verification and registry of audit on Vehicle specifications</p>
	<p>Replacing older vehicles with newer, more fuel efficient alternatives (<i>based on minimum vehicle construction date specified to contractor</i>).</p> <p>Converting high-use vehicles to cleaner fuels, where feasible.</p> <p>Installing and maintaining emissions control devices, such as catalytic converters.</p> <p>Use of low-sulphur fuels if available in Ghana.</p>							Percentage of low sulphur fuel used
	Power generators: use of NOx catalytic reduction/ CO catalytic oxidation;	Contractor and eni HSE and Procurement managers to	Reduction on/off site		Audit	Before beginning of activities	eni HSE Supervisor	Verification and registry of audit on equipment



Potential ESH Impact	IMPACT MANAGEMENT				IMPACT MONITORING			
	ESH Commitment	Responsible Party	Type	Source	Compliance Monitoring	Timing/ Frequency	Responsible Party	Key Performance Indicator
	Apply WHO recommended ambient emission and air quality levels and WBG EHS guidelines; Vehicles and machinery will be turned off when not in use.	include requirements in tendering documents. Contractor			Monitoring	Ongoing	eni HSE Field Team	specifications Compliance with air emission criteria
		Contractor			Assessment/inspections of vehicle management.	Ongoing	eni HSE Field Team	Assessment records
	Regular maintenance checks will be carried out and records kept on all vehicles and machinery.	Vehicle owner (eni and contractor as required)			Audit	Weekly	eni HSE Field Team	Records of maintenance Registry
	Keep an inventory of air emission sources (measured or estimated).	Contractor and eni HSE Manager, depending on the ownership of emission source	Monitoring		Monitor emissions (estimated).	Yearly	eni HSE manager	Records of emissions (estimated). Compliance with emission criteria
Increased dust emissions <i>Certain commitments on this section are also applicable for the following impacts: Impacts on Flora</i>	Covering of materials that can be transported by wind e.g. topsoil stockpiles.	Contractor	Avoidance	ESHIA Phase 2 Annex G Section G.4.1.3	Monitoring	Daily	eni HSE Field Team	Verification of action
	The use of compacted natural materials (i.e., gypsum sand) in parking areas if available.	Contractor			Audit	Before beginning of activities	eni HSE Field Team	Verification of action



Potential ESH Impact	IMPACT MANAGEMENT				IMPACT MONITORING			
	ESH Commitment	Responsible Party	Type	Source	Compliance Monitoring	Timing/ Frequency	Responsible Party	Key Performance Indicator
<p><i>due to Degradation of Abiotic Components in Ecosystems</i></p> <p><i>Degradation of Surface Water Quality due to Increased Sediment Load (Resulting from Increased Erosion and Dust)</i></p>	Vehicles will only travel along designated transport corridors.	Vehicle owner (eni and contractor as required)	Reduction on/off site		Analysis of In Vehicle Monitoring System data to ensure use of designated transport routes. Register of any deviation of the vehicles and machinery from the set perimeter.	Weekly	eni HSE Field Team	Compliance with transport corridors.
	Vehicle speed limited to minimize dust generation.					Weekly	eni HSE Field Team	Compliance with speed limits.
	Dust suppression, using water and/or dust suppression agents, will be undertaken for the control of loose materials if dust generation is observed on any surface and stockpile, the working strip, and/or stored topsoil (according to the availability of water resources).	Contractor			Visual monitoring of dust conditions to decide if it is necessary to apply the dust suppression agents.	Daily	eni HSE Field Team	Verification and registry of application of dust suppression agents
	Dust arrestment equipment (such as particle traps for vehicle's engine) to be used where practicable.	Vehicle owner (eni and contractor as required)			Audit	Prior commencement to of activities	eni HSE Field Team	Verification and registry of audit on Vehicle specifications.
Emissions from Hydrostatic Testing	Equipment in compliance with the best available technologies for air pollutant emission reduction will be used.	Contractor and eni HSE and Procurement managers to include requirements in	Avoidance	ESHIA Phase 2 Annex G Section	Audit	Prior to commencement of activities	eni HSE Manager and Development Manager	Verification and registry of audit.



	IMPACT MANAGEMENT				IMPACT MONITORING			
Potential ESH Impact	ESH Commitment	Responsible Party	Type	Source	Compliance Monitoring	Timing/ Frequency	Responsible Party	Key Performance Indicator
		tendering documents.		G.4.1.3				
	Regular and periodic maintenance of the equipment will be undertaken.	Equipment owner and contractor as required).	Management		Audit	TBD by contractor	eni HSE Field Team	Registry of maintenance of hydrotesting equipment
GHG emissions	Implementation of best available techniques related to: efficiency of power generation; optimization of overall energy efficiency; The design of the plant and the process should be focused on ensuring a reduction in flaring and reduction in venting.	Contractor and eni HSE and Procurement managers to include requirements in tendering documents.	Reduction on/off site	ESHIA Phase 2 Annex G Section G.4.2	Audit	Prior to commencement of activities	eni HSE Manager & Development Manager	Verification and registry of audit on Best Available Techniques (BATs)
	Regular monitoring and recording and reporting as part of a continuous improvement program specifically for GHG.	Contractor	Monitoring		Monitoring of fuel and consumption flaring/venting	Ongoing	eni HSE Manager & Development Manager	GHG emissions Registry
LIGHT EMISSIONS								
Disturbance and/or Displacement of Fauna due to Pollution	Lighting will, where possible, be aimed directly at the areas where it is required, minimizing light pollution outside of the	Contractor	Reduction on/off site	ESHIA Phase 2 Annex G Section	Assessment to verify correct implementation	Daily	eni HSE field team	Verification of correct implementation



Potential ESH Impact	IMPACT MANAGEMENT				IMPACT MONITORING			
	ESH Commitment	Responsible Party	Type	Source	Compliance Monitoring	Timing/ Frequency	Responsible Party	Key Performance Indicator
	ORF and other working areas.			G.4.8.3				
Landscape changes and visual impacts due to installation of the pipeline, construction of ORF and associated infrastructure.	Use specifically designed lighting equipment that minimizes the upward spread of light near to and above the horizontal.	eni Procurement Manager (requirements requested) and Contractor (implementation)	Avoidance	ESHIA Phase 2 Annex G Section G.4.9.3	Audit	Before commencement of activities	eni HSE field team	Audit records on equipment in use
NOISE EMISSIONS								
Increased ambient noise levels due to noise emissions from equipment/vehicles involved in construction activities and hydrostatic testing	On noise sources/ equipment: selection of equipment according to the best technologies available in terms of noise reduction. On construction activities: limit noisy construction activities to the least noise-sensitive times of day that will need to be defined via engagement with local communities.	Contractor and eni HSE, Local Content, Sustainability and Procurement managers to include requirements in tendering documents Contractor	Avoidance	ESHIA Phase 2 Annex G Section G.4.3.3	Assessment of noise levels generated by vehicles and equipment Operational control of the times of the day when noisy activities are carried out.	Every 6 months Daily	eni HSE Manager & Development Manager eni HSE Field Team Local content and Sustainability Manager	Verification of procurement records showing Noisy equipment compliance with Best Available Techniques (BATs). Records of Consultation with local communities to identify sensitive



Potential ESH Impact	IMPACT MANAGEMENT				IMPACT MONITORING			
	ESH Commitment	Responsible Party	Type	Source	Compliance Monitoring	Timing/ Frequency	Responsible Party	Key Performance Indicator
								periods and records of compliance with the noise sensitive periods ban of noise.
	On noise sources/equipment: switch off equipment when not in use; keep the noise level of audible warning devices to the minimum necessary for health and safety.	Contractor	Reduction on/off site		Assessments /inspections of vehicle management	Ongoing	eni HSE Field Team	Assessment records.
	On propagation path: locate stationary equipment (i.e., compressors) as far as practicable from nearby receptors; orient plant to direct noise emissions away from sensitive locations as far as possible; use on-site structures and terrain to screen sensitive locations wherever practicable.	Contractor and eni Procurement Management and engineering team			Audit and monitoring, Noise monitoring at sensitive locations during construction, at regular intervals (once a week) during day and night (See Table 10.1)	Before beginning activities of and Weekly	eni HSE manager and eni HSE Field Team	Compliance with ambient noise levels.
	On noise sources/equipment: regular maintenance of noisy equipment and	Equipment owner (eni and contractor as required)	Management		Audit	Weekly	eni HSE field team	Maintenance Registry.



Potential ESH Impact	IMPACT MANAGEMENT				IMPACT MONITORING			
	ESH Commitment	Responsible Party	Type	Source	Compliance Monitoring	Timing/Frequency	Responsible Party	Key Performance Indicator
	<p>vehicles in accordance with manufacturers specifications to prevent increases in noise emissions; keep the noise level of audible warning devices to the minimum necessary for health and safety.</p> <p>If construction work outside daylight hours is unavoidable, notify the scheduled activity to the residents of nearby in advance;</p>	Contractor and eni CLO			Audit	Weekly	eni HSE Manager and CLO	<p>Compliance with noise emission levels.</p> <p>Registry of communication to nearby communities.</p>
HAZARDOUS MATERIALS STORAGE AND HANDLING								
<p>Degradation of Surface Water Quality due to Accidental Spillages of the Fuels and Chemicals</p> <p><i>Certain commitments also applicable for the following impacts:</i></p> <p>Degradation of Groundwater Quality</p>	<p>Fuels and other hazardous chemicals will be stored according to industry best practice including bunds that can accommodate 150 % of the total storage volume and covered to prevent rainfall entering the bund. Control systems will be properly maintained.</p> <p>Refuelling of equipment</p>	<p>Contractor</p> <p>Contractor</p>	Management	ESHIA Phase 2 Annex G Section G.4.4.3	Audit on Compliance with hazardous materials storage and handling requirements (see Section 7.1)	Weekly	eni HSE Field Team	Audit records



Potential ESH Impact	IMPACT MANAGEMENT				IMPACT MONITORING			
	ESH Commitment	Responsible Party	Type	Source	Compliance Monitoring	Timing/ Frequency	Responsible Party	Key Performance Indicator
Potential soil contamination Impacts on Flora due to Degradation of Abiotic Components in Ecosystems	and vehicles will be carried out in designated areas on hard standing ground to prevent seepage of any spillages to ground. Collection systems will be installed in these areas to manage any spills.				Assessment of refuelling practices. Audit of spills management and conditions of the refuelling area, including presence of collection systems.	Ongoing assessments Monthly	eni HSE Field Team eni HSE Field Team	Assessment records. Audit Records



Potential ESH Impact	IMPACT MANAGEMENT				IMPACT MONITORING			
	ESH Commitment	Responsible Party	Type	Source	Compliance Monitoring	Timing/ Frequency	Responsible Party	Key Performance Indicator
SPILL PREVENTION AND MANAGEMENT								
Degradation of Surface Water Quality due to Accidental Spillages of the Fuels and Chemicals and <i>Commitments also applicable for the following impacts:</i> Degradation of Groundwater Quality Potential soil contamination	Spills to ground (soil) will be remediated immediately by an appropriately qualified person and the remediation verified.	Contractor	Repair or remedy	ESHIA Phase 2 Annex G Section G.4.4.3	Operational Control and Audits	Ongoing	eni HSE Field Team	Records on spill events and remediation actions developed, including timings Records of training on spill remediation
	Spill containment and clean-up kits will be available on-site, and clean-up from any spill must be in place and executed at the time of a spillage, with appropriate disposal as necessary.	Contractor			Assessment	Weekly	eni HSE Field Team	Records of the assessment of existence of ERP and of compliance with hazardous materials storage and handling requirements
ROUTINE WATER DISCHARGES								
Degradation of Groundwater and Surface Water Quality due to Seepage from Discharge of Wastewater and Improper Waste Storage and Handling <i>Commitments also</i>	All wastewater generated during construction will be collected in a saver pit and treated and disposed of in conformity with legal requirements.	eni Development Project Manager (inclusion of saver pit and treatment facilities in project) and Contractor	Management	ESHIA Phase 2 Annex G Section G.4.5.3 ESHIA	Audit of existence and functioning of sewage treatment plant sludge management.	Before commencement of activities and monthly.	eni HSE Manager	Audit records



Potential ESH Impact	IMPACT MANAGEMENT				IMPACT MONITORING			
	ESH Commitment	Responsible Party	Type	Source	Compliance Monitoring	Timing/ Frequency	Responsible Party	Key Performance Indicator
<i>applicable for the following impacts:</i> Changes in Hydrology by Reduced Flows and/or Changes in Flow Direction Pressures on local infrastructure and public services (e.g. electricity, waste sanitation)	There will be no direct discharge of wastewater to onshore water receptors and wetlands.			Phase 2 Annex G Section G.4.4.3				



7.1 Prevention of Accidental Spills and Hazardous Materials Handling and Storage Specific Measures and good practices

The most efficient measure to avoid impacts from the use of hazardous materials is to reduce or even avoid the use of such materials.

As a result, both eni Ghana and its contractors shall adopt a policy of using environmental friendly products when feasible. In particular non-chlorinated solvents, paints with low volatile organic compound content, and non-lead-based paints will be chosen in preference.

Similarly, PCBs, leaded paints, chromium-based cooling water treatment and mercury-filled meters shall be prohibited from purchase due to their extreme hazardous or toxic nature.

Other important measures in terms of prevention of accidental spills from hazardous materials, independently of the commitments included in the table above, are to maintain a good housekeeping within construction working area, ensure good material handling practices and inspection procedures.

These good practices, that also contribute to facilitate the inspection and check of potential leaks include the following:

- Ensuring sufficient aisle space to provide access for inspections and to improve the ease of material transport.
- Storing materials in designated protected areas away from high-traffic areas to reduce the likelihood of accidents that might cause spills or damage to drums, bags, or containers.
- Stacking containers in accordance with the manufacturers' directions to avoid damaging the container or the product itself.
- In addition, storing containers on pallets or equivalent structures is recommended. This facilitates inspection for leaks and prevents the containers from coming into contact with wet floors, which can cause corrosion. This consideration also reduces the incidence of damage by pests (insects, rodents, etc.).
- Delegating the responsibility for management of hazardous materials to personnel trained and experienced in hazardous substance management.
- Storage spaces and containers should be routinely inspected for leaks, signs of cracks or deterioration, or any other signs of leakage.
- All containers should be properly labelled for correct identification.
- Maintain a good inventory of hazardous materials stored.



Additional good practices that need to be followed during Project construction works are presented following:

- Petroleum products will be stored in tightly sealed containers that are clearly labelled;
- During re-vegetation works, if non-organic fertilizers are used, these will be applied in the minimum amounts recommended by the manufacturers. The contents of any partially used bags of fertilizer will be transferred to a sealable plastic bin to avoid spills;
- Containers of paints will be tightly sealed and properly stored when not required for use. All excess paint materials will be properly disposed of according to manufacturer's instructions and Waste Management Plan.
- A supply of empty drums will be available for use in the event of spills during project construction. In order to isolate the hazardous material and prevent expansion, the contaminated material will be placed in the drums, sealed and placed in the storage area to await proper characterization and disposal.
- In the event that a larger amount of material needs to be isolated, it will be placed directly into a lined roll-off container from a licensed hazardous waste transporter. The roll-off container will be placed out of the flow of construction traffic and equipment, in a bermed area to contain and isolate possible leaks and rainwater.

In the event of water or liquid present in the bunds or secondary containments of hazardous materials, extraction and delivery to authorised waste contractor should be the default option. Only if after a sampling of the liquid and analysis, clean rain water is the only stored liquid, release to the environment could be an acceptable option.



8. Roles and Responsibilities

Responsible parties for implementation and monitoring of activities indicated in this plan are presented in *Table 7.1* and in the documents referenced therein.

eni Ghana shall ensure sufficient resources are allocated on an ongoing basis to achieve effective implementation of Company's responsibilities in this Plan.

Contractors shall ensure sufficient resources are allocated on an ongoing basis to achieve effective implementation of this Pollution Prevention and Control Management Plan.

The Contractor's Plans shall describe the resources allocated to the execution of each task and requirement contained therein, and shall describe how roles and responsibilities are communicated to relevant personnel.

The Contractor and eni Ghana HSE team will be the main responsible of the correct implementation of the requirements of this PPCMP. Their responsibilities are described in the following *Table 8.1*.



Table 8.1 Roles and Responsibilities

Name/Title	Responsibilities	Duties
<i>Contractor</i>	Provide overall direction for project construction. Ultimately responsible that the work is conducted in accordance with all of the pollution prevention and control related commitments.	<ul style="list-style-type: none"> Control and supervise the correct implementation of the measures and commitments included within this plan and assigned under the responsibility of the contractor. Identify the contractor personnel responsible for carrying out and managing each of the commitments. Provide adequate training to the personnel in line with the requirements and responsibilities assigned to each position. Provide support to the audit, monitoring and assessment processes performed by eni Ghana or third parties. Provide early notification of any incident or near miss related to pollution to eni Ghana HSE Team as well as the subsequent formal report of the incident. The contractor selected by eni Ghana will be required to undertake regular inspections to ensure adherence to the Pollution Prevention and Control Management Plan.
<i>eni HSEQ Manager</i>	<p>Provide overall HSE management and guidance on the implementation of this PPCMP.</p> <p>Coordinate overall verification, assessment, monitoring and auditing related to the PPCMP.</p> <p>Ensure that Contractors are complying with:</p> <ul style="list-style-type: none"> The PPCMP, the ESHMP and the 	<ul style="list-style-type: none"> Oversee Contractor programs for construction pollution monitoring and audits as specified in this PPCMP; generate the appropriate reports; and oversee any corrective actions; Coordinate Pollution control related activities in response to routine or emerging issues; Collect Contractor monitoring and assessment reports in a timely manner; Communicate with Contractors regarding compliance issues (including permitting); Record all spills and communicate with government authorities (i.e. EPA) as required on pollution issues;



Name/Title	Responsibilities	Duties
	<p>Contractor's HSE plan;</p> <ul style="list-style-type: none"> ▪ Applicable noise emissions, air emissions and hazardous materials handling and storage government regulations (see Appendix A and Appendix B for guidelines and limits); and ▪ Project requirements, specifications, and commitments for Pollution Prevention and Control matters. 	<ul style="list-style-type: none"> ▪ Call in specialists to consult on specific problems or to conduct third-party audits as needed; ▪ Ensure the effective implementation and use of the trainings programs with respect to pollution prevention issues.
<i>eni Logistics Manager and Team</i>	To participate in the definition and preparation of the technical documents for all logistic services tenders; to cooperate with the concerned department/s to the tender evaluation and final recommendation for the contracts award.	<ul style="list-style-type: none"> ▪ Ensure, with the collaboration of HSE team, the technical requests in the tender documents for contractors are aligned with the requirements set within this PPCMP.
<i>eni Contracts and Procurement Manager and Team</i>	To manage the company procurement process and coordinate the purchase and contract awarding process, by receiving the request of material/services, arranging the tendering process, preparing the purchase order/contract to be awarded and relevant amendments.	<ul style="list-style-type: none"> ▪ Ensure, with the collaboration of HSE team, that the technical requests in the tender documents prepared for contractors or to acquire any supply are aligned with the requirements set within this PPCMP.



Name/Title	Responsibilities	Duties
<i>eni Ghana HSE Field Supervisors</i>	<ul style="list-style-type: none"> Coordinate environmental activities related to pollution prevention and control; Communicate the results of verification, assessment, monitoring and auditing inspections to appropriate offices via transmittal of copies of original reports, summaries of reports, or periodic formal and informal reports as appropriate. Communicate with HSE team (HSE coordinator and HSE Manager) regarding emerging pollution issues and areas of concern. Communicate (informally) with the Contractors regarding compliance issues. Implement community engagement and awareness campaigns. 	<ul style="list-style-type: none"> Work with Contractor HSE personnel: oversee activities performed, review monitoring compliance and reports, and conduct site visits. Plan and Conduct the independent verification, assessment, monitoring and auditing to ensure compliance with PPCMP requirements and communicate the results to both eni Ghana HSE manager and contractor HSE personnel. Oversee project requirements, specifications, and commitments for matters related to pollution prevention. Communicate through verbal and written reports to the HSE Manager regarding compliance issues and areas of concern. Advise the Contractor field personnel concerning issues related to pollution prevention and control, including implementation of commitments, their verification, assessment, monitoring and auditing and the interpretation of related regulatory requirements. Review construction schedules and assist in communicating pertinent information to local communities through coordination with eni Ghana so that conflicts and disruptions can be avoided or minimized. Revise, in collaboration with Procurement and Contracts teams, the tendering and contracting documents for/with contractors to ensure all technical requirements set within this PPCMP are included and properly reflected in the documents.



9. Training Awareness and Competency

Project shall ensure that personnel responsible for the execution of tasks and requirements in the Pollution Prevention and Control Management Plan are competent on the basis of education, training and experience. The Contractor shall elaborate a Plan where it shall be described the training and awareness requirements necessary for its effective implementation.

Section 14 of the ESHMP provides details on the training, awareness and competency procedures for the project. Minimum environmental, social and health training requirements per role within the Project are presented in section 14.3 of the Framework ESHMP. Additional training requirements for this specific management plan are presented in *Table 9.1* below.

Project training activity associated with the implementation of the Pollution Prevention and Control Management Plan shall be appropriately documented by means of a training needs assessment, training matrix/plan and records of training undertaken.

Table 9.1 Specific Training Requirements

Position (from all companies involved)	Training Topic	Frequency
Eni HSE field team. Contractor Personnel in charge of implementing the PPCMP	Detailed training on the commitments and mitigations measures of the PPCMP.	Prior to start any of the activities; Refreshers and updates every year and after any change or update in the plan.
All personnel dealing with hazardous materials (including fuel)	Handling and storage of hazardous materials.	Prior to start any of the activities; Refreshers and updates every year.
Selected Personnel. (Every shift and working area must have at least one person trained)	Methods for the Collection of Spills and on Remediation of damaged receptor.	Prior to start any of the activities; Refreshers and updates every year.
Personnel in charge of monitoring air and noise emissions	Air and Noise Emissions Monitoring Methods and reporting requirements.	Prior to start any of the activities; Refreshers and updates every year.



10. Performance Indicators

Performance indicators are used to measure and track performance against the effectiveness of mitigation and control measures described in this Plan. General performance indicators may also be relevant, such as training and awareness numbers.

Performance indicators must be measurable against a specified target. The performance indicators outlined in *Table 7.1* apply to this Plan. Details regarding how they will be measured, target/benchmark and frequency of control are described in *Table 10.1*.

However Contractors may, subject to agreement with Company, modify or add to these indicators to enhance the Contractor's plan, based on lessons from the performance indicators.

Table 10.1 Performance Indicators

Performance Indicator	Measurement	Target/Benchmark	Frequency of Monitoring
Equipment specifications	% of equipment applying NO _x and catalytic reduction/ CO catalytic oxidation.	100% of equipment equipped with NO _x and catalytic reduction/ CO catalytic oxidation.	Prior to commencement of construction activities.
Distance of generators to sensitive areas	Distance in meters between the location of a generator and working areas or air conditioning intakes as well as residential areas. Prevalent wind direction in construction area.	Minimum of 100 m distance from generators to indicated areas and always downwind from them.	Before commencement of construction activities and placement of generators.
Compliance with transport routes	Analysis of the data measured by eni's In Vehicle Monitoring System (speed and positioning) to record the % of adherence to the designated transport routes.	No vehicle deviations of the set geographical area of construction activities.	Weekly



Performance Indicator	Measurement	Target/Benchmark	Frequency of Monitoring
Compliance with speed limits	Analysis of the data measured by eni's In Vehicle Monitoring System (speed and positioning) to record the % of speed limits breaches.	No breaches of the limits established at: - 25km/h within construction zones - 15km/h near water courses.	Weekly
Records of compliance with noise sensitive periods ban of noise	Record the time and duration of noisy activities developed during construction activities.	No noisy activities performed in noise sensitive periods (mainly night time).	Daily
Compliance with noise levels at sensitive receptors	Noise monitoring at sensitive locations during construction, at regular intervals (once a week) during day and night.	Noise levels in compliance with Ghana EPA and IFC ambient noise standards (see Appendix B), established in 55 dB at daylight (6-22h) and 45 dB at night (22-6h) for residential areas.	Weekly and daily during specially noisy construction activities such as hydrotesting.
Compliance with ambient air quality levels at sensitive receptors	Air monitoring at sensitive locations during construction, at regular intervals (once a week).	Ambient air quality levels in compliance with Ghana EPA and IFC ambient air quality standards (see Appendix A).	Weekly
Compliance with hazardous materials storage and handling requirements	Records of hazardous materials storage and handling requirements	No accidental spillages of hazardous materials All refuelling of equipment and vehicles carried out in designated areas.	Weekly for compliance of storage and handling requirements and ongoing assessments during refuelling practices.
Spill Events and Remediation Actions	Record of number of spills and time required to remediate the event.	Any accidental spill event to be remediated in the least time possible, targeting immediate remediation	Ongoing assessments of spill events and remediation actions.



11. Reporting

11.1 eni Ghana

Throughout the project, eni Ghana will keep regulatory authorities informed of the performance with respect to HSE matters (as indicated in the ESHMP Section 11.2). The HSE status report will include performance details of the Pollution Prevention and Control Plan.

In the HSE report that eni will prepare monthly, the content will at least include:

- Details and results of all monitoring and assessment undertaken during the reporting period following the requirements of this PPCMP;
- Detail of the audits undertaken during the reporting period;
- Results of the performance indicators applicable during the reporting period detailed this PPCMP;
- Summary and latest status of the incidents, Non-Conformance and Field Observations, including spills, having occurred or being detected during the reporting period (including those not closed in previous reports) together with the corrective and remedial actions undertaken or the planned response;
- Summary and status of Non-Conformities and Findings/Observations and corrective actions undertaken or planned in response, as described in the ESHMP Framework Section 11.4;
- Summary of community engagement and awareness campaign activities applicable during the reporting period;
- Records of hazardous materials consumed, such as volume of fuel, and an estimate or, preferably, a measurement of atmospheric emissions including greenhouse gases during the reporting period and the total since the beginning of the Project.

11.2 Contractor

Periodic reports related to the implementation and operation of the Pollution Prevention and Control Plan.

Two types of reports have been considered and defined in the ESHMP Section 11.2: A Weekly Site Inspections Report and a Monthly Construction Report. These reports will be created by the Contractor manager and sent to eni Ghana HSE manager for review.



The Weekly Site Inspections Report will include the compiled results of a daily check of site conditions with respect to pollution prevention and control commitments and the implementation of mitigation measures.

The contractor's monthly report shall include, in relation to this PPCTMP, at least the following content:

- Any additional management and mitigation measure applied where applicable;
- Results and details of monitoring undertaken by Contractor during the reporting period.
- Results of the Performance Indicators defined in this Plan that are applicable during the reporting period and any other performance indicator considered;
- Summary and status of incidents, non-Conformities and Findings/Observations documented as part of Contractors' verification and monitoring, as described in the ESHMP Framework Section 11.4;
- Assessment and audit reports and summary and status of all Non-Conformities that had been identified therein;
- Copies of all pollution related written communications from official authorities of Ghana; Volumes of hazardous materials consumed; and
- Estimate or measurement of air emissions.

11.3 Incident notification and reporting

All incident notification and reporting related to pollution arising as a result of construction activities will be appropriately recorded, documented and notified in accordance with eni Ghana HSE-IMS and in line with the ESHMP (Plan ms hse 009 eni Ghana) detailed in Section 11 of such plan.

In any case Contractor shall immediately notify Company of all contained and uncontained spills detailing material released, volume, location, cause and proposed corrective measures, where appropriate.

For all uncontained releases, Contractor shall provide the following additional information:

- Response time;
- Clean up requirements;
- Outcome and initial assessment of environmental and social impact.



11.4 Reporting of non-conformities

The reporting of non-conformities related to construction pollution prevention will follow the eni Ghana HSE-IMS requirements and in line with the ESHMP.

11.5 Document Control

The document control procedure related to Pollution Prevention and Control during construction will follow the requirements of eni Ghana HSE-IMS and in line with the ESHMP.



12. Appendices

Appendix A. Industry Good Practices for Air Emissions

Appendix B. Noise Emissions and Ambient Noise Limit Values

Appendix C. Effluent Discharge Limit Values



Appendix A. Industry Good Practices for Air Emissions

Key provisions of the WBG General EHS Guidelines, WBG EHS guidelines for onshore oil and gas developments, WBG EHS Guidelines for Thermal Power Plants and WB/IFC Performance Standards 3 relating to air emissions are outlined in Table A.12.1. presents the Ghana EPA guidelines governing air emissions and common air pollutants specific for industrial and residential areas and the WHO guideline values and interim targets levels.

Table A.12.1 Industry Good Practices for Air Emissions

Source	Industry Good Practice Standard
General	All reasonable attempts should be made to maximize energy efficiency and design facilities for lowest energy use. The overall objective should be to reduce air emissions and evaluate cost effective options for reducing emissions that are technically feasible.
Exhaust gases	<p>Guidance for the management of small combustion sources with a capacity of up to 50 megawatt-hours thermal, including standards for exhaust emissions, is provided in the IFC's General EHS Guidelines.</p> <ul style="list-style-type: none"> ▪ For engines using liquid fuels these are as follows. <ul style="list-style-type: none"> ○ Particulate matter: 50 mgNm⁻³ (up to 100 if justified by project-specific conditions) (approximately 24 and 49 ppm respectively). ○ Sulphur dioxide: 1.5% of Sulphur (up to 3% if justified by project-specific conditions). Consideration to using low Sulphur fuels or secondary treatment to meet 1.5% Sulphur. ○ Nitrogen oxides: 1,460 mgNm⁻³ if bore size diameter <400 mm (up to 1,600 mgNm⁻³ if justified to maintain high energy efficiency) and 1,850 mgNm⁻³ if bore size diameter >400 mm. These normalized gas concentrations equate to approximately 711, 779 and 901 ppm respectively. ○ Dry gas, excess oxygen content: 15%. ▪ For gas-fired engines these are as follows. <ul style="list-style-type: none"> ○ Nitrogen oxides: 200 mgNm⁻³ for spark ignition, 400 mgNm⁻³ for dual fuel and 1,600 mgNm⁻³ for compression ignition. <ul style="list-style-type: none"> ○ Dry gas, excess oxygen content: 15%.
Greenhouse gasses	Significant (>25,000 t tons CO ₂ equivalent per year) greenhouse gas



Source	Industry Good Practice Standard
	(GHG) emissions from the facilities owned or controlled within the physical project boundary, as well as indirect emissions associated with the off-site production of energy used by the project should be quantified annually in accordance with internationally recognized methodologies and good practice.
Venting and flaring	Measures consistent with the Global Gas Flaring and Venting Reduction Voluntary Standard (part of the World Bank Group's Global Gas Flaring Reduction Public-Private Partnership should be adopted when considering venting and flaring options for offshore activities). The standard provides guidance on how to eliminate or achieve reductions in the flaring and venting of natural gas. Continuous venting of associated gas is not considered current good practice and should be avoided.
Well testing	During well testing, flaring of produced hydrocarbons should be avoided, especially in environmentally sensitive areas. Feasible alternatives should be evaluated for the recovery of these test fluids, while considering the safety of handling volatile hydrocarbons, for transfer to a processing facility or other alternative disposal options. An evaluation of alternatives for produced hydrocarbons should be adequately documented and recorded.
Fugitive emissions	Methods for controlling and reducing fugitive emissions should be considered and implemented in the design, operation, and maintenance of offshore facilities. The selection of appropriate valves, flanges, fittings, seals, and packing should consider safety and suitability requirements as well as their capacity to reduce gas leaks and fugitive emissions.

Source: WBG's General EHS Guidelines; EHS guidelines for onshore oil and gas developments (World Bank Group, 2007), WBG EHS Guidelines for Thermal Power Plants (World Bank Group, 2007) and WB/IFC Performance Standards 3 (World Bank Group, 2012).



Table A.12.2 Air Quality Standard Values: Ghana EPA Standards and WHO Ambient Air Quality Standards.

Substance	Average-time	Time-Weighted Average (TWA) [$\mu\text{g}/\text{m}^3$]		Average-time	Guideline value [$\mu\text{g}/\text{m}^3$]
Sulphur Dioxide (SO_2)	1 h	900	Industrial	24 h	125 (Interim target-1)
		200	Residential		50 (Interim target-2)
					20 (guideline)
	24 h	150	Industrial	10 minute	500 (guideline)
		100	Residential		
	Calendar year	80	Industrial	--	--
		50	Residential		
	1 h	400	Industrial	1 h	200 (guideline)
		90	Residential		
Nitrogen oxides (Measured as NO_2)	24 h	150	Industrial	--	--
		60	Residential		
	Calendar year	100	Industrial	Calendar year	40 (guideline)
		30	Residential		
Total Suspended Particulate (TSP)	1 h	230	Industrial	--	--
		150	Residential		
	24 h	75	Industrial	--	--
		60	Residential		
	24 h	70	--	24h	150 (Interim target 1)
					100 (Interim target 2)
					75 (Interim target 3)



Substance	Average-time	Time-Weighted Average (TWA) [$\mu\text{g}/\text{m}^3$]		Average-time	Guideline value [$\mu\text{g}/\text{m}^3$]
					50 (Guideline)
	--	--	--	Calendar year	70 (Interim target 1) 50 (Interim target 2) 30 (Interim target 3) 20 (Guideline)
Particulate Matter PM _{2.5}	--	--	--	24 h	75 (Interim target-1) 50 (Interim target-2) 37.5 (Interim target-3) 25 (guideline)
	--	--	--	Calendar year	35 (Interim target-1) 25 (Interim target-2) 15 (Interim target-3) 10 (guideline)
Carbon Monoxide (CO)	24 h 1 h	60 mg/m ³ 10 mg/m ³	--	--	--
Ozone	--	--	--	8-hour daily maximum	160 (Interim target-1) 100 (guideline)

Source: WBG General EHSs Guidelines: Environmental Air Emissions And Ambient Air Quality (2007) and Environmental Quality Guidelines for Ambient Air (EPA, 1996)



Appendix B. Ambient Noise Limit Values

The requirements in terms of ambient noise levels applicable to the project are presented in the following tables. Noise emissions derived from construction activities must be aligned with these values at all times and any non-conformity adequately reported.

The Ghana EPA maximum permissible noise levels during day and night time hours are presented in Table B.12.3.

Table B.12.3 Ghana EPA Ambient Noise Level Standards

Zone	Description of Noise Receptor	Permissible Noise Level [dB(A)]	
		Daytime 06h00 – 22h00	Night time 22h00 – 06h00
A	Residential areas with negligible or infrequent transportation	55	48
B1	Educational (school) and health (hospital clinic) Facilities	55	50
B2	Area with some commercial or light industry	60	55
C1	Area with some light industry, place of entertainment or public assembly and place of worship such as churches and mosques	65	60
C2	Predominantly commercial areas	75	65
D	Light industrial areas	70	60
E	Predominantly heavy industrial areas	70	70

Source: General Environmental Quality Standards for Industrial or Facility Effluents, Air Quality and Noise Levels (EPA).



The WBG General Environmental EHS Guidelines (World Bank Group 2007), which implement the "Guidelines for Community Noise" established by the World Health Organization (WHO) in 1999, prescribe the absolute noise levels reported in for day time and night time to be achieved.

In environments where the ambient noise levels already exceed a level of 55 dB(A) daytime and/or 45 dB(A) night time the IFC includes a guideline stating that noise emissions should not cause the ambient noise level in a residential area to rise by 3 dB(A) or more, determined during the noisiest hour of a 24 hour period.

Table B.12.4 IFC Guidelines for Ambient Noise Levels

Receptor	Maximum Ambient Noise Level 1-hour Leq [dB(A)]	
	Daytime	Night time
	06h00-22h00	22h00-06h00
Residential, Institutional, Educational	55	45
Industrial, Commercial	70	70

Source: IFC General EHSs Guidelines: Noise (IFC, 2007)

The Project will need to take these ambient noise level standards into account for the compliance of noise mitigation requirements included in this PPCMP.



Appendix C. Effluent Discharge Limit Values

Table C.12-5 provides industry good practice standards for effluent discharges from offshore oil and gas developments based on MARPOL, IFC and OSPAR standards. These standards are also in line with the effluent discharges guidelines adopted in the EPA Guidelines for Environmental Assessment and Management in the Offshore Oil and Gas Development (2010).

Table C.12-5 Guidelines for Effluent Discharge Levels

Drilling fluids and cuttings	<p><i>In addition to EPA guidelines and as per IFC Guidelines, disposal of spent NADF or of cuttings from wells drilled with NADF by discharge to the sea must be avoided. Instead, they should be transferred to shore for recycling or treatment and disposal. If discharge of cuttings is necessary, they should be treated before discharge to meet the following guidelines:</i></p> <ul style="list-style-type: none"> • <i>Oil concentration lower than 1% by weight on dry cuttings</i> • <i>Hg max 1 mg/kg dry weight in stock barite</i> • <i>Cd - max 3 mg/kg dry weight in stock barite</i> • <i>Discharge via a caisson at least 15 m below sea surface</i>
Completion and Workover Fluids	<i>Discharge to sea if oil and grease do not to exceed 42 mg/l-daily maximum and 29 mg/l-1 monthly average. Any spent acids to be neutralised (to attain a pH of 5 or more) as per IFC EHS guidelines.</i>
Cooling water	The effluent should result in a temperature increase of no more than 3°C at the edge of the initial mixing/dilution zone. Where the zone is not defined, use 100 m from point of discharge as per EPA and IFC EHS guidelines.
Produced water	Oil and grease not to exceed 40 mg/l-1 daily max and 29 mg/l-1 monthly average as per EPA guidelines ⁽²⁾
Produced sand	No discharge unless residual oil less than 1% by weight on dry sand as per EPA guidelines
Sewage	Treat with approved marine sanitation unit (achieve no floating solids, no discolouration of surrounding water) as per MARPOL Annex IV



	requirements. Minimum residual chlorine of 1 mg/l as per IFC EHS Guidelines.
Food waste	Macerate to acceptable levels and discharge in compliance with MARPOL 73/78 Annex V requirements.
Bilge water	Treat to 15 ppm oil concentration as per MARPOL 73/78 Annex I requirements.
Storage Displacement Water (Ballast Water)	Compliance with the International Convention for the Control and Management of Ship's Ballast Water and Sediments.
Deck drainage	Treat to 15 ppm oil concentration as per MARPOL 73/78 Annex I requirements.
Desalination brine	Mix with other discharge streams if feasible.

(1) EPA Guidelines have been considered. However, additional IFC standards have been included in *italics*.

(2) Not applicable because produced water will be re-injected.

Source: Guidelines for Environmental Assessment and Management in the Offshore Oil and Gas Development (EPA, 2010). Reference: MARPOL 1973/1978: International Convention for the Prevention of Pollution from Ships. Legend: PPM: parts per million

