Metago

Environmental Engineers (Pty) Ltd

Prepared For

Sasol Petroleum Temane Limitada

- ENVIRONMENTAL MANAGEMENT PLAN -

Construction of the Temane Well-heads, Flowlines, Access Roads and a Central Processing Facility

- Inhambane Province, Mozambique -

PROJECT NUMBER 154-003

REPORT NO. 1 Final - English version

March 2002

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DEFINITIONS AND ACRONYMNS

Communication Task Team – Team employed by Sasol whose main purpose is liaison with authorities and the local communities regarding the activities and presence of Sasol in the project area.

Construction Right of Way – the area within which the Contractor / Sasol will be required / permitted to work along the flowlines and access roads.

EIA – Environmental Impact Assessment.

EIS – Environmental Impact Statement.

EMP – Environmental Management Plan.

Environmental Consultant – An independent environmental consultant with experience in the environmental management of construction contracts.

Environmental Management Plan (EMP) – i) Defines the measures to be taken during the life of a project, including design, construction, operation and decommissioning to prevent and/or manage adverse environmental impacts; ii) defines the actions needed to implement these measures; and iii) describes how this will be achieved.

Environmental Management Plan Audit – A systematic, documented and objective evaluation of the environmental performance of a project by objectively obtaining and analysing evidence to determine whether the implementation of the EMP conforms with its requirements.

Environmental Management System – The part of the overall management system that includes organisational structure, planning activities, responsibilities, procedures, processes and resources for developing, implementing, achieving, reviewing and maintaining an environmental policy.

The Government – The National Government of Mozambique.

Maintenance period – A one-year period following formal acceptance by Sasol of a defined section of flowline.

Metago – Metago Environmental Engineers (Pty) Ltd (see also Environmental Consultant).

MICOA – Ministry for the Co-ordination of Environmental Affairs.

Sasol – Refers to Sasol (Pty) Ltd and all its affiliate organisations.

SSS(EM) – Senior Site Supervisor (Environmental Management).

The Works – All areas within which Sasol's and the Contractor's activities will take place, including the construction right of way, access roads, campsites, borrow pits and the like.

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- ENVIRONMENTAL MANAGEMENT PLAN - CONSTRUCTION OF THE TEMANE WELL-HEADS, FLOWLINES, ACCESS ROADS AND A CENTRAL PROCESSING FACILITY, INHAMBANE PROVINCE, MOZAMBIQUE

1. INTRODUCTION

During October 2000, Sasol Petroleum Temane Limitada (Sasol), Empresa Nacional de Hidrocarbonetos de Moçambique, E.P. (ENH), Companhia Moçambicana de Hidrocarbonetos S.A.R.L. (CMH) and the Government of Mozambique signed a Petroleum Production Agreement for the production and processing of the Temane and Pande gas fields in Inhambane Province, Mozambique. The outcome of these agreements will be the production and processing of natural gas resources and the export of the processed natural gas to Secunda in South Africa via an underground pipeline.

The key project elements are as follows:

1. Exploration activities to determine the extent of the gas reserves and optimal locations for extraction. Exploration will take place over the lifespan of the project.

2. Development of a network of production wells and gas flowlines within the Temane and Pande well-fields and the construction and operation of a central processing facility (CPF) for the cleaning and drying of the gas.

3. Transportation of the gas from Temane to Secunda and Maputo via underground transmission pipeline.

4. Upgrading and conversion of Sasol's plant infrastructure at Secunda and Sasolburg to accommodate the natural gas.

The project was structured into several components and an Environmental Impact Statement (EIS) was produced for each of the following:

1. Gas field environmental impact study for the establishment of the well fields at Temane and Pande and the central processing facility at Temane.

2. Exploration environmental impact study for all seismic and drilling activities within the Temane and Pande exploration area.

3. Mozambique pipeline environmental impact study for the proposed pipeline between the central processing facility (CPF) at Temane and the Mozambique / South Africa border crossing at Ressano Garcia.

4. South African pipeline environmental impact study for the proposed pipeline from the border crossing at Komatipoort to Sasol's production plant at Secunda.

5. Secunda plant upgrading environmental impact study to prepare for the introduction of natural gas at the plant.

6. Sasolburg plant conversion environmental impact study to prepare for the introduction of natural gas at the plant.

7. Natural gas network conversion environmental impact study for the establishment of a natural gas network in South Africa.

Environmental management for each of these project components will be governed by specific environmental management plans. **This document is relevant for *component 1* listed above (gas field EIS) and is restricted specifically to the Temane Production Block (including the CPF situated in the Block)**[1]. Subject to the necessary Government approvals the construction of the project will commence early in 2002 with commissioning scheduled to take place during the year 2003 continuing to 2004.

1.1. PURPOSE OF THE ENVIRONMENTAL MANAGEMENT PLAN

The EMP is a means for Sasol (and its project partners), contractors, the Government of Mozambique and others to reach agreement on the project's environmental performance standards. In so doing the

[1] Note that the principles and approaches set in this EMP will be applied to the environmental management of the Pande Gas Field, however issues specific to the Pande Gas Field, e.g. management of known archaeological sites, will be described separately.

risk and hence potential liability to those involved with the project can be effectively managed and environmental requirements met to the satisfaction of all concerned. The EMP aims to present management measures that will eliminate, offset or reduce adverse environmental impacts.

1.2. ENVIRONMENTAL POLICY

As the project owner, Sasol has implemented the following environmental policy that shall set the framework for environmental management for the project. All visitors, contractors and employees are required to comply with the requirements of the policy.

Sasol believes that the health and safety of human life, as well as the quality of the environment should be protected. Sasol is committed to act responsibly with regard to the effect of its operations and products on human existence and the environment. Sasol is committed to:

- Advise our partners and contractors on our health, safety and environmental strategy and program;
- As a minimum requirement, comply with all applicable health, safety and environmental legislation, Responsible Care and with all other agreed requirements;
- Ensure that impact assessments and systematic safety studies are done for all projects which pose a potential threat;
- The responsible utilisation of natural resources;
- Minimise or prevent the generation of pollutants through prudent design and the use of best economically viable technologies;
- Monitor and review the performance of our environmental management system to achieve continual improvement;
- Prominently display this Health, Safety and Environmental policy and make it available to all employees and other interested and affected parties; and
- Facilitate the sharing of best health, safety and environmental practices.

Sasol will achieve these by:

- Implementing internationally recognised safety, health, environmental and quality management systems;
- Inform and provide appropriate training to all employees and contractors as required to ensure awareness and enhance understanding on health, safety and environmental matters;
- Benchmarking internationally on best safety, health and environmental practices;

- Responding effectively to safety, health and environmental emergencies involving our operations and products;
- Appoint responsible contractors and execute conformance audits to ensure compliance; and
- Provide appropriate resources required to implement the above.

1.3. COMPONENTS OF THE ENVIRONMENTAL MANAGEMENT PLAN

This environmental management plan is one of three documents comprising the overall environmental management plan for the Temane Gas Fields and Central Processing Facility Project. In addition there is a set of specialist studies produced to assist in the preparation of the environmental management plans. The complete set of documents is as follows:

1. Design EMP	*Draft document available in EIS report[2]. Final version in preparation.*
2. Construction EMP	***This document.***
3. Commissioning, operational and decommissioning EMP	*In preparation.*
4. Specialist studies	*In preparation.*

1.4. SCOPE OF THE CONSTRUCTION EMP

The Construction EMP (this document) contains environmental[3] management requirements for all activities related to the **construction** and **installation** of the following project components within the Temane Development Block:

- Well-heads (i.e. gas extraction wells);
- Flowlines (i.e. pipelines from the well-heads to the central processing facility);

[2] Temane and Pande Gas Fields EIS. Mark Wood Consultants and Impacto. December 2001. Note that the EIS has been submitted to MICOA for evaluation and issue of a record of decision (licence) for the project.

[3] The environment is considered to include biological, physical (e.g. soils, water) and social components.

- Access roads (to the well-heads and the central processing facility);
- Central Processing Facility (CPF); and
- All related infrastructure and construction requirements for the above.

Note / limitations:

1. *Issues related to compensation, resettlement and relocation have not been addressed in this document and the reader is referred to Mr Peter Stuart-Thompson and to the procedure document: 'The Resettlement and Damages Compensation Procedure for Temane / Pande Field Development Projects and the Mozambique / Secunda Pipeline'.*

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2. *At the time of EMP compilation, the following work was still in progress for the project: soil survey of flowlines; updated groundwater study; revised air quality assessment; revised risk assessment; water pollution assessment and waste site environmental specification compilation. Although these studies were undertaken in extensive detail for the EIS[4], the decision was taken by Sasol to improve the level of detail in certain respects. As this information becomes available, this construction EMP will be updated accordingly.*

3. *The EMP does not include specifications regarding occupational health, hygiene or safety requirements. Sasol's and the Contractor's obligations in this regard are set by legislation, Sasol's requirements are specified in the Main Contract documentation.*

4. *Except where specified, this EMP has been prepared based on information provided to Metago Environmental Engineers (Pty) Ltd (environmental consultant) by Sasol and Foster Wheeler.*

[4] Temane and Pande Gas Fields EIS. Mark Wood Consultants and Impacto. December 2001.

1.5. APPROACH TO THE PREPARATION OF THE ENVIRONMENTAL MANAGEMENT PLAN

Metago Environmental Engineers (Pty) Ltd was contracted by Sasol to compile this environmental management plan (EMP). In summary, this included:

i) A review of available project information produced to date, including the draft EIS produced by Mark Wood Consultants (December 2001) on behalf of Sasol and design documentation provided by Foster Wheeler.

ii) Discussions with Sasol and the design engineers (Foster Wheeler) regarding anticipated project activities.

iii) Conducting a site inspection over a period of two days.

iv) Conducting specialist studies where necessary to close gaps identified in the EIS.

v) Compiling management requirements based on the above and professional experience.

The EMP has been developed to include:

- Mitigation / management measures required during the construction phase of the project;
- A description, where necessary, of the activities necessary to achieve the mitigation measures;
- Programming and scheduling requirements;
- Defining responsibilities, resources, communication and reporting structures; and
- Specifying performance evaluation requirements.

Note:

1. Environmental management needs for the project may change, new activities may be performed and previously identified activities modified. Environmental management must focus on continual improvement and thus wherever possible the EMP must be upgraded and improved based on changing circumstances, new techniques and improved information. The EMP represents the minimum requirements for environmental management for the project. The EMP documents the

actions, approaches and measures required to mitigate and manage environmental risk associated with the project, recording not only changes to the project itself but also the impact of external factors such as legislation, policy and public and social accountability. To make provision for these changes responsibilities have been assigned for identifying and making changes to the EMP (see 5.3, 5.4 and 11).

2. The EMP was compiled by Mr Russell Gillespie of Metago Environmental Engineers (Pty) Ltd on behalf of Sasol.

2. ENVIRONMENTAL MANAGEMENT STRUCTURE

2.1. ORGANISATIONAL STRUCTURE AND RESPONSIBILITY

The overall organisation structure for environmental management on the Temane Project will be as presented in Figure 1.

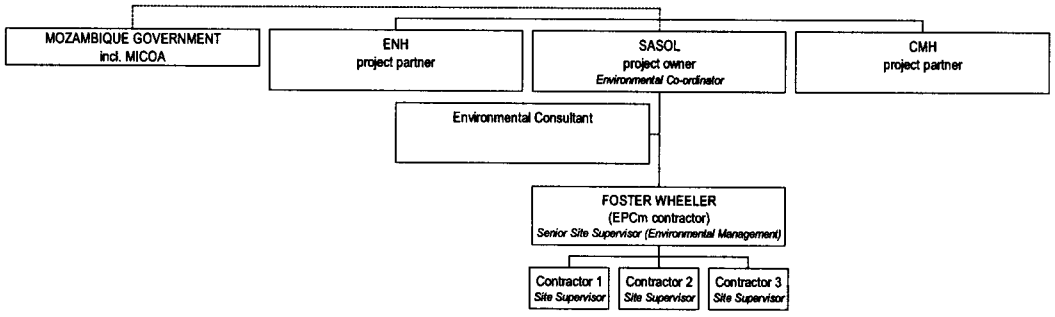

FIGURE 1. OVERALL ENVIRONMENTAL ORGANISATION STRUCTURE BETWEEN KEY ROLE PLAYERS DURING THE CONSTRUCTION PHASE OF THE PROJECT.

With regard to environmental management during the construction phase of the project, the principal responsibilities of each party within this structure will be as follows:

Sasol (encompassing ENH & CMH)	*Sasol is to manage its activities and that of its contractors in such a way that pollution is prevented, waste minimised and the rights of the environment protected.* *Sasol will appoint an Environmental Co-ordinator for the project. The Co-ordinator will liase with any consultants as necessary. The Co-ordinator will update the EMP based on requirements of the works, the Government or internal Sasol requirements. The Co-ordinator will be based at Sasol Head Office.* *The final decision on all environmental matters relating to the works will remain with Sasol.* *Sasol will initiate, co-ordinate and manage all communication with the Government (local, provincial and national), except where specified otherwise in*

	contract documentation.
EPCm Contractor (Foster Wheeler)	*The EPCm Contractor will provide a method statement to Sasol to specify how the requirements of the EMP will be met. The contents of the method statement should include all requirements as specified in the EMP.* *The EPCm Contractor, as managing contractor, will be responsible for non-compliance with the EMP not only with regard to its activities but also those of other Contractors.* *The EPCm Contractor shall comply with all the requirements of the EIA and EMP and shall, in accordance with accepted standards of the international petroleum industry and the World Bank, employ such up to date techniques, practices and methods of construction that will ensure compliance with this standard and, in general, minimise environmental damage, control waste, avoid pollution, prevent loss or damage to natural resources and minimise effects on surrounding landowners, occupants and the general public.* *The EPCm Contractor shall prevent or minimise the occurrence of accidents which may cause damage to the environment, prevent or minimise the effects of such accidents and shall return the environment to a state as close to the condition existing prior to any such accident as possible.* *The EPCm Contractor shall take proactive steps to ensure that the standards in the EMP are met during all phases of construction. These shall include, but not be limited to, the following:* o *Employment of competent and dedicated members of staff to oversee the implementation of the EMP. Any replacement of staff responsible for the environmental management of the contract shall be subject to Sasol's approval.* o *Active participation of such staff in the planning, construction and rehabilitation of the works.* o *Instruction of staff about the relevant environmental sensitivities and the specific measures that each employee will implement to meet the environmental protection and management standards defined by the EMP.* *The EPCm Contractor will appoint, with the approval of Sasol, a full-time Senior Site Supervisor for Environmental Management (SSS(EM)). This person will liase closely with the environmental supervisors of all appointed contractors and with the Sasol Environmental Co-ordinator. The Senior Site Supervisor (Environmental Management) will be based on site. The SSS(EM) will ensure compliance with the requirements of the EMP by Contractors (including the EPCm Contractor), as well as with any other requirements related to environmental issues as they become known. Specific responsibilities of the SSS(EM) will be as follows:* o *Ensure the protection of the environment.* o *Perform all of the day-to-day tasks necessary to monitor the performance of the Contractor(s) with regard to the requirements of the EMP.* o *To thoroughly familiarise him/herself with existing information regarding the project area and the EMP.* o *To liase with the Sasol Environmental Co-ordinator in the case of incidents, non-compliance or any matter where the course of action is unclear.* o *Verify the accuracy of the information contained in the EMP and to bring any errors, omissions, oversights to the attention of Contractors and Sasol as necessary.* o *In consultation with Sasol's Environmental Co-ordinator guide all aspects of the rehabilitation process.*

	The Senior Site Supervisor (Environmental Management) will act as a guide and advisor to Contractors on environmental issues during the construction phase of the project. This will be achieved by ongoing inspections / auditing of the project, identification of problem areas and provision of actions plans to avoid environmental damage. *The SSS(EM) should have experience in environmental management and will be required to be able to evaluate the effectiveness of specified management measures and be familiar with environmental management techniques. He / she should be able to propose solutions to problems identified as regards the implementation of the plans.*
Contractors	*The Contractor(s) will provide a method statement to Sasol to specify how the requirements of the EMP will be met. The contents of the method statement should include all requirements as specified in the EMP.* *Each Contractor will appoint a site supervisor who will be based on site. This person will be responsible for ensuring that the requirements of the EMP are met. The person should have experience in environmental management and will be required to be able to evaluate the effectiveness of specified management measures and be familiar with environmental management techniques. He / she should be able to propose solutions to problems identified as regards the implementation of the plans.* *The Contractor shall take proactive steps to ensure that the standards in the EMP are met during all phases of construction. These shall include, but not be limited to, the following:* o *Employment of competent and dedicated members of staff to oversee the implementation of the EMP. All employments and replacements of staff responsible for the environmental management of the contract shall be subject to the EPCm Contractor's and Sasol's approval.* o *Active participation of such staff in the planning, construction and rehabilitation of the works.* o *Instruction of staff about the relevant environmental sensitivities and the specific measures that each employee will implement to meet the environmental protection and management standards defined by the EMP.*
Environmental Consultant	*Sasol / the EPCm Contractor shall employ the services of an Environmental Consultant as and when required to ensure compliance to the requirements of the EMP. The Environmental Consultant shall be an independent expert, to assist in the monitoring of the impact of the project on the environment and to audit compliance with the project standard (i.e. the EMP content). The environmental consultant may call on other independent experts in the course of his/her duties. The environmental consultant shall report directly to Sasol. Responsibilities of the Environmental Consultant shall be set by Sasol / the EPCm Contractor and may include the following:* o *Monitor the impact of the project on the environment with particular emphasis on areas of environmental sensitivity.* o *Audit compliance by the contractor(s) with this environmental standard.* o *Call on specialist sub-consultants, as required for input, advise and to verify the effectiveness of impact management.* o *Prepare environmental audit reports documenting the effectiveness of environmental management, problem areas, remedial actions proposed and taken and compliance/non-compliance by the Contractor(s) with the project standard.*

The onus is on the responsible party to demonstrate compliance to the requirements of the EMP.

2.2. LIAISON, CO-ORDINATION AND REPORTING

The structure for all communication, correspondence and reporting between project stakeholders will be as per the overall project organisational structure as presented in Figure 1. *Note: All communication with the Mozambique Government regarding environmental management matters will be via Sasol.* Specific requirements regarding communication between project stakeholders are presented in 3.4.

2.3. ENVIRONMENTAL MANAGEMENT SYSTEM

There are three main tools for the environmental management of projects:

- The Environmental Impact Assessment (EIA);
- The Environmental Management Plan (EMP); and
- The Environmental Management System (EMS).

The links between these three important tools are illustrated graphically in Figure 2.

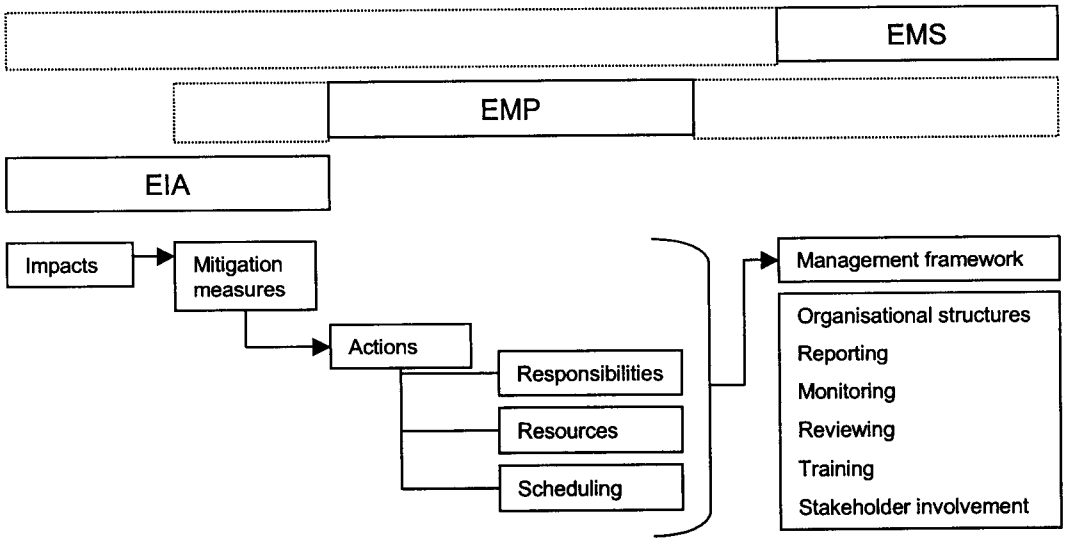

FIGURE 2. THE LINKS BETWEEN THREE IMPORTANT ENVIRONMENTAL MANAGEMENT TOOLS, THE ENVIRONMENTAL IMPACT ASSESSMENT (EIA), THE ENVIRONMENTAL MANAGEMENT PLAN (EMP) AND THE ENVIRONMENTAL MANAGEMENT SYSTEM (EMS). THE DOTTED LINE BLOCKS INDICATE THE FULL SET OF COMPONENTS FOR EACH TOOL.

The EMP is intended to guide impact management and mitigation associated with the project. It converts EIA mitigation measures into actions and allocates responsibility and deadlines to those actions. The EMS confirms management commitment to the EMP and describes how the requirements of the EMP will be achieved. It sets the management framework in terms of environmental organisational structure, reporting, review and monitoring, training and public disclosure. While this EMP has specified requirements in this regard, it is the responsibility of Sasol and its Contractors to ensure that a suitable management system is implemented to ensure compliance (and be able to demonstrate compliance) with to the EMP.

Prior to commencing work on the project Contractors will provide a method statement for ensuring continued compliance with the requirements of this EMP. Note that while Sasol may comment on any inadequacies in these plans, the responsibility for non-compliance with the standards in the EMP lies solely with the Contractor.

3. ACTIVITY AND IMPACT MANAGEMENT PLAN

This section presents specific environmental management requirements for the construction phase of the Temane Gas Fields and Central Processing Facility Project.

3.1. BACKGROUND TO ENVIRONMENTAL IMPACT MITIGATION AND MANAGEMENT

For environmental management to be effective the primary focus of this management must be placed on managing activities so as to prevent or minimise the occurrence of impacts. Environmental management measures can be varied and the measures themselves can have a variety of objectives, however the first priority is always to **prevent adverse impacts**, thereafter management measures with other objectives should be considered. The various objectives for management measures should be remembered when using this Environmental Management Plan (Table 1).

TABLE 1. OBJECTIVES OF MITIGATION MEASURES FOR ADVERSE ENVIRONMENTAL IMPACTS. FIRST PRIORITY IS AVOIDANCE OF NEGATIVE IMPACTS; THE OBJECTIVES ARE LISTED IN DECREASING ORDER OF PRIORITY.

Avoidance	• Avoiding activities that could result in adverse impacts. • Avoiding resources or areas considered as sensitive.
Prevention	• Preventing the occurrence of negative environmental impacts and / or preventing such an occurrence having negative environmental impacts.
Preservation	• Preventing any future actions that might adversely affect an environmental resource. Typically achieved by extending legal protection to selected resources beyond the immediate needs of the project.
Minimisation	• Limiting or reducing the degree, extent, magnitude or duration of adverse impacts. This can be achieved by scaling down, relocating, redesigning elements of a project.
Rehabilitation	• Repairing or enhancing affected resources, such as natural habitats or water sources, particularly when previous development has resulted in significant resource degradation.
Restoration	• Restoring affected resources to an earlier (and possibly more stable and productive) state, typically 'background / pristine' condition.
Compensation	• Creation, enhancement or protection of the same type of resource at another suitable and acceptable location, compensating for lost resources.

Ref: The World Bank. Environment Department. January 1999. Environmental Management Plans. Environmental Sourcebook Update. Number 25.

The management requirements presented in this section have been compiled in approximate order of construction activities. While specifications have been listed under activities, the requirements are not necessarily mutually exclusive to the activity under which the specification or requirement is listed. Should any specification be applicable to any other activity, listed or otherwise, the intent remains and compliance is non-negotiable.

Table 2 summarises the activities, sub-categories, page and specification references for the activity and impact management measures specified in this section.

TABLE 2. REGISTER OF ACTIVITY CATEGORY AND SUB-CATEGORIES INCLUDED IN THE ACTIVITY MANAGEMENT PROGRAMME.

Activity category	Activity sub-categories	Page reference	Specification reference
Administration and general issues	Release of contracts Compliance to legislation Working period and work hours Quality management Personnel management Dust generation Noise management Disturbance of archaeological sites / collecting specimens or artefacts Collecting or harvesting fruits, vegetables, grains and any other plant material Hunting / harassing wild animals – including fishing House-keeping Sex worker management Management of expectations	17	3.2
Employment and labour management	Employment Employee supervision Health management	20	3.3
Community, stakeholder and government liaison	General Communication / liaison Access to property Reporting	21	3.4
Site and camp establishment and management	Camp establishment Camp site access Camp site management – general Effluent management (incl. release of laundry, kitchen and other wash water, incl. shower water Waste management Fires Closure and rehabilitation Camp demobilisation	24	3.5
Mosquito / vector control	Mosquito control Pesticide management	26	3.6
Fire prevention and management	Fire prevention and management	27	3.7
Access control	Access to CPF site Access to well-heads Access to flowlines Access to roads	28	3.8
Demining	General Access to demining areas Access to CPF site Access to flowlines and access roads Equipment use	28	3.9

Activity category	Activity sub-categories	Page reference	Specification reference
	Clearance of vegetation from CPF site Demining of flowlines		
Site preparation	Equipment use Topsoil stripping and stockpiling	30	3.10
Provision of utilities	Sewage management Electricity Water provision	31	3.11
Water and effluent management	Obstruction of water flow Effluent management Stormwater management Flood management	32	3.12
Waste management	General Waste generation Waste storage and transport – general Waste disposal Development and operation of waste disposal sites Landfill construction Storage and handling of hazardous waste Disposal of hazardous waste Hydrocarbon spill (incl. oil, fuel, diesel, lubricants etc.) Disposal of medical waste	33	3.13
Materials management	General Spill management Materials classification Storage facilities Refuelling	37	3.14
Logistics management	Vehicle and machinery movement	39	3.15
Well-head site preparation and management	Location Site preparation Site preparation – grading and levelling Access to well-heads Revegetation of old well-head sites	39	3.16
Flowline installation and testing	General Routing Access Blasting Excavations / trenching Backfilling Aquatic crossings – Govuro River Aquatic crossings – wetlands, drainage lines, pans, etc. Reinstatement Rehabilitation Hydro-testing / pipeline testing	41	3.17
Civils	Sourcing of construction materials	53	3.18

Activity category	Activity sub-categories	Page reference	Specification reference
	Sand washing Batching plant Lighting of site		
Steelwork	Welding	53	3.19
Mechanical	Pressure testing Pipe cleaning	54	3.20
Vehicle and machinery maintenance (and refuelling)	Vehicle maintenance Vehicle washing Refuelling	54	3.21
Borrow pit and quarry development	General Blasting Borrow pit development and closure Dust management (quarries and borrow pits)	55	3.22
Road construction	General Blasting Borrow pit development Aquatic crossings Drainage Rehabilitation	56	3.23
Landscaping and painting	Landscaping Painting (update)	58	3.24
Land use controls	Access along flowline routes and access roads	59	3.25

3.2. ADMINISTRATION AND GENERAL ISSUES

Ref.	Activity	Objective	Requirements / specifications	Responsibility	Scheduling	Performance Indicator(s) [5]	Training Requirements [6]
3.2.1.	**Release of contracts**	Avoidance Prevention Preservation Minimisation Rehabilitation Restoration	This EMP will be included as part of tender documentation and form part of all contracts. Should a contract already have been awarded, the EMP requirements will be included as a change / variation order to contract.	***Sasol*** ***Foster Wheeler***	At the time of release of requests for quotation. In the case of an EMP not having been included as part of a contract.	Inclusion of EMP as part of all contracts and orders.	Contractor training on EMP requirements.
3.2.2.	**Compliance to legislation**	Avoidance Prevention	In all cases, the requirements of Mozambican (and other where relevant) legislation will be met. Should this not be possible for any reason, Sasol shall be immediately notified of any breach, or pending breach. This notification must be accompanied by full details of the contravention or pending contravention and must be accompanied by a corrective action plan.	**Sasol** **Foster Wheeler** **All Contractors**	At all times.	Audit findings. Absence of legal warnings / prosecutions.	Contractor training on relevant legal requirements.
3.2.3.	**Working period and work hours**	Avoidance and prevention of noise disturbances	All construction work shall be restricted to between the hours of 06h00 and 18h00 unless otherwise approved by Sasol following consultation with affected communities.	**Foster Wheeler**	At all times.	Audit findings. Absence of complaints in this regard.	None.
3.2.4.	**Quality management**	Avoidance Prevention Preservation Minimisation	Development of an environmental management system for the project which shall be compliant with the requirements of ISO 14001 and shall include, but not be limited to: o A description of responsibilities, lines of communication and qualifications of staff responsible for environmental management on the project and the implementation of the EMP. o Detailed plans and method statements for the elements of construction for which such information is required for the EMP. o Details of incident and non-conformance identification and management. o Details of performance assessment and review regarding the EMP.	**Sasol** **Foster Wheeler** **All Contractors**	Prior to site establishment.	Audit findings.	Training on EMP requirements.

[5] Performance indicators are only specified where there may be additional requirements to the verification that the requirement / specification has been met. Additional monitoring requirements are specified under 5. Note that number of incidents, audit findings etc. shall also be used as indicators of performance.

[6] Training will be specified only where it is not clear as a requirement elsewhere in the EMP, e.g. it is clear that Contractors will be required to ensure the necessary training of all employees to avoid environmental impacts and ensure their awareness of the requirements of the EMP.

Ref.	Activity	Objective	Requirements / specifications	Responsibility	Scheduling	Performance indicator(s)[5]	Training Requirements[6]
3.2.5.	**Personnel management**	Avoidance Prevention Preservation Minimisation	A site and project specific code of conduct for all employees must be drafted prior to commencement of construction. Issues that should be addressed include, but are not restricted to: • Possession of firearms. • Use of alcohol on duty. • Use / possession of drugs. • Poaching of animals / collection of plant life. • Respect for the rights of local communities / inhabitants.	**Foster Wheeler**	Prior to employment	Implementation of code of conduct.	Employees to be provided with and briefed on code of conduct.
3.2.6.		Avoidance of impacts associated with smoking, including personnel discomfort and fire risks.	Smoking is only permitted outside and in designated areas (subject to normal safety precautions as regards flammable materials).	**Sasol** **Foster Wheeler** **All Contractors**	At all times.	As per requirement.	None.
3.2.7.	**Dust generation**	Minimisation	Dust shall be controlled to ensure no detrimental effect to landowners, occupants, employees or the general public. Measures may include dust suppression using water spray and surface binding using 'environmentally friendly' products. A baseline dust quantification for the project area to be available prior to the start of construction. If instructed to do so, the contractor will demonstrate compliance with internationally accepted air quality standards by means of measurement of dust levels at receiver points specified by Sasol. Measurements shall be in accordance with international standards.	**Foster Wheeler**	As required.	Lack of complaints by communities or employees. A baseline dust quantification for the project area to be available prior to the start of construction.	None.
3.2.8.	**Noise management**	Minimisation	Noise levels shall be controlled to ensure no detrimental effect to landowners, occupants, employees or the general public. All vehicles and equipment must be maintained regularly to prevent excessive emissions and noise. Silencers and noise control devices should be used where required. A baseline noise quantification for the project area to be available prior to the start of construction. If instructed to do so, the contractor will demonstrate compliance with internationally accepted noise standards by means of measurement of residual noise levels at receiver points specified by Sasol. Measurements shall be in accordance with international standards.	**Foster Wheeler**	As required.	Lack of complaints by communities or employees. A baseline noise quantification for the project area to be available prior to the start of construction.	None.
3.2.9.	**Disturbance of archaeological sites / collecting specimens or artefacts**	Prevention	PROHIBITED UNDER ALL CIRCUMSTANCES.	**Foster Wheeler**	At all times.	As per requirement. Inclusion in training / induction programme(s).	Training of employees on EMP requirements.

Ref.	Activity	Objective	Requirements / specifications	Responsibility	Scheduling	Performance indicator(s)	Training Requirements
3.2.10.	**Collecting or harvesting fruits, vegetables, grains and any other plant material**	Prevention	All employees must be actively discouraged from collecting or harvesting fruits, vegetables, grains and any other plant material. The harvesting or collection of such material shall be prohibited within the boundaries, or in the near vicinity of the CPF, any campsite, well-head or flowline.	**Foster Wheeler**	At all times.	As per requirement. Inclusion in training / induction programme(s).	Training of employees on EMP requirements.
3.2.11.	**Hunting / harassing wild animals – including fishing**	Prevention	At no stage may any employee hunt animals for food or sport purposes, except with the written permission of the SSS(EM).	**Foster Wheeler**	At all times.	As per requirement. Inclusion in training / induction programme(s).	Training of employees on EMP requirements.
3.2.12.	**House-keeping**	Avoidance Preservation	At all times the works will be maintained in tidy order. No littering will be permitted.	**Foster Wheeler** **All Contractors**	At all times	Absence of litter on site.	Training of employees on EMP requirements.
3.2.13.	**Sex worker management**	Prevention Minimisation Prevention	The presence of sex-workers inside the CPF or campsites is prohibited. The presence of sex-workers outside of the CPF and campsite must be actively discouraged. Condoms must be distributed free of charge to employees and should be readily available.	**Foster Wheeler** **Foster Wheeler** **Foster Wheeler**	At all times.	Absence of sex workers on site. Visual observations Availability of condoms.	HIV / Aids and STD awareness education for employees.
3.2.14.	**Management of expectations**	Minimisation / avoidance of unrealistic expectations.	Community leaders and residents may have expectations that Sasol will play a supporting and developmental role within the area and that the project will have other positive economic benefits. In order to maintain realistic expectations, close communication shall be maintained between local communities and the already established communication task team (CTT) with the objective of clarifying the limitations to Sasol's involvement in the development of the community.	**Sasol**	Ongoing.	Minutes of meetings and correspondence indicating the activity of the CTT.	None.

3.3. EMPLOYMENT AND LABOUR MANAGEMENT

Ref.	Activity	Objective	Requirements / specifications	Responsibility	Scheduling	Performance Indicator(s)	Training Requirements
3.3.1.	**Employment**	Avoid conflict situations	The employment of workers will be a transparent process that is undertaken by the Contractors appointed for the project.	**All Contractors**	Ongoing	Documented and implemented employment procedure	None.
3.3.2.		Avoid conflict situations	Contractors will be responsible for all negotiations regarding employment and other project related issues.	**All Contractors**	Ongoing.	As per requirement.	None.
3.3.3.		Avoidance of conflict situations Legal compliance	Employment will be undertaken and managed according to Mozambican labour law and an approved labour agreement between Sasol and the Mozambican Government (available from Sasol on request) and following liaison with local authorities and communities. In particular the following should be addressed: o The employment of local Mozambican employees is a crucial success factor for the project and therefore local labour should be utilised as far as possible. This should further be complimented with applicable skills training and recording thereof. o All recruitment for the project will take place through a recruitment office in Vilankulos. This recruitment office is to be set up and run by Contractor(s). o Candidates for employment shall be registered with the recruitment office from where recruitment shall take place. No recruiting will take place at the CPF site. o No fees will be levied for recruitment or admission to employment.	**Sasol** **All Contractors**	Ongoing	Minutes of liaison with authorities / communities. Established recruitments office. Register of job-seekers.	None.
3.3.4.		Positive local economic benefit Regional upliftment	Where possible, priority will be given to employ workers within the districts and locality where the proposed activities are taking place. Where possible the appointment of women is to be encouraged.	**Sasol** **All Contractors**	Ongoing.	Percentage of employees from local area. Percentage of women employees.	None.
3.3.5.		Positive local economic benefit Regional upliftment	The EPCm Contractor will prepare and submit a local content plan to Sasol for approval. All contractors will be expected to abide by this plan.	**Sasol** **All Contractors**	Plan to be submitted prior to award of contracts. Compliance to plan ongoing.	Prepared and implemented plan. Percentage of work awarded to locals.	None.
3.3.6.		Legal compliance	The employer will ensure that agreements undertaken with employees (including disciplinary criteria, working conditions, payment of over-time etc.) are in line with the Labour Agreement between Sasol and the Government of Mozambique and are properly understood by all employees.	**Sasol** **All Contractors**	At all times.	As per requirement.	None.

Ref.	Activity	Objective	Requirements / specifications	Responsibility	Scheduling	Performance indicator(s)	Training Requirements
3.3.7.		Avoidance of conflict	In order to maintain a transparent labour recruitment process, the information concerning procedures and work requirements will be disseminated through channels used by local authorities and grass roots community organisations.	**Sasol**	Ongoing	Records of communication.	None.
3.3.8	**Employee supervision**	Prevention Avoidance	Contractors must ensure proper supervision of employees at all times, including after hours where employees are resident on site.	**All Contractors**	At all times	Compliance to EMP requirements. Audit findings.	None.
3.3.9		Prevention of unnecessary disturbance	No person or persons shall make recreational use of all-terrain vehicles or motorcycles without the approval of the SSS(EM).	**Sasol** **All Contractors**	At all times.	No evidence of recreational use of off-road vehicles.	Training of employees on EMP requirements.
3.3.10	**Health management**	Minimisation	Prepare and implement a programme and procedure(s) to minimise the spread of HIV infection. The programme shall be prepared with the assistance of a specialist in the field. A typical programme would include, among other things, the implementation of the following measures: o An HIV/Aids training course and on-going education on transmission of HIV/Aids and STDs to employees, through workshops, posters and informal information sessions; o Encouragement of employees to determine their HIV status; o Supply of condoms at the construction site(s); o Development of a comprehensive construction camp management plan, including rules for onsite behaviour, entrance and exit policies and prohibition of sex workers on site.	**Foster Wheeler**	Before site establishment.	Implementation of procedures and programmes.	Training of employees on procedure and programme requirements.

3.4. COMMUNITY, STAKEHOLDER AND GOVERNMENT LIAISON

A key management principle during the construction phase of the project shall be that of ensuring that the rights of the inhabitants are not infringed and that all operations are conducted in a manner that is respectful to the local residents and the land and resources that belong to them.

The project area is characterised by the following socio-economic conditions, which shall at all times be taken into consideration:

- Subsistence living;
- Extreme poverty;

- Strong dependence on local natural resources;
- Lack of health and education facilities, access roads; and
- Very limited employment opportunities.

Ref.	Activity	Objective	Requirements / specifications	Responsibility	Scheduling	Performance indicator(s)	Training Requirements
3.4.1	**General**	Avoidance Prevention Preservation Minimisation	Access over land, the integrity of fences, control of bush fires, littering, dust control, noise abatement, harassment of domestic and wild animals, sedimentation and contamination of ground and surface waters, damage to landscape and vegetation and all such environmental matters, shall be controlled in the best interests of the land owner / occupier and the general public.	**All Contractors** **Sasol**	At all times.	Record of communication / complaints.	Training of employees on EMP requirements.
3.4.2	**Communication / liaison**						
3.4.3	Sasol shall employ a Communication Task Team (CTT) that is actively involved in the project area. The team shall liase with the local communities and authorities regarding the activities and presence of Sasol in the project area, including: o The proposed project goals and activities in the area; o The long-term activities and their expected environmental impacts; o How these activities will be conducted to ensure environmental protection; o Employment requirements and the employment policy; and o Contact details should the residents have questions, concerns or complaints. This team is an important source of information for the EPCm Contractor that will take responsibility for the day-to-day communication with affected communities and for the employment of local labour.						
3.4.4		Minimisation	Close liaison must exist between the Sasol Communication Task Team (CTT) and Contractors as regards the scheduling of activities. The CTT must consult with local communities ahead of any activity that may affect these communities in any way. Thus it is the duty of the EPCm Contractor to timeously notify the CTT of all scheduled activities. The requirements of the local communities must be heard, in some cases local communities may require a ceremony prior to work taking place in an area. Should this be requested the CTT will advise the EPCm Contractor timeously.	**Foster Wheeler** **Sasol**	Ongoing	Minutes and correspondence related to the activities of the CTT. Up-to-date programme of activities.	None.
3.4.5		Minimisation	The EPCm contractor shall produce a procedure for approval by Sasol, that defines, but is not limited to, the following: o Locations at which community members can raise issues / complaints; o Means by which community members can raise issues / complaints; o How the community will be notified of the opportunity and means for communication with regard to project issues; and o How these complaints / issues will be captured, handled, responded to and rectified as necessary.	**Foster Wheeler**	Procedure to be produced prior to the commencement of any construction activity.	Comments and complaints register.	None.

Ref.	Activity	Objective	Requirements / specifications	Responsibility	Scheduling	Performance indicator(s)	Training Requirements
			The EPCm Contractor must keep and maintain a comments and complaints register. This register must be available for periodic review by Sasol. The register should include, but not be limited to: o The name of the complainant / communicator; o Contact details of the communicator; o Nature of the communication; and o Any action taken to rectify the issue.				
3.4.6	**Access to property**	Avoidance of claims, conflict etc.	The property and rights of all persons must be respected at all times.	**Foster Wheeler**	At all times.	As per requirement.	Training of employees on EMP requirements.
3.4.7		Prevention	Access by Sasol, Contractors and their employees to homesteads and associated lands outside of the construction right of way shall be prohibited.	**All Contractors**	At all times.	As per requirement.	Training of employees on EMP requirements.
3.4.8	**Reporting**	Development of sound relationships with stakeholders	Sasol shall report on environmental performance for the project as part of its annual environmental reporting.	**Sasol**	In the annual report.	Content of annual report.	None.
3.4.9		Development of sound relationships with stakeholders	Consider placing articles related to the project and environmental performance in the local and even national media.	**Sasol**	Quarterly.	Record of articles.	None.
3.4.10		Development of sound relationships with stakeholders	Sasol shall report on project-related environmental matters at Project Liaison Committee meetings.	**Sasol**	Monthly.	Minutes of meetings.	None.

3.5. SITE AND CAMP ESTABLISHMENT AND MANAGEMENT

Ref.	Activity	Objective	Requirements / specifications	Responsibility	Scheduling	Performance indicator(s)	Training Requirements
3.5.1.	**Camp establishment**	Prevention Minimisation Preservation	The campsite of the demining and site preparation contractors will be sited adjacent to the Temane 3 well-head site. The campsite area has already been cleared (see Figure 3) and no further clearance surrounding the cleared area shall be permitted. FIGURE 3. AERIAL PHOTOGRAPH OF CAMPSITE ADJACENT TO WELL-HEAD SITE T3	**All Contractors**	At all times.	Absence of further clearance.	None.
3.5.2		Minimise influx of workers from outside areas.	With the exception of 3.5.1 all construction camps shall be located within the CPF site.	**Foster Wheeler**	At all times.	All camps sited within CPF boundary.	None.
3.5.3		Prevention	The siting of construction camps, workshops, maintenance and refuelling sites and materials storage areas should not be in the vicinity of sensitive sites, e.g. areas of periodic waterlogging (at any point in time), drainage lines and areas of extensive animal habitation and should be sited in existing areas of disturbance wherever possible. No camp shall be located in any area of pristine vegetation, nor within 100m of any watercourse, nor in any area that could cause nuisance or safety hazards to surrounding landowners, inhabitants or the general public.	**Foster Wheeler**	At all times.	Layout plan of camps, workshops etc. in relation to sensitive sites.	None.

Ref.	Activity	Objective	Requirements / specifications	Responsibility	Scheduling	Performance indicator(s)	Training Requirements
3.5.4		Prevention Minimisation	Prior to the commencement of construction, documentation shall be prepared for each proposed campsite and should include, but not be limited to, details of: o Site layout; o Topsoil management; o Cuts and fills; o Sewage treatment; o Solid waste management and disposal; o Erosion control; o Fencing; o Litter management; o Provision for vehicle and plant servicing; o Management of hazardous materials; o Water supply; o Management of bush fire risk; o Rehabilitation and closure. The documentation shall be submitted to Sasol as part of the Contractor's method statement prior to establishment on site.	**All Contractors**	Prior to campsite establishment.	Submission, approval and implementation of campsite management plan.	None.
3.5.5		Prevention	The contractor shall comply with all relevant laws and regulations concerning water provision, sanitation, wastewater discharge and solid waste disposal.	**All Contractors**	At all times.	Audit findings.	Contractor training on relevant requirements.
3.5.6	**Camp site access**	Preservation	Access to all campsites shall only be along existing access routes. New route development is prohibited.	**All Contractors**	At all times.	Absence of new track development.	Employee training on EMP requirements.
3.5.7		Preservation	The access route to the north of the campsite adjacent to well-head Temane 3 shall be closed to prevent access (see Figure 3).	**Foster Wheeler**	Immediately.	Single access point only to campsite.	None.
3.5.8		Avoidance	Campsites will be fenced and access to campsites restricted to campsite residents.	**All Contractors**	At all times.	Fenced sites. Controlled access to sites.	None.
3.5.9	**Camp site management – general**	Prevention	All storage, refuelling, maintenance and other such facilities shall comply with the requirements of Sections 3.14, 3.15 and 3.21.	**All Contractors**	At all times.	See Sections 3.14, 3.15 and 3.21.	Training on EMP requirements.
3.5.10		Minimisation	The contractor shall keep construction campsites clean and tidy at all times. All campsites will be kept free of litter throughout the duration of the project.	**All Contractors**	At all times.	Absence of litter, rubbish, material in inappropriate locations.	None.

Ref.	Activity	Objective	Requirements / specifications	Responsibility	Scheduling	Performance indicator(s)	Training Requirements
3.5.11	**Effluent management (incl. release of laundry, kitchen and other wash water, incl. shower water**	Prevention Avoidance Minimisation	A method statement indicating the management off effluent from the site(s) will be prepared and submitted to Sasol. This statement will specify: o How effluent will be stored prior to treatment; o How the effluent will be treated to meet project water quality standards; o Measures to ensure that there will be no release of polluted runoff from the site. o Measures to prevent erosion at any discharge point.	**All Contractors**	Prior to site establishment.	Submission, approval of statement and implementation of accepted methods.	None.
3.5.12	**Waste management**	Prevention Minimisation	Waste management should be as per the requirements of Section 3.13. No permanent waste disposal site shall be permitted at a camp site.	**Foster Wheeler** **All Contractors**	At all times.	See Section 3.13. Absence of waste site at camp(s).	None.
3.5.13	**Fires**	Prevention	Specific measures must be taken to prevent the spread of bush fires caused by activities at campsites. Measures may include the appropriate instruction of employees concerning fire risks and the construction of firebreaks around the site perimeter.	**Foster Wheeler** **All Contractors**	At all times.	Demonstrable fire protection measures.	Education of employees.
3.5.14	**Closure and rehabilitation**	Prevention Rehabilitation Restoration	Once construction is completed, all redundant infrastructure, waste and construction materials should be removed from site by the contractor and disposed off as per the requirements of 3.13.	**All Contractors**	At completion of construction, prior to demobilisation and/or commissioning.	Clean site.	None.
3.5.15		Rehabilitation	Disturbed camp site areas that are to remain free of infrastructure should be rehabilitated to a state comparable to the surrounding vegetation. A rehabilitation and closure plan must be submitted to Sasol for approval. Areas compacted by vehicles during construction may have to be scarified / ripped to allow penetration of plants roots and the regrowth of natural vegetation. Stockpiled topsoil should be used as the final cover for all disturbed areas where revegetation is required. In addition the requirements of 3.10 shall apply.	**All Contractors**	Prior to demobilisation.	Sign off of site by SSS(EM).	None.
3.5.16	**Camp demobilisation**	Restoration	All campsites will be free of refuse / litter at the time of demobilisation.	**All Contractors**	At demobilisation.	Absence of litter / refuse on site.	None.
3.5.17		Prevention Avoidance	The Sasol Environmental Co-ordinator will sign off the campsite prior to acceptance of demobilisation by the EPCm Contractor (see also Table 4).	**SSS(EM)** **All Contractors**	Prior to demobilisation.	Sign off documentation.	None.

3.6. MOSQUITO / VECTOR CONTROL

	Activity	Objective	Requirements / specifications	Responsibility	Scheduling	Performance indicator(s)	Training Requirements
3.6.1	**Mosquito control**	Minimisation	Prepare and implement a programme to minimise malarial incidence among employees. A	**Foster Wheeler**	Prior to the commencement of	Availability and implementation of	Training of employees with regard to malaria risk

Ref.	Activity	Objective	Requirements / Specifications	Responsibility	Scheduling	Performance Indicator(s)	Training Requirements
			programme shall be prepared with the assistance of a person(s) experienced in vector control. A typical programme would include, but not be restricted to: o Measures to control the breeding of mosquitoes at construction sites; o Measures to prevent employees from contracting the disease, including education with respect to malarial prevention and the installation of protective measures in sleeping and eating areas; o Measures to determine and effectively treat malarial infection as quickly as possible after the contraction of the disease.		construction activity.	programme.	and preventative measures.
3.6.2	**Pesticide management**	Prevention Avoidance	Should pesticides be used they will be selected so as to avoid any negative effects on non-target organisms.	**Foster Wheeler**	At all times.	Documentation concerning 'safety' of chemicals used.	None.
3.6.3		Prevention	The disposal of waste pesticide and pesticide containers will be as per the requirements of 3.13.	**Foster Wheeler**	At all times.	Records of disposal.	Training of employees responsible for disposal.

3.7. FIRE PREVENTION AND MANAGEMENT

Ref.	Activity	Objective	Requirements / Specifications	Responsibility	Scheduling	Performance Indicator(s)	Training Requirements
3.7.1	**Fire prevention and management**	Prevention	All necessary precautions will be taken to prevent the ignition of bush fires caused either deliberately or accidentally, including education.	**Foster Wheeler**	At all times.	Demonstrable prevention measures.	Training as required.
3.7.2		Prevention Minimisation	A fire prevention and fire emergency management plan shall be prepared and submitted as part of the method statement to be submitted to Sasol prior to establishment on site. The plan shall include, but not be limited to, the following: o Sources of fire risk; o Measures to comply with any requirements of local authority fire departments; o Measures to minimise the risk of accidental bush fires caused by any activity related to the works; o Measures to control an accidental bush fire.	**Foster Wheeler**	Prior to commencement of construction activities.	Availability and implementation of plan.	Training of employees on requirements of plan.
3.7.3		Prevention	Adequate fire fighting equipment must be provided at specified localities on the work site. This equipment shall include, but not be limited to, fire extinguishers, fire resistant clothing for fire fighters and fire fighting flails.	**Foster Wheeler**	At all times.	Availability of fire fighting equipment.	Training on use of equipment.
3.7.4		Prevention	Should any burning of vegetation be required (subject to other requirements as specified in this EMP) this shall only be done at times when there is no wind and appropriate fire fighting equipment shall be immediately available.	**Foster Wheeler** **All Contractors**	Burning of vegetation.	As per requirement.	None.

3.8. ACCESS CONTROL

Ref.	Activity	Objective	Requirements / specifications	Responsibility	Scheduling	Performance indicator(s)	Training Requirements
3.8.1	**Access to CPF site**	Minimisation	Access to the CPF site shall be restricted to Sasol employees and the employees of any of its contractors. The CPF site shall be fenced.	**Foster Wheeler**	At all times.	Site access control measures.	None.
3.8.2	**Access to well-heads**	Minimisation	Access to well-heads shall be restricted to Sasol employees and the employees of contractors working at the well-heads.	**Foster Wheeler**	At all times.	Site access control measures.	None.
3.8.3	**Access to flowlines**	Minimisation	Access to flowline excavations and trenches during construction should be restricted as far as possible to avoid any accidents. Following the laying of the pipeline and backfilling, access will not be restricted.	**Foster Wheeler**	At all times	Control measures to avoid / prevent accidents at trenches.	None.
3.8.4	**Access to roads**	Minimisation	Access along any roads leading to well-heads or the CPF shall, in general, not be restricted except as necessary to allow for construction needs.	**Foster Wheeler**	At all times.	As per requirement.	None.

3.9. DEMINING

Ref.	Activity	Objective	Requirements / specifications	Responsibility	Scheduling	Performance indicator(s)	Training Requirements
3.9.1	**General**	Preservation	The principle of minimising vegetation clearing and topsoil moving wherever possible will be followed at all times.	**Foster Wheeler** **Demining Contractor**	During demining.	Records of extent of vegetation cleared and topsoil moved ('before/after' photographs will be suitable)	None.
3.9.2	**Access to demining areas**	Avoidance Preservation	Access to areas to be demined is to be gained by using existing routes of access only. No new routes or tracks may be constructed.	**Sasol** **Foster Wheeler** **Demining Contractor**	At all times.	Absence of new and unplanned tracks / roads.	None.
3.9.3	**Access to CPF site**	Avoidance Preservation	Access to the CPF will be by established access routes only.	**Sasol** **All Contractors**	At all times.	Absence of new tracks leading to / from flowlines and access roads.	None.
3.9.4	**Access to flowlines and access roads**	Avoidance Preservation	Access to the flowlines / access roads will be in a linear direction from the starting point of demining. Exit from the route will be by the same approach. The starting point will be either the CPF, or the well-head (only if an existing access road is available to the well-head).	**Demining Contractor**	At all times.	Absence of new tracks leading to / from flowlines and access roads.	None.
3.9.5	**Equipment use**	To prevent the introduction of alien plants / weeds.	All bush clearing and demining equipment must be washed down before being brought in from outside of the Temane Block.	**Foster Wheeler** **All Contractors**	Prior to the importation of equipment / vehicles into the Temane Block.	Record of washing.	Training of vehicle and equipment operators on EMP requirements.
3.9.6	**Clearance of vegetation from CPF site**	Prevention Compensation	Ten large trees (> 400mm) on the CPF site have been marked with danger tape, white wash or both	**Sasol** **Foster Wheeler**	During demining.	Existence of large trees on site following	None.

Ref.	Activity	Objective	Requirements / specifications	Responsibility	Scheduling	Performance indicator(s)	Training Requirements
			and must not be disturbed. Any trees with a diameter of greater than 150mm and not on the CPF footprint must not be disturbed. All trees, vegetation and fruit removed during clearing operations are the property of the local communities and must not be removed from site and should be made available to the local communities. Communities must be advised of the availability of the wood. Should the trees not be used by the communities during the contract period, proper disposal will be required. First priority will be to determine a suitable use for the wood, failing which the wood may be burnt in a controlled manner to avoid the risk of bush fires.	**Demining contractor**	During Demining. During of contract. At completion of contract period.	vegetation clearing. Record of advise. Record of considerations and decisions taken.	
3.9.7	**Demining of flowlines**	Preservation	The width for demining of flowlines, access roads etc. shall be as specified in Foster Wheeler Drawing No. 25732-8312-41-1501 and should in any event be kept as narrow as possible.	**Foster Wheeler** **Demining Contractor**	During demining	Extent of cleared areas.	None.
3.9.8		Preservation	No vegetation shall be cleared outside of the construction right of way.	**Foster Wheeler** **Demining Contractor**	At all times.	Extent of cleared areas (before / after photographs).	None.
3.9.9		Preservation	Vegetation shall be cleared to the minimum degree necessary for construction. Cleared vegetation shall be windrowed along the perimeter of the construction right of way.	**Foster Wheeler** **Demining Contractor**	During demining.	Provide before / after photographs.	None.
3.9.10		Preservation	Bulldozer operators are to be instructed about the importance of minimising disturbance to the soils and unnecessary vegetation clearing.	**Demining Contractor**	During demining.	Record of instruction.	Training of bulldozer operators.
3.9.11		Prevention	In areas of unstable or steep slopes, where the clearing of vegetation may cause erosion, the demining / clearing crew shall use erosion prevention techniques such as drainage diversion ditches or bundled cut vegetation to reduce runoff velocity and erosion hazard.	**Demining Contractor**	During demining.	Degree of erosion (before, during, after photographs).	None.
3.9.12		Compensation	Trees felled during clearing operations are the property of local communities and shall not be removed from site or used by the contractor.	**Sasol** **All Contractors**	At all times.	As per requirement.	Training of employees on EMP requirements.
3.9.13		Avoidance Preservation	The principle of avoidance of locally sensitive ecological components through minor deviations to the flowlines must be adhered to during demining of the flowlines. Small, high biodiversity patches of canopy forest habitats on termite mounds, important nesting sites and very large trees are examples. Decision in this regard are to be made on the recommendations of the SSS(EM).	**Sasol** **All Contractors**	At all times.	Record of diversions. Record of disturbance to any sensitive areas.	None.
3.9.14		Preservation Avoidance	Sasol should be notified of any proposal for a route change, this notification should include a motivation for the proposed route change. No changes shall be agreed to that, in the opinion of Sasol, result in an unacceptable increase in environmental impact.	**Demining Contractor**	Prior to route change.	Record of notification and any approval(s).	None.

Ref.	Activity	Objective	Requirements / specifications	Responsibility	Scheduling	Performance indicator(s)	Training Requirements
			Any change shall be certified by an environmental consultant.				

3.10. SITE PREPARATION

Ref.	Activity	Objective	Requirements / specifications	Responsibility	Scheduling	Performance indicator(s)	Training Requirements
3.10.1	**Equipment use**	To prevent the introduction of alien plants / weeds.	All vehicles and equipment must be washed down before being brought to site from outside of the Temane Block.	**Foster Wheeler** **All Contractors**	Prior to importation of equipment or vehicles into the Temane Block.	Record of washing.	Training of equipment / vehicle operators.
3.10.2	**Topsoil stripping and stockpiling**	Preservation	Topsoil should be stripped for later use in landscaping and rehabilitation. Topsoil stripping and management requirements shall be as follows: o The top 150mm of soil shall be stripped and stockpiled; o Topsoil should be stockpiled separately from subsoil or rocky material (the topsoil contains both the seedbed and the nutrient supply necessary for plant growth: if mixed with subsoil the usefulness of the topsoil for rehabilitation / landscaping of the site will be lost). o Note: A soil survey is still to be completed as part of the preparation of the EMP. Once completed the requirements of the survey in terms of soil protection needs will be included in the EMP. o Dry sand loams and clayey loams must be stockpiled separately from the wet and more structured soils associated with the hydromorphic sandy loams. The wet and dry soils must be replaced as closely as possible to the site from which they were derived. o Topsoil stockpiles must not be compacted and should not exceed 1.5m in height. o Topsoil stockpiles must not be kept longer than 5 days without adequate erosion protection. o Soil stockpiles should be located away from drainage lines and areas of temporary inundation. o Topsoil stockpiles shall be protected from wind and rain erosion by immediately seeding with *Eragrostis teff*, an annual species which quickly produces a dense cover, and which will not invade adjacent areas of indigenous vegetation.	**Foster Wheeler** **Site Preparation Contractor**	During site preparation where the removal of topsoil is required.	Details of topsoil removal (quantity) and topsoil stockpile location.	None.

Ref.	Activity	Objective	Requirements / specifications	Responsibility	Scheduling	Performance indicator(s)	Training Requirements
3.10.3		Minimisation	Topsoil and other stockpile areas should be clearly defined on a site layout plan and must be submitted to Sasol.	**Site Preparation Contractor**	Prior to topsoil stripping.	Layout plan indicating location of topsoil stockpile footprints.	None.

3.11. PROVISION OF UTILITIES

Ref.	Activity	Objective	Requirements / specifications	Responsibility	Scheduling	Performance indicator(s)	Training Requirements
3.11.1	**Sewage management**	Prevention	In the absence of a sewage treatment plant, chemical toilets are the preferred alternative. A method statement must be provided to Sasol describing sewage management that should include, but not be limited to: o Provision of toilet facilities, including type, number and location; o Method of sewage handling; and o Details of expected effluent quality, handling and disposal methods. Pit latrines are not considered a viable alternative. Septic tanks are to be avoided and only used on a temporary basis should no other option exist. Where no treatment facilities are available, preference should be given to properly managed chemical toilet facilities.	**Foster Wheeler**	Prior to initiation of construction activities on site.	Submitted, approved and implemented sewage management plan.	None.
3.11.2		Prevention	One chemical toilet should be provided per 10-15 members of staff on site. The contractor is to ensure that permanent on-site toilet facilities are properly maintained and in working order. No disposal or leakage of sewage will occur on or near the site.	**Foster Wheeler**	Prior to the initiation of construction activities on site.	Toilets available and managed as per requirement. Audit findings.	None.
3.11.3	**Electricity**	Avoidance	Employee accommodation should be electrified to avoid the use of fires for cooking.	**Foster Wheeler**	Camp establishment.	Electrified accommodation.	None.
3.11.4		Minimisation	Generators should comply with project noise standards.	**Foster Wheeler**	At all times.	Noise emission measurements from generators.	None.
3.11.5		Prevention	Transformers should be free of polychlorinated biphenyls (PCB), must be bunded and regularly inspected and maintained.	**Foster Wheeler**	At all times.	Bunds around transformers. Documented statement that no PCBs are used. Records of inspection.	None.
3.11.6	**Water provision**	Avoidance	Water abstraction for the project will be from groundwater wells. The project must have no detrimental impact on water volumes available to existing users in the area. Should the use of surface waters be considered this shall be subject to the approval of the Sasol Environmental Co-ordinator and verified by an Environmental Consultant.	**Foster Wheeler**	At all times.	Volume of groundwater used (records).	None.

3.12. WATER AND EFFLUENT MANAGEMENT

Ref.	Activity	Objective	Requirements / specifications	Responsibility	Scheduling	Performance indicator(s)	Training Requirements
3.12.1	**Obstruction of water flow**	Prevention	Impediments to natural water flow should be avoided, or, if unavoidable, be allowed for in the design by means of appropriately sized and positioned drains, culverts etc.	**Foster Wheeler**	At all times.	No damming of water or obstructions to water flow (natural or during storm events).	None.
3.12.2	**Effluent management**	Prevention	No seepage fields, soakaways or evaporation ponds shall be developed without the approval or Sasol and verification by an Environmental Consultant.	**Foster Wheeler**	NA	As per requirement.	None.
3.12.3		Prevention	All effluent shall be required to meet internationally accepted effluent quality guidelines. The EPCm Contractor will provide a method statement to Sasol that describes, but shall not be limited to: o Expected effluent to be produced during the construction phase of the project; o Expected effluent quality; o Means to treat, handle and release the effluent. Means to contain contaminated water should release not be possible.	**Foster Wheeler**	Prior to initiation of construction activities.	Submitted, approved and implemented effluent management plan. Effluent quality at all points of release.	None.
3.12.4	**Stormwater management**	Prevention	Stormwater shall not be allowed to be contaminated in any manner and should be kept separate from site runoff. The EPCm Contractor shall submit a method statement detailing the proposed approach to stormwater management based on the principle of the separation of clean and dirty water. Measures such as stormwater diversions, drainage channels etc. should be considered.	**Foster Wheeler**	At all times. Method statement to be submitted	Runoff water quality (records).	None.
3.12.5		Prevention Minimisation	Every effort shall be made to ensure the maintenance of the natural flow of water following storm events. This may include the use of drainage channels, installation of culverts etc. Furthermore no works shall increase the risk of erosion during storm events. Should this be unavoidable specific erosion control measures shall be implemented for the duration that the risk exists.	**Foster Wheeler**	At all times.	No alterations to natural flows. Details of measures implemented.	None.
3.12.6	**Flood management**	Prevention	The position of floodlines (1:10 and 1:50 year) relative to the CPF site, well-heads, access roads and flowlines should be confirmed and any consequences of this for construction should be determined by the Contractor as soon as possible. To avoid obstruction to flows, culverts, drains and other means shall be used as necessary.	**Foster Wheeler**	Prior to commencement of construction activities.	Map indicating floodlines. Details of measures implemented.	None.

3.13. WASTE MANAGEMENT

This section has been divided into general waste (incl. non-hazardous waste) management specifications (3.13.1) and hazardous waste management specifications (3.13.2) [7].

3.13.1. WASTE MANAGEMENT: GENERAL ISSUES AND NON-HAZARDOUS WASTE

Ref.	Activity	Objective	Requirements / specifications	Responsibility	Scheduling	Performance indicator(s)	Training Requirements
3.13.1.1	**General**	Prevention	The EPCm Contractor will develop an overall waste management strategy that defines, but shall not be restricted to, the following: o Waste minimisation strategy o Waste collection strategy o Waste transport strategy o Waste disposal strategy. All Contractors shall comply with the waste management strategy. The strategy must be submitted to Sasol for approval.	**Foster Wheeler**	Prior to the initiation of construction activities	Submitted, approved and implemented waste management strategy.	None.
3.13.1.2		Prevention	The EPCm Contractor will ensure effective management of all Contractors to ensure the minimisation of waste produced.	**Foster Wheeler**	At all times.	Record of waste production and disposal.	None.
3.13.1.3	**Waste generation**	Minimisation	Reduction of waste volumes where possible with specific emphasis on reducing the quantities of hazardous wastes requiring disposal.	**Foster Wheeler**	At all times.	Record of waste reduction initiatives.	None.
3.13.1.4	**Waste storage and transport – general**	Avoidance	A clear distinction should be made between the hazardous and non-hazardous components of the waste stream with separation occurring at source. Wastes should be placed in separate containers and transported to their disposal facilities separately.	**All Contractors**	At all times.	Separate containers for hazardous and non-hazardous waste.	None.
3.13.1.5		Avoidance	All waste generated outside of the CPF site will be collected and brought to base camp.	**All Contractors**	At all times.	No waste storage / disposal at campsites.	None.
3.13.1.6		Prevention	Lids shall be kept on waste drums at all times	**All Contractors**	At all times.	As per requirement.	None.
3.13.1.7		Avoidance	Chemicals that are no longer used, necessary, or past their shelf-life date shall be disposed of promptly as per the requirements of the EMP.	**All Contractors**	At all times.	Records of disposal.	None.
3.13.1.8		Prevention	Waste containers shall bear labels that identify the contents. Containers shall be lined or constructed of materials that are compatible with the wastes to be stored. Containers should be in good condition, free from corrosion, leaks or ruptures.	**All Contractors**	At all times.	Labels on containers. Use of containers appropriate to waste.	None.
3.13.1.9		Prevention	Waste containers shall be stored above ground, over drip pads and under covering.	**All Contractors**	At all times.	As per requirement.	None.

[7] Hazardous waste is defined as waste, other than radioactive waste, which is legally defined as hazardous in the state in which it is generated, transported or disposed of (UNEP).

Ref.	Activity	Objective	Requirements / specifications	Responsibility	Scheduling	Performance Indicator(s)	Training Requirements
3.13.1.10		Prevention	Domestic waste must be contained and storage areas shall be contained to prevent scavenging by persons or animals.	**All Contractors**	At all times.	As per requirement.	None.
3.13.1.11		Minimisation	In all cases, the necessary tools and materials, including absorbent material, shovels and bags shall be readily available to clean up spills or drips.	**All Contractors**	At all times.	Availability of spill / drip clean-up materials.	None.
3.13.1.12	**Waste disposal**	Avoidance	No waste shall be burnt on open fires. No waste shall be disposed of by incineration unless emissions from any incinerator meet internationally accepted emissions guideline levels / limits.	**All Contractors**	NA	As per requirement. Audit findings.	None.
3.13.1.13		Avoidance	No waste shall be disposed of in a waste site not approved by Sasol. The EPCm Contractor must ensure the safe, proper and responsible disposal of waste as per international best practice, Mozambican law and Sasol's requirements.	**All Contractors**	At all times.	Audit findings.	None.
3.13.1.14		Avoidance	In general, littering, discarding or burying of any materials should not be allowed on site.	**All Contractors**	At all times.	As per requirement.	None.
3.13.1.15		Minimisation	Where markets exist for the re-use or recycling of waste materials these materials should be separated from the waste stream at their point of generation and stored separately for collection by the recycling agent.	**All Contractors**	At all times.	Records of re-use, recycling.	None.
3.13.1.16		Prevention Avoidance	While in some circumstances it would be preferable to remove waste material from site for disposal, this has to be done in such a manner that it does not create risks of non-compliance with legislation or company policy for the Temane Gas Project. This is particularly important in the context of the institutional environment within which the project will be operating which is characterised by a lack of both waste disposal facilities and the capacity for transportation of waste. The following requirements would therefore apply to the off-site disposal of waste: o The transportation would have to be undertaken by a recognized contractor familiar with the requirements for the transportation of hazardous wastes; o The frequency of waste collection and the interim measures for the storage of waste on site would have to be appropriate to one another and would have to be such that the system as a whole does not pose an unacceptable risk to either the environment or human health and safety; o The transportation contractor would have to have in place the means to respond appropriately to spillages of waste anywhere along the route within a time limit acceptable to the Temane Gas Project; o Certificates of safe disposal would have to	**All Contractors**	At all times.	Certificates of safe disposal	None.

Ref.	Activity	Objective	Requirements / specifications	Responsibility	Scheduling	Performance Indicator(s)	Training Requirements
			be provided to Temane Gas Project for all wastes removed from site. Such certificates would have to be issued by a recognized waste disposal operation; and o The site at which such waste is disposed of would have to comply with the corporate requirements of Temane Gas Project and it's shareholders. As such it would have to be audited at intervals appropriate to the risk associated with the disposal operation.				
3.13.1.17	**Development and operation of waste disposal sites**	Avoidance Minimisation	**A landfill for non-hazardous waste shall be constructed within the boundaries of the CPF site. This site shall be designed, constructed and operated as per international best practice requirements. Should hazardous waste not be transported off site for proper disposal, a hazardous waste disposal must be designed, constructed and operated as per international best practice requirements.**	**Foster Wheeler**	Prior to the initiation of construction activities.	Landfill on site for non-hazardous materials. Audit findings.	Training in waste site management.
3.13.1.18	**Landfill construction**	Avoidance Minimisatoin	The design for the waste disposal site(s) shall include: o The design and construction of a stormwater control system to ensure the isolation of the waste disposal facilities from the local surface water environment; o Measures to reduce the generation of leachate including minimizing the area of exposed waste, compaction of waste, progressive rehabilitation of the site and minimizing the quantities of liquid waste disposed of to the sites; o The collection and treatment of leachate if deemed appropriate; o Monitoring of the waste site operation including records of: o the types, quantities, date of wastes disposed of (incl. disposal method); o the frequency and quality of leachate generated; and o the quality of groundwater up and down gradient of the site. o The control of access to the site to eliminate scavenging of wastes The design shall consider predominant wind direction, proximity to housing, water and groundwater pollution risks.	**Foster Wheeler**	Prior to the initiation of construction activities.	Design to include all requirements.	None.
3.13.1.19		Avoidance Prevention	The construction and operation of any landfill must have all necessary legal and other relevant	**Foster Wheeler**	Prior to the development of any	Necessary document approvals.	None.

Ref.	Activity	Objective	Requirements / specifications	Responsibility	Scheduling	Performance Indicator(s)	Training Requirements
			approvals.		waste site.		

3.13.2. HAZARDOUS WASTE MANAGEMENT

In addition to the requirements specified previously with regard to hazardous waste, the following shall also apply:

Ref.	Activity	Objective	Requirements / specifications	Responsibility	Scheduling	Performance Indicator(s)	Training Requirements
3.13.2.1	**Storage and handling of hazardous waste**	Prevention	A comprehensive list of all potential hazardous wastes and estimated volumes must be compiled for all activities. A hazardous materials inventory must be kept and be readily available.	**All Contractors**	From project initiation and at all times.	Hazardous materials inventory.	None.
3.13.2.2		Prevention	Material Safety Data Sheets will be used in all cases in assisting in making an assessment of the possible risk and best approach to handling and disposal methods.	**All Contractors**	At all times.	Availability of MSDSs for all hazardous materials. Disposal / handling consistent with requirements.	None.
3.13.2.3		Avoidance	Specifications for storing and handling of all hazardous waste and substances (e.g. fuel and chemicals) will be adhered to. Specific attention needs to be given to designing the fuel depot and control during filling so as to manage pollution risks.	**Foster Wheeler** **All Contractors**	At all times.	Audit findings.	Training on use, handling etc. of hazardous materials.
3.13.2.4		Avoidance	All hazardous waste generated outside of the CPF site during the project will be immediately collected and brought to base camp for handling as per specified requirements.	**All Contractors**	At all times.	Records of waste disposal.	None.
3.13.2.5		Prevention	Flammable / combustible liquid storage shall be in limited volumes prior to disposal.	**All Contractors**	At all times.	Records of waste disposal.	None.
3.13.2.6		Prevention	Flammable / combustible liquid waste shall be stored in safety cans designed for such liquids. Cans should be equipped with flame arrestors.	**All Contractors**	At all times.	As per requirement.	None.
3.13.2.7	**Disposal of hazardous waste**	Avoidance	All waste oils, greases, fuels etc. should be collected and disposed of in an appropriate manner off site. The contents of grease traps or other waste oil, grease and/or fuel disposal / storage containers should under no circumstances be voided to the surrounding area.	**All Contractors**	At all times.	Records of waste disposal.	None.
3.13.2.8	**Hydrocarbon spill (incl. oil, fuel, diesel, lubricants etc.)**	Avoidance	Contaminated soil should be removed and disposed of as per hazardous waste disposal requirements.	**All Contractors**	Immediately after any spill.	Incident and corrective action records.	None.
3.13.2.9	**Disposal of medical waste**	Prevention	The Contractor will be responsible for the disposal of medical wastes, taking into consideration that no effective incineration currently exists in the area. Records of disposal for all medical waste shall be kept.	**All Contractors**	At all times.	Records of disposal.	None.
3.13.2.10		Prevention	Medical waste will be kept separate from any other waste. The EPCm Contractor shall prepare and submit a method statement to Sasol defining the	**All Contractors**	Statement submitted prior to initiation of construction activities.	Submitted, approved and implemented method statement(s).	None.

Ref.	Activity	Objective	Requirements / specifications	Responsibility	Scheduling	Performance Indicator(s)	Training Requirements
			strategy for the storage, handling and disposal of medical waste. No medical waste may be disposed with non-hazardous waste.		At all times.	Records of disposal.	
3.13.2.11		Prevention	Suppliers of potentially hazardous substances (chemicals, batteries etc) shall be required to remove used products and their containers when making their next deliveries of those substances. Certificates of safe disposal of those wastes must be provided.	**All Contractors**	At all times.	Certificated of disposal.	None.

3.14. MATERIALS MANAGEMENT (INCL. FUELS AND CHEMICALS)

Ref.	Activity	Objective	Requirements / specifications	Responsibility	Scheduling	Performance Indicator(s)	Training Requirements
3.14.1	**General**	Prevention	Comply with all applicable laws, regulations, permit and approval conditions and requirements relevant o the storage, use and proper disposal of hazardous materials.	**All Contractors**	At all times.	Audit findings.	Training as regards legal requirements.
3.14.2		Prevention	Manage all hazardous materials and wastes in a safe and responsible manner. Prevent contamination of soils, pollution of water and/or harm to people or animals as a result of the use of these materials.	**All Contractors**	At all times.	Audit findings.	None.
3.14.3		Avoidance Prevention	Prepare a hazardous materials management plan as part of the method statement to be submitted to Sasol prior to establishment on site. The plan shall include, but shall not be limited to, measures to prevent: o Soil contamination; o Pollution of water; o Accidental fires; and o Risk / injury to people or animals.	**All Contractors**	Prior to the initiation of construction activities.	Submitted, approved and implemented plan.	None.
3.14.4	**Spill management**	Minimisation	All spills of fuels, oils or other hazardous substances must be immediately cleaned up and measures taken to remediate the spill. The incident must be reported to the SSS(EM).	**All Contractors**	Immediately following any spill.	Incident and corrective action records.	None.
3.14.5		Minimisation	The necessary tools, materials and expertise must be readily available to deal with spills of oil, fuels, lubricants and other hazardous materials. Spill cleanup kits should be available on site.	**All Contractors**	At all times.	Availability of tools and materials.	Training in spill handling and clean-up.
3.14.6	**Materials classification**	Prevention	Classify all hazardous materials to be used / stored on site according to recognised international codes of practice. Ensure that the handling, storage, transport and disposal of these materials meets the requirements of these codes.	**All Contractors**	At all times.	Classification records. Audit findings.	None.
3.14.7	**Storage facilities**	Prevention	Proper storage facilities should be provided for the storage of oils, grease, fuels, chemicals and any	**All Contractors**	At all times.	As per requirement.	None.

Ref.	Activity	Objective	Requirements / specifications	Responsibility	Scheduling	Performance Indicator(s)	Training Requirements
			hazardous materials to be used during construction. These storage facilities (including any tanks) should be stored on an impermeable surface and surrounded by a bund wall, in order to ensure that accidental spillage does no pollute local soil or water resources.				
3.14.8		Avoidance	No fuel storage tanks shall be located in any location other than at approved plant yards of campsites.	**All Contractors**	At all times.	As per requirement.	None.
3.14.9		Avoidance	Chemicals, fuels, lubricating oils and any other hazardous materials shall not be stored within 100m of a surface water body or within the floodplain of rivers or any area of temporary inundation.	**All Contractors**	At all times.	As per requirement.	None.
3.14.10		Avoidance	Any fuel storage facilities with a capacity greater than 1 000L shall be located only on flat or gently sloping ground. A berm / bund should be constructed around the facility to contain at least 110% of the total capacity of the storage containers. The bund and floor of the facility shall be impermeable to the substances stored and to water, failing which they should be appropriately lined to achieve the same end.	**All Contractors**	At all times.	As per requirement.	None.
3.14.11		Avoidance	No fuel storage or refuelling facility should be within 100m of a watercourse or wetland, within a floodplain or where there is the potential for spilled fuel to enter a watercourse or groundwater.	**All Contractors**	At all times.	As per requirement.	None.
3.14.12		Prevention	No Smoking signs shall be posted in fuel storage areas.	**All Contractors**	At all times.	As per requirement.	None.
3.14.13		Avoidance	No fuel or any other chemical storage will be below ground (either partially or completely).	**All Contractors**	At all times.	As per requirement.	None.
3.14.14		Minimisation	An inventory of any hazardous chemicals / substances (including that within equipment) kept on site, along with a description of possible ill effects and treatment of health – related afflictions resulting from accidents, should be kept in the storage area as well as by the appropriate manager.	**All Contractors**	At all times.	Inventory of hazardous materials and MSDS documentation available at specified locations.	Training in hazardous material use and handling.
3.14.15		Minimisation	Workers should at all times be made aware of the health risks associated with any hazardous substances used (e.g. smoking near refuelling depots), and should be provided with appropriate protective clothing / equipment in case of spillages or accidents.	**All Contractors**	At all times.	Records of training conducted. Provision of PPE.	Training in hazardous material use and handling.
3.14.16		Avoidance	Cement should be stored and mixed on an impermeable substratum.	**All Contractors**	Cement mixing	As per requirement.	None.
3.14.17	**Refuelling**	Avoidance Prevention	Refuelling and maintenance of vehicles should occur within specified depots only. Working / fuel transfer areas within these depots should be underlain by an impermeable surface	**All Contractors**	At all times.	As per requirement.	None.

Ref.	Activity	Objective	Requirements / specifications	Responsibility	Scheduling	Performance indicator(s)	Training Requirements
			and should have grease traps to ensure that no spillage of greases, oils or fuels occurs into local soil or water resources.				
3.14.18		Minimisation	Used oils and greases should be separated and recycled.	**All Contractors**	At all times.	Record of oil and grease recycling.	None.

3.15. LOGISTICS MANAGEMENT (PERSONNEL, EQUIPMENT AND PARTS)

Ref.	Activity	Objective	Requirements / specifications	Responsibility	Scheduling	Performance indicator(s)	Training Requirements
3.15.1	**Vehicle and machinery movement**	Limit unnecessary compaction of topsoils Prevent disturbance of animals and plants outside of construction areas.	Transport routes to and within the site and construction areas should be clearly marked. All vehicles used for transportation / construction purposes should remain within these demarcated routes and areas. No movement off these routes will be permitted.	**All Contractors**	At all times.	Route markings as per requirement. No new route / track development.	None.
3.15.2		Avoidance	No new access, haul or maintenance roads are to be constructed without the approval of the SSS(EM).	**All Contractors**	At all times.	No new route / track development.	None.
3.15.3		Prevention	Safe travelling speeds for each section of the route along the right of way shall be determined and enforced. This may include, but not be limited to, the monitoring of vehicle speeds, the erection of speed limit signs and the installation of speed humps.	**Foster Wheeler – signs, speed humps, testing etc.** **All Contractors**	Ongoing.	Speed testing.	All vehicle operators to have valid licences, if not training will be required.

3.16. WELL-HEAD SITE PREPARATION AND MANAGEMENT

Ref.	Activity	Objective	Requirements / specifications	Responsibility	Scheduling	Performance indicator(s)	Training Requirements
3.16.1	**Location**	Avoidance	The Temane 3 well site is situated in very close proximity to, and possibly within the permanent wetland areas of the Govuru River floodplain. The final design of this well site must take this into consideration. The risk of water contamination must be avoided and no impediments to natural water flows shall be permitted, The Temane 9 well site is situated in close proximity to the eulittoral zone (seasonally flooded zone) of a small barrier lake. The location of this well site and any associated disturbance must not be situated within 50m of the eulittoral zone (seasonally or periodically flooded zone) of the barrier lake.	**Foster Wheeler**	Prior to final design and construction – relocation is required.	Justification for siting of well site. Map indicating location of well site and floodplain extent. Description of measures taken to ensure no risk of water pollution and no damage to the hydrological or ecological functioning of the aquatic system.	None.
3.16.2	**Site preparation**	Avoidance	The area for each well-head is to be 40m by 40m	**Foster Wheeler**	Site preparation for well-	Site layout of well-heads	None.

Ref.	Activity	Objective	Requirements / specifications	Responsibility	Scheduling	Performance indicator(s)	Training Requirements
			only. Cleared woody vegetation shall be cut and baled and then made available for use by local inhabitants.		heads.	(to scale). Photographs of vegetation.	
3.16.3	**Site preparation – grading and levelling**	Rehabilitation Avoidance Prevention Minimisation Avoid compaction and detrimental effects on microbes and seeds within the soils.	During grading and levelling of the site, topsoil shall be removed and stockpiled as follows: o The top 150mm of soil shall be stripped and stockpiled; o Dry sandy loams and clayey loams must be stockpiled separately from the wet and more structured soils associated with the hydromorphic sandy loams. The wet and dry soils must be replaced as closely as possible to the site from which they were derived. o Topsoil will be stored within a protected (fenced) area within the site; o Topsoil stockpiles shall not exceed 3.5m. o Topsoil stockpiles shall be protected from wind and rain erosion by immediately seeding with *Eragrostis teff*, an annual species which quickly produces a dense cover, and which will not invade adjacent areas of indigenous vegetation.	**Foster Wheeler**	During well-head development.	Photographs (time series).	None.
3.16.4		Avoidance	No soils or spoil material shall be imported to the well-head site for the purposes of construction without verification that the source was not contaminated with weeds.	**Foster Wheeler**	NA	As per requirement. Audit findings.	None.
3.16.5		Avoidance	A method statement will be prepared and submitted to Sasol detailing how erosion will be prevented at each of the well-heads. It is suggested that some (probably low grass) vegetation be permitted within the 40m x 40m area to help with erosion management.	**Foster Wheeler**	Prior to the initiation of construction.	Submitted, approved and implemented plan.	None.
3.16.6	**Access to well-heads**	Avoidance	Access shall only be gained along existing routes.	**All persons**	At all times.	No new track / route development.	None.
3.16.7	**Revegetation of old well-head sites**	Rehabilitation	Well head sites that are not needed shall be rehabilitated.	**Foster Wheeler**	On decision that site not needed.	Photographs (time series).	None.
3.16.8		Rehabilitation	Compacted soils shall be tilled and broken to encourage revegetation.	**Foster Wheeler**	During rehabilitation.	Photographs.	None.
3.16.9		Rehabilitation Preservation	Rehabilitation of well sites must be performed immediately upon completeion of construction. Revegetation of well sites will be conducted through the encouragement of natural process of secondary succession. Stockpiled subsoil and topsoil will be reintroduced in the correct order, and the original surface contours of the site will be reinstated. In order to encourage the establishment of indigenous pioneer (seral) plant communities, any areas on the periphery of the site, where the topsoil was not	**Foster Wheeler**	During rehabilitation.	Photographs.	None.

Ref.	Activity	Objective	Requirements / specifications	Responsibility	Scheduling	Performance indicator(s)	Training Requirements
			removed and has become compacted, must be tilled. Diversion ditches, swales, straw and hay will be used on steeps slopes in order to prevent erosion and encourage rapid revegetation. Due to the extremely flat topography of almost the entire exploration area, such measures will probably not be necessary. The ESO, in consultation with appointed specialists, will guide the rehabilitation process.				

3.17. FLOWLINE INSTALLATION AND TESTING

Ref.	Activity	Objective	Requirements / specifications	Responsibility	Scheduling	Performance indicator(s)	Training Requirements
3.17.1	**General**	Avoidance	No persons are to stray from the construction right of way / servitude.	**All persons**	At all times.	As per requirement.	None.
3.17.2		Preservation	No features of archaeological significance are known to occur on the flowline or access road routes. Where construction of flowlines reveals an archaeological find or artefacts, the following must take place: o All activities around the site must cease immediately; o An initial appraisal of the nature and dimensions of the site shall be made and the SSS(EM) notified who will in turn notify the Sasol environmental co-ordinator; o A consulting archaeologist should visit the site, and in consultation with the contractor's site representative and the Sasol Environmental Co-ordinator make a decision concerning the required action to be taken.	**All Contractors**	At all times.	Report of all findings and steps taken. Photographs.	Train employees concerning the requirements of the EMP.
3.17.3		Avoidance	The flowline to be installed across the Govuro River should be of sufficient capacity to ensure that no further crossings will be needed following further exploration on the east side of the river.	**Foster Wheeler**	Before construction.	Design to meet requirements.	None.
3.17.4	**Routing**	Minimisation	The ecological work prepared for the flowlines provides a general understanding of the habitats of the Temane block. Small areas, important in conservation, which cannot be detected at a broader scale of analysis, might occur in the area. For this reason, the continued involvement of the SSS(EM) during construction is considered necessary in order to manage unnecessary disturbance of sensitive sites. Slight deviations to the route must be allowed for where necessary to avoid sensitive sites.	**Foster Wheeler**	Flowline construction	Records of route changes.	None.
3.17.5		Avoidance	Where possible the flowline should be routed to be	**Foster Wheeler**	Flowline construction.	Record of route	None.

Ref.	Activity	Objective	Requirements / specifications	Responsibility	Scheduling	Performance indicator(s)	Training Requirements
			a minimum of 50m from housing. Should this not be possible, reference must be made to the requirements of the compensation and resettlement procedures as agreed between Sasol and the Government.			changes and proximity of housing.	
3.17.6		Avoidance Prevention	The active channel of the Govuro River consists of a well defined, vegetation free, fast flowing deep channel flanked on both sides by sloping *Nymphaea/Potamogeton* dominated flanks. The presence of this vegetation would suggest that they are flooded for extended time periods, while the absence of both common reed and the sedge, *Cladium*, from these communities suggest that the depth and nature of the substrate is limiting. Trenching through these "terraces" and the main water course is likely to have both un upstream and downstream influence on their stability. It is critically important that the selected method of pipe laying ensures the integrity of these terraces, both upstream and downstream of the crossing point, as disruption of these could significantly influence the medium term future water course, by creating a point of weakness in an otherwise well defined and contained channel. To minimise the risk of this eventuality the following should be considered: o The river crossing point should be selected where the extent of occurrence of *Nymphae/Potamogeton* stands on either side of the river are minimal. o The pipeline should approach and cross the river perpendicular to direction of flow. o The crossing point of the Govuro River and the associated flowline routing is illustrated in Figure 4. o A geo-technical survey of the selected route alignment should be conducted in order to insure that no impermeable horizon within the substrates of the selected alignment servitude are affected. In the event of breaching limestone or other hard barriers, the breach should be made good with material of similar density and strength. o Any terraces that are traversed should be reconstructed with profiles and slopes similar to those present pre-construction. o The profile of the defined channel and associated bank structures at the crossing point shall not be altered and shall be reinstated in a manner that will not result in erosion up or downstream of the crossing. o The bisection of any island or part of an island within the floodplain, other than	**Foster Wheeler**	Prior to flowline construction	Plotted route alignment indicating changes.	None.

Ref.	Activity	Objective	Requirements / specifications	Responsibility	Scheduling	Performance indicator(s)	Training Requirements
			termitaria should be avoided. o It is strongly suggested that the flowline crossing be located as marked on Figure 4, i.e. shifted slightly north from the proposed crossing.				

FIGURE 4. FLOWLINE ROUTING TO WELL-HEADS TEMANE 8 AND TEMANE 9, ACROSS THE GOVURO RIVER. THE ROAD RUNNING IN A NORTH/SOUTH DIRECTION AND TO THE WEST OF THE GOVURO RIVER IS THE EN 1

3.17.7	Avoidance	The Contractor shall notify Sasol of any changes in route alignment in excess of 50m from the current alignment, that are made during the course of construction for any reason whatsoever. Sasol should be notified of any proposal for a route change, this notification should include a motivation for the proposed route change. No changes shall be agreed to that, in the opinion of Sasol, result in an unacceptable increase in environmental impact. Any change shall be certified by an environmental consultant.	**Foster Wheeler**	Prior to route modification.	Map of previous and new route.	None.
3.17.8	Avoidance	The construction right of way should be surveyed and its extents clearly marked (at maximum 200m intervals). These markers shall be preserved until all clearance has been completed so as to indicate the limits of clearing. No clearing shall take place beyond the markers.	**Foster Wheeler**	During survey	Construction right of way markers.	None.
3.17.9	Avoidance	Sensitive habitats that must be avoided by the finally selected flowline alignment are briefly listed and discussed below: o Islands in floodplain: Islands (both those formed by termite mounds and larger islands formed by sediment deposition or elevated dune crests that have resisted	**Foster Wheeler**	Survey phase	Records of route re-alignments.	None.

Ref.	Activity	Objective	Requirements / specifications	Responsibility	Scheduling	Performance Indicator(s)	Training Requirements
			erosion) comprise an important component 3.19of habitat diversity within the Govuro wetlands, though they occupy a limited area. These islands also act as crucial wildlife refuges during flood periods. Construction of the flowline through these islands may lead to channelled flows through the pipeline servitude and create increased rates of erosion that may disturb or completely remove these islands. o Floodplain pans: Provide restricted but important breeding and feeding areas for various animal species, especially fish, birds and amphibians, many of which are largely dependant on such habitats for the completion of their life cycles. o Limestone outcrops along the active-channel: These outcrops are crucial in determining channel morphology and hydrological patterns, which in turn play and important role in determining habitat diversity and ecosystem functioning. Trenching through these outcrops may create nick points that could lead to artificially channelled flows and modification or destruction of riparian and floodplain habitats. o Backwater situated directly upstream of limestone outcrop on east bank of the river at the alternative crossing point: Compromises part of a restricted habitat type within the Govuro River wetlands, and is likely to be an important breeding and feeding area for numerous animal species, especially fish and bird species that utilise such backwaters as preferred breeding and/or feeding areas.				
3.17.10	**Access**	Avoidance	Access to flowlines for construction shall only be by one of the following: o Existing road, track or seismic line o Along the flowline construction right of way. The access routes to the flowlines are indicated on project design drawings. No new routes may be developed.	**All persons**	At all times.	No new / unplanned road / track development.	None.
3.17.11	**Blasting**	Prevention	Any blasting which may become necessary should be restricted to normal working hours: between 07h00 and 17h00.	**Foster Wheeler**	At all times.	Absence of complaints.	None.
3.17.12		Minimisation	Full precautions must be taken to avoid missile damage to surrounding buildings and / or infrastructure should blasting be required. Full precautions must be taken to ensure that blast rock is not scattered over the construction right of way or	**Foster Wheeler**	Prior to and during blasting.	Evidence of precautions taken.	None.

Ref.	Activity	Objective	Requirements / specifications	Responsibility	Scheduling	Performance indicator(s)	Training Requirements
			outside of the construction right of way. Where necessary blast nets or other safeguards shall be employed to ensure that blast rock remains in situ after the blast and that it is removed from the trench in a controlled manner.				
3.17.13		Restoration Compensation	In the case of accidental over blast, Sasol must be notified immediately and in writing. This notification shall include what damage has occurred, how the blast rock is to be collected and disposed of and how the damage incurred is to be rectified.	**Foster Wheeler**	Immediately after incident.	Incident and corrective action report.	None.
3.17.14		Restoration Compensation	Prepare and submit to Sasol, a pre-blast photographic record of any structures or buildings within 200m of a blast zone, including any structural defects in these structures / buildings.[8]	**Foster Wheeler**	At least 48 hours prior to blasting.	Photographic record (before and after).	None.
3.17.15		Minimisation	All inhabitants within 200m of a blast zone shall be notified of the date and time at which blasting is scheduled to occur, at least 24 hours prior to the event.	**Foster Wheeler**	At least 24 hours prior to blasting.	Record of notification.	None.
3.17.16	**Excavations / trenching**	Prevention	Excavations should be left open for the minimum period of time. Excavations left open during construction should be checked periodically (especially once the rain season begins) such that animals falling in can be safely removed and released away from construction activities.	**Foster Wheeler**	Ongoing	Records of accidents.	None.
3.17.17		Avoidance	Only vegetation falling within demarcated access route or construction areas should be removed.	**Foster Wheeler**	Vegetation clearing.	Photographs (before / after).	None.
3.17.18		Prevention Restoration	Where the land is naturally armoured (significant amounts of surface rock and stone), this material may be returned over the construction right of way in approximately the same proportions as occurred prior to construction. Rock may not be permanently stockpiled.	**Foster Wheeler**	During and after pipe-laying	Photographs (before / after).	None.
3.17.19		Prevention	No waste may be disposed of in any trench or excavation.	**All persons**	NA.	Records of waste disposal. Audit findings.	None.
3.17.20		Preservation	At the start of each working day, the open trench shall be inspected and any trapped animals shall be rescued by catch and release (e.g. frogs) or by driving out e.g. dangerous snakes.	**Foster Wheeler**	Daily.	Record to be kept of animals found in trenches, animals rescued and dead animals.	Training of employees as to dangerous animals and how / how not to handle them.
3.17.21		Avoidance	No contamination of topsoil will be permitted.	**All persons**	NA.	Audit findings.	None.
3.17.22		Prevention	No damming effect must result through the replacement of soil. Topsoil should be replaced in its correct pedological sequence.	**Foster Wheeler**	Ongoing.	Audit findings.	None.
3.17.23		Preservation	Topsoil should be temporarily stockpiled separately	**Foster Wheeler**	During trenching.	Photographs.	None.

[8] It is strongly suggested that a detailed photographic record is kept of all areas that will be disturbed; this record should reflect the state of the environment prior to disturbance, during disturbance and after disturbance.

Ref.	Activity	Objective	Requirements / specifications	Responsibility	Scheduling	Performance Indicator(s)	Training Requirements
			from subsoil or rocky material during trenching (the topsoil contains both the seedbed and the nutrient supply necessary for plant growth: if mixed with subsoil the usefulness of the topsoil for rehabilitation of the site will be lost). Note: A soil survey is still to be completed as part of the preparation of the EMP. Once completed the requirements of the survey in terms of soil protection needs will be included in the EMP. During trenching topsoil layers must be stockpiled separately from sub-soil layers. No mixing must occur. Dry sand loams and clayey loams must be stockpiled separately from the wet and more structured soils associated with the hydromorphic sandy loams. The wet and dry soils must be replaced as closely as possible to the site from which they were derived. Topsoil stockpiles must not be compacted and should not exceed 1.5m in height. Topsoil stockpiles must not be kept longer than 5 days without adequate erosion protection. Topsoil must not be compacted. Soil stockpiles should be located away from drainage lines and areas of temporary inundation.				
3.17.24		Avoidance Rehabilitation	Prepare a method statement detailing the proposed location and method of disposing of waste rock excavated from the pipeline trench. As a general rule, windrowing of waste rock along the perimeter of the trench shall be prohibited. Waste rock and other granular material shall be collected and transported to a disposal site approved by the Sasol Environmental Co-ordinator. Erosion gullies or old borrow pits should be identified for the preferential disposal of material. The method statement shall include the measures that are proposed to stabilise and rehabilitate the disposal site.	**Foster Wheeler**	After trenching.	Photographs.	None.
3.17.25	**Backfilling**	Preservation Rehabilitation	Soil must be replaced in the order of removal, i.e. subsoil first, followed by topsoil.	**Foster Wheeler**	Backfilling.	Photographs.	None.
3.17.26		Preservation	After completion of the backfilling, recontouring and erosion control works, topsoil should be evenly spread at a uniform depth over the areas from which it was removed.	**Foster Wheeler**	After backfilling.	Photographs.	None.
3.17.27		Prevention	Consideration must be given to preventing the development of preferential flow paths that may develop along the pipeline route following backfilling. This is more likely to occur where the pipeline is aligned with the direction of flow. This effect can be reduced by creating low, 100mm high, narrow 2-5m broad, lenticular shaped berms at	**Foster Wheeler**	After backfilling.	Photographs.	None.

Ref.	Activity	Objective	Requirements / specifications	Responsibility	Scheduling	Performance Indicator(s)	Training Requirements
			100m intervals perpendicular to the pipeline route across the width of the servitude.				
3.17.28	**Aquatic crossings – Govuro River**[9]	Avoidance	Bridges and causeways shall not be constructed to enable vehicles and heavy equipment to cross rivers or permanent wetlands.	**Foster Wheeler**	NA	As per requirement.	None.
3.17.29		Prevention	The importation of fill or bedding material to stabilise wet areas is PROHIBITED.	**Foster Wheeler**	NA	As per requirement.	None.
3.17.30		Prevention	When crossing watercourses or wetlands, on site tools and equipment such as pumps, compressors and generators must be placed on bermed impermeable sheeting (e.g. polyethylene or other similar material) to prevent hydraulilc fluid or fuel leaks from contaminating soil or groundwater or entering any watercourse or wetland.	**Foster Wheeler**	Crossing of wet areas.	Photographs.	None.
3.17.31		Prevention	All equipment which is required to work in aquatic environments must be clean of oil, grease and other contaminants harmful to aquatic life.	**Foster Wheeler**	At all times.	Audit findings.	Training of vehicle and equipment operators.
3.17.32		Avoidance Restoration	Make provision to maintain the natural flow of any drainage line affected by construction.	**Foster Wheeler**	At all times	Photographs.	None.
3.17.33		Prevention Avoidance	Method statements must be prepared and submitted to Sasol describing, in detail, the approach to crossing the Govuro River and areas inundated with water or waterlogged to any degree. This statement must specify: o Access requirements and approach; o Proposed drainage requirements; o An itemised list of equipment that will be used; o Measures to ensure the continued functioning of the aquatic systems during and post construction; o Measures to ensure the prevention and management of erosion during the works.	**Foster Wheeler**	Prior to initiation of construction activities.	Submitted, approved and implemented plan.	None.
3.17.34		Avoidance	Construction of the Govuru River crossing must take place at low flow periods during the dry season.	**Foster Wheeler**	Timing of Govuro Crossing – dry season	As per requirement.	None.
3.17.35		Restoration	A geotechnical survey of the flowline servitude (from east of old Temane 8 well-head) to the River must be conducted in order to ensure that any impermeable horizon that may be present in the soils is not disrupted by trenching. Should such a layer be disrupted, it must be replaced with a material and in a manner to duplicate the functioning of the removed layer.	**Foster Wheeler**	Prior to construction.	Geotech report and method statement.	Construction teams must be trained to recognise situations where replacement of substrata with comparable material will be required.
3.17.36		Prevention	The use of coffer dams shall be avoided, but where	**Foster Wheeler**	NA	Photographs.	None.

[9] These requirements will also apply in all cases to crossings of wetlands, pans and inundated areas (except where clearly not relevant)

Ref.	Activity	Objective	Requirements / specifications	Responsibility	Scheduling	Performance Indicator(s)	Training Requirements
			these are necessary, it is essential that all material used for construction of the coffer dam is removed from the wetland upon completion of construction. Material used for coffer dam construction must be sourced from areas free of alien invasive plant species so as to prevent the introduction of propagules of such species into the wetland areas (the SSS(EM) will guide the engineers and contractors in this regard).				
3.17.37		Prevention Avoidance	The importation of material into the floodplain e.g. for example backfilling to permit vehicular access shall not be permitted, as this will materially influence the movement of water in both the surface and the subsurface layers.	**Foster Wheeler**	NA	As per requirement.	None.
3.17.38	**Aquatic crossings – wetlands, drainage lines, pans, etc.**	*Wetlands are remarkably resilient ecosystems, and if construction of the flowline is undertaken during the dry season, the sensitive habitats described below are avoided and the recommended construction mitigation measures strictly adhered to, then it is expected that the natural process of secondary succession will rapidly lead to the revegetation of disturbed areas by indigenous pioneer (seral) plant communities. These seral plant communities comprise species that occur in undisturbed wetland areas adjacent to the pipeline servitude, and are likely to revegetate disturbed areas rapidly. Furthermore, it is considered unlikely that any threatened plant or animal species will be directly impacted by disturbance of habitat within the construction servitude. It must however be emphasised that the above is only applicable if, as expected, construction does not disturb any impermeable horizon in the substrate or modify surface flows through the wetland systems. If an impermeable horizon occurs and it is disrupted, this may lead to dewatering of the wetland that may have severe negative impacts on all riparian and floodplain habitats.*					
3.17.39		Prevention	No permanent damage to any wetland or drainage lines shall be permitted as a result of construction. Limiting access and construction disturbance in wetlands is critical.	**Foster Wheeler**	NA	As per requirement. Photographic record.	None.
3.17.40		Avoidance	As far as is practicable, construction activities shall be scheduled to take place during the dry season when surface and subsurface water flows are lowest, plants are dormant and inundation is limited.	**Foster Wheeler**	Construction during the dry season.	As per requirement.	None.
3.17.41		Avoidance	No vegetation within the wetland may be removed, other than that which is absolutely necessary along the construction right of way.	**Foster Wheeler**	NA	Photographic record of vegetation removal (before and after).	None.
3.17.42		Avoidance	Bridges and causeways shall not be constructed to enable vehicles and heavy equipment to cross rivers of permanent wetlands.	**Foster Wheeler**	NA	As per requirement.	None.
3.17.43		Avoidance	The importation of fill or bedding material to stabilise wet areas is PROHIBITED.	**Foster Wheeler**	NA	As per requirement.	None.
3.17.44		Avoidance	As far as is possible, the trench shall be backfilled with the material originally removed. This shall be done in accordance with the natural soil profile in the wetland. Where this is not possible, alternative options shall be motivated for approval by Sasol. The method chosen as being most appropriate for a particular site (including the use of clay barriers at intervals along the pipeline) shall not affect the natural surface or sub-surface (lateral and longitudinal groundwater) flow within the wetland and shall contain / prevent channelling of water along the pipeline and / or in the backfill.	**Foster Wheeler**	During backfilling.	Photographic record.	None.
3.17.45		Avoidance Prevention	Natural ground levels must be restored and the influence of spoil minimised. Channelling effects (that are to be avoided) are likely to be exacerbated	**Foster Wheeler**	During trenching and backfilling.	Photographic record (before / after).	Construction teams must be properly trained to meet EMP requirements.

Ref.	Activity	Objective	Requirements/specifications	Responsibility	Scheduling	Performance indicator(s)	Training Requirements
			by residual material remaining on the surface after infilling in the form of a low ridge. This should be prevented altogether by ensuring the removal of spoilt material or where this is not possible by creating low circular/oval irregularly shaped mounds with an elevation of not more than 100mm above natural ground level. Sediment management is unlikely to be of importance during the laying of the pipeline across the floodplain section of the crossing, because of low to no flows.				meet EMP requirements.
3.17.46		Avoidance Minimisation	All temporary construction roads in or adjacent to wetlands will be managed so as to disperse runoff and avoid concentrating water flows. Temporary construction roads in proximity to wetlands shall be completely removed and rehabilitated after construction.	**Foster Wheeler**	At all times	Photographic record	None.
3.17.47		Avoidance Minimisation	The use of heavy machinery in wetlands shall be carefully monitored and shall be restricted to the absolute minimum. Machine operators shall be fully informed about the sensitivity of these areas.	**Foster Wheeler**	At all times	Record of training. Record of machinery used and approval by Sasol.	Training of machine operators on EMP requirements.
3.17.48		Restoration	The original wetland geometry and topography in both cross-sectional and longitudinal profile shall be reinstated after construction.	**Foster Wheeler**	After construction.	Photographic record and mapping as necessary.	None.
3.17.49		Restoration	Each wetland must be tested before construction to identify any clay lenses within the depth of excavation. Re-seal any impermeable layer that is breached by construction within a wetland, using either clay removed from the trench, or alternatively with bentonite or any other appropriate material or method approved by Sasol.	**Foster Wheeler**	During and after construction.	Photographic record.	None.
3.17.50		Rehabilitation	Remove from the wetland immediately after construction is completed, all coffer dams, causeway and construction materials, discard material, berms and other foreign items used in the construction of the pipeline. Ripping and disking of the wetland surface shall be done in all compacted areas after construction.	**Foster Wheeler**	After construction.	Photographic record.	None.
3.17.51	**Reinstatement**[10] [11]	Rehabilitation	Restore the trench and construction right of way to natural contours of the ground and allow for normal surface drainage. It is suggested that photographic records of all areas before and after construction are taken and kept on record for consultation.	**Foster Wheeler**	Immediately following backfilling.	Photographic record.	None.

[10] Note that resinstatement and associated revegetation will be required along the flowline right of way, temporary access roads, all borrow pit areas, spoil sites, camp sites and the like. There may also be areas along permanent roads that may also be included should any disturbance have taken place.

[11] Note: excludes requirements for river and wetland which are separately described in the EMP.

Ref.	Activity	Objective	Requirements / specifications	Responsibility	Scheduling	Performance indicator(s)	Training Requirements
3.17.52		Rehabilitation	Remove all temporary works along the construction right of way and restore any damages to original conditions.	**Foster Wheeler**	Immediately following backfilling	Photographic record.	None.
3.17.53		Rehabilitation	Loosen compacted soils along the construction right of way by means of a plough or scarifier. Scarifying areas where topsoil has been removed shall be carried out prior to the replacement of topsoil. Care shall be taken to avoid topsoil inversion if scarifying is carried out in areas where topsoil has not been removed. Any ripping or scarifying operation shall not exceed a depth of 100mm.	**Foster Wheeler**	Immediately following backfilling.	Photographic record.	None.
3.17.54		Prevention Minimisation Rehabilitation	Prevent concentrated run-off along, or next to the construction right of way by shaping the land, establishing vegetation and taking other appropriate measures to absorb and disperse runoff.	**Foster Wheeler**	Immediately following backfilling.	Photographic record.	None.
3.17.55		Rehabilitation	In all cases the backfilled pipeline trench shall be backfilled evenly with topsoil to a minimum depth of 150mm. A soil survey will in addition specify requirements for ameliorating any hostile subsoils. If any sections of the route exist where sufficient topsoil could not be stripped during vegetation clearing, topsoil shall be imported from elsewhere which shall be of the same type as the soil being supplemented and which shall be free of all invasive alien and invader plant species.	**Foster Wheeler**	Immediately following backfilling.	Photographic record.	None.
3.17.56		Rehabilitation	Where the land was naturally armoured with surface rock or stone, after construction, this armouring should be replaced to protect against erosion.	**Foster Wheeler**	Immediately following backfilling.	Photographic record.	None.
3.17.57		Preservation	On slopes steeper than 5%, special protection methods should be used to arrest soil erosion during the period before vegetation reestablishment.	**Foster Wheeler**	Immediately following backfilling.	Photographic record.	None.
3.17.58		Preservation Rehabilitation	Cleared brush and tree limbs should be spread over the construction right of way to assist in the regeneration of natural vegetation, erosion control and provision of habitat for animals. Bush spreading shall be in accordance with the following: Bush, tree limbs and timber fragments should be retained along the right of way and spread evenly across the right of way after construction. Any remaining tree trunks and large branches are to be laid on the construction right of way so that they lie in a random fashion across the natural slope of the ground. Continuous straight lines are prohibited. Tree trunks and large branches are not to be placed in watercourses, gullies, or areas inundated with water.	**Foster Wheeler**	Immediately after backfilling.	Photographic record.	None.

Ref.	Activity	Objective	Requirements / specifications	Responsibility	Scheduling	Performance Indicator(s)	Training Requirements
3.17.59		Rehabilitation	Once reinstatement has been completed, the maintenance period shall commence. The SSS(EM) will verify the suitability of the reinstatement work completed and will confirm the commencement of the maintenance period. Over a period of one year and at three monthly intervals an environmental consultant will review the revegetation process. At any point should revegetation not be deemed to meet the needs of suitable cover with pioneer and secondary species, further reinstatement work may be instructed.	**Foster Wheeler**	Following reinstatement.	SSS(EM) report. Environmental Consultant Report.	None.
3.17.60	**Rehabilitation**	Rehabilitation	Upon completion of construction, immediate rehabilitation will be performed within all parts of the flowline servitude situated outside the permanent maintenance and access road. Revegetation of the servitude will be conducted through the encouragement of natural process of secondary succession, except in areas with steeper gradients and/or highly erodable soils, where the contractor must revegetate disturbed areas using a seed mix not containing any species not indigenous to the area. In order to encourage the establishment of indigenous pioneer (seral) plant communities those areas where soils have been compacted, must be tilled. In those areas where excavation has taken place, stockpiled subsoil and topsoil will be reintroduced in the correct order.	**Foster Wheeler**	Following reinstatement	Photographic record.	None.
3.17.61		Rehabilitation	Rehabilitation of relatively steep (approximately 8°) slopes within the flowline servitude on the banks of the edge of the Govuro River floodplain near the Temane 8 well site, must be revegetated using seeds and plugs of indigenous hydrophytic pioneer species such as *Imperata cylindrica*, *Stenatotaphorum secundatum*, *Dactyloctenium geminatum* and *Dactyloctenium aegyptium*. Diversion ditches, swales, straw and hay will be used on steeps slopes in order to prevent erosion and encourage rapid revegetation. The SSS(EM) in consultation with appointed specialists, will guide the rehabilitation process.	**Foster Wheeler**	Following reinstatement.	Photographic record.	None.
3.17.62		Rehabilitation Preservation	Re-seeding shall only be done in those areas where erosion hazard requires an immediate short-term grass cover. In such cases the specification shall be based on the recommendation of the SSS(EM).	**Foster Wheeler**	As needed.	Photographic record.	None.
3.17.63	**Hydro-testing / pipeline testing**	Avoidance	Water for hydro-testing will be obtained only from production boreholes drilled and approved for the Temane Gas Project.	**Foster Wheeler**	Hydro-testing.	Quantities of water used to be recorded.	None.
3.17.64		Avoidance	No hydrocarbon-contaminated water will be discharged to the environment. Should corrosion inhibitors be used, they should be 'environmentally friendly'.	**Foster Wheeler**	NA	As per requirement. MSDS for corrosion inhibitors used.	None.

Ref.	Activity	Objective	Requirements / specifications	Responsibility	Scheduling	Performance indicator(s)	Training Requirements
3.17.65		Avoidance Prevention	Prior to the commencement of hydro-testing a method statement will be prepared and submitted to Sasol for approval. This statement will include, but not be limited to: o The location and description of the water source; o The volume of water required; o The anticipated quality of the water source (including chemistry and total suspended solids); o The equipment and infrastructure required for the works; o The quality (including concentrations of any chemical additives) of the effluent; o The location and detailed description of the receiving environment into which the effluent will be discharged; o Methods proposed to prevent erosion or any biophysical impacts at the point of water discharge; o Methods proposed to dispose of and rehabilitate any sediment deposited in temporary storage areas prior to discharge; o Methods proposed to ensure that the discharged water quality meets applicable standards as defined by Sasol. o It will be determined whether the effluent water may have any toxic or other effects on aquatic life through accepted bio-assay testing methods. Results of this testing will be submitted to Sasol prior to the release of any effluent. Should toxic effects be identified, then the results should be accompanied by a method statement on how these effects will be avoided or minimised.	**Foster Wheeler**	Prior to hydro-testing.	Submitted and implemented method statement.	None.
3.17.66		Prevention	It will be ensured that no transfer of aquatic organisms between different catchments will take place.	**Foster Wheeler**	During hydro-testing	As per requirement. Description of preventative measures taken.	None.
3.17.67	**Welding**	Prevention	Precautions must be taken to avoid the risk of accidental bush fires.	**Foster Wheeler**	During welding.	Description of precautionary measures taken.	None.

3.18. CIVILS

Ref.	Activity	Objective	Requirements/specifications	Responsibility	Scheduling	Performance indicator(s)	Training Requirements
3.18.1	**Sourcing of construction materials**	Avoidance	Soil and / or sand required for construction purposes should only be obtained from areas approved by the SSS(EM). Sasol shall approve areas based on recommendations and motivations received from the SSS(EM). Soils or sands should not be removed from any river, wetland areas (i.e. areas of periodic inundation) or other sensitive areas.	**Foster Wheeler**	At all times.	All sources and quantities of sand required / used must be specified.	None.
3.18.2	**Sand washing**	Avoidance Prevention	Should sand washing be necessary, a method statement must be submitted to Sasol which should include details of, but not be restricted to, the following: o Any additives to be used in the washing process, including chemistry and environmental status (include MSDS); o Methods for the management of effluent, including TDS and the monitoring thereof; o Measures to prevent erosion as a result of the washing process; o Location of the washing process; o Estimated quantity to be washed and water volumes required; and o Source of water for washing.	**Foster Wheeler**	Prior to sand washing.	Submitted, approved and implemented method statement.	None.
3.18.3	**Batching plant**	Avoidance Minimisation	A method statement must be submitted to Sasol specifying the approach to dust management. Measures could include sprays, division panels, direct feed from silo to mixer, dust screens etc. Dust generated must be minimised as far as possible.	**Foster Wheeler**	Prior to operation of batching plant and during operation.	Monitoring of dust levels in environment.	None.
3.18.4	**Lighting of site**	Prevention	During construction no spotlights shall be pointed away from the site.	**Foster Wheeler**	At all times.	Absence of spotlights directed away from site.	None.

3.19. STEELWORK

Ref.	Activity	Objective	Requirements/specifications	Responsibility	Scheduling	Performance indicator(s)	Training Requirements
3.19.1	**Welding**	Avoidance	Any welding or other sources of heating of materials should be done in a controlled environment wherever possible and under appropriate supervision, in such a manner as to minimise the risk of bush fires and injury to staff.	**All Contractors**	At all times.	Audit findings.	None.

3.20. MECHANICAL

Ref.	Activity	Objective	Requirements / specifications	Responsibility	Scheduling	Performance indicator(s)	Training Requirements
3.20.1	**Pressure testing**	Prevention	Water from pressure testing of pipes / vessels will be routed to the dirty water system. No pollutants will be added to the water used for pressure testing. Should chemical additives be required they should be 'environmentally friendly'.	**Foster Wheeler**	During pressure testing of pipes	As per requirement. MSDS for chemicals used.	None.
3.20.2	**Pipe cleaning**	Prevention Avoidance	Pipe cleaning may involve the use of acid / caustic. This will be managed by a specialist contractor, that will deliver the acid / caustic to site, collect it again prior to any release to the environment and ensure its safe and appropriate disposal.	**Foster Wheeler**	During pipe cleaning.	Certificate of safe disposal by contractor.	None.

3.21. VEHICLE AND MACHINERY USE & MAINTENANCE (INCL. WORKSHOPS) AND REFUELLING

Ref.	Activity	Objective	Requirements / specifications	Responsibility	Scheduling	Performance indicator(s)	Training Requirements
3.21.1	**Vehicle and machinery use – general**	Minimisation	Where possible / practical vehicles and machinery should be equipped with tracks or high flotation tyres so as to minimise the effects of compaction on soils.	**All Contractors.**	At all times.	Percentage of vehicles / machinery using tracks / high flotation tyres. Where applicable, documented reasons for not using preferred equipment.	None.
3.21.2	**Vehicle maintenance**	Prevention	All equipment and machinery is to be maintained in good working order so as to prevent oil, fuel or other such leaks. Vehicle maintenance will only be performed within the CPF site at a designated area. The surface of this area must be either: i) impermeable or ii) be overlain by a disposable absorbent pad (refer to 3.13 for disposal requirements).	**All Contractors**	At all times.	Records of maintenance and inspections. As per requirement.	None.
3.21.3		Prevention	All vehicles must be equipped with temporary sheeting in case of emergency maintenance outside of the CPF site.	**Sasol** **All Contractors**	At all times.	Sheeting in all vehicles.	None.
3.21.4		Avoidance	The area(s) intended for the maintenance of equipment, vehicles and machinery shall be located on an impermeable surface and shall have a drainage and collective sump system (with oil/water separator). No hydrocarbon contaminated water may be voided to the environment.	**Sasol** **All Contractors**	At all times.	Quality of effluent water.	None.
3.21.5	**Vehicle washing**	Prevention	A wash bay(s) shall be designed and constructed at which all vehicle washing will take place. The washbay will be constructed so as to capture all runoff after passing through an oil / water separator. No hydrocarbon contaminated water shall be voided to the environment.	**Sasol** **All Contractors**	At all times.	Quality of effluent water.	None.
3.21.6	**Refuelling**	Avoidance	Fuel transfer shall be performed in a manner to	**All Contractors**	At all times.	As per requirement.	None.

Ref.	Activity	Objective	Requirements / specifications	Responsibility	Scheduling	Performance indicator(s)	Training Requirements
		Prevention	minimise spillage. Fuel transfer should take place over an impermeable surface. Operations personnel shall monitor refuelling operations in order to prevent overfilling.			Incident and corrective action records.	
3.21.7		Prevention	All reasonable precautions must be taken to prevent fuel and lubricant spills during the course of construction. The following must be ensured: o No overfilling of diesel bowsers and equipment tanks. o Regular inspections are performed to verify that no leaking or defective equipment is brought onto site. o Any oils or lubricants discharged during routing vehicle servicing on site are captured using drip trays, containers or other appropriate containment measures.	**Al Contractors**	At all times.	As per requirement.	None.

3.22. BORROW PIT AND QUARRY DEVELOPMENT

Ref.	Activity	Objective	Requirements / specifications	Responsibility	Scheduling	Performance indicator(s)	Training Requirements
3.22.1	**General**	Avoidance	Borrow pit development will be minimised wherever possible, e.g. open one instead of several. The contractor should also take cognisance of the existence of several borrow pits in the area and investigate opening these rather than new pits.	**Foster Wheeler**	NA	Report on borrow pit site selection.	None.
3.22.2		Prevention	Borrow pit and quarry development shall meet all legal and approval requirements.	**Foster Wheeler**	NA	Audit findings.	None.
3.22.3	**Blasting**		See 3.17.11 to 3.17.15				
3.22.4	**Borrow pit development and closure**	Avoidance	The SSS(EM) must be notified and consulted prior to the establishment of any borrow pit. Liaise with local community structures concerning the borrow pit if it is to be located outside of Sasol area.	**Foster Wheeler**	Prior to borrow pit establishment.	Approval by SSS(EM).	None.
3.22.5		Avoidance	If an existing borrow pit is to be reopened, the responsibility for closure and maintenance of the pit must be established. It is suggested that photographic records are kept of such pits (before / after) to establish a baseline condition. The reopening of any borrow pit will first be approved by Sasol based on the results of the foregoing.	**Foster Wheeler**	Prior to reopening borrow pit.	Report on closure and maintenance of borrow pit(s). Sasol approval.	None.
3.22.6		Avoidance Prevention	Prepare a method statement, including plans, detailing the expected quantity of excavation, temporary and permanent drainage control, the final contouring of the borrow pit and the proposed method of rehabilitation. This shall be submitted to the Sasol Environmental Co-ordinator for approval prior to the opening of any borrow pit. The method	**Foster Wheeler**	Prior to establishment or reopening of any borrow pit.	Submitted, approved and implemented method statement.	None.

Ref.	Activity	Objective	Requirements / specifications	Responsibility	Scheduling	Performance indicator(s)	Training Requirements
			statement is to take into consideration the following requirements: o Nature of vegetation and land use of the area of the pit is to be documented. o The topsoil cover over the borrow area shall be quantified before opening the pit. o Topsoil over the area to be excavated shall be removed and safely stored (and vegetated with *Eragrostis teff*), without any modification that might limit its plant support capacity for rehabilitation purposes upon closure of the borrow pit. o Dangerous conditions (e.g. steep slopes, loose and unstable material, holes) shall be made safe for people and livestock. This may necessitate the fencing of the borrow pit during the course of the works. o Spoils shall be smoothed and gradients flattened to 25% slope or less and topsoil placed to a minimum of 300mm over the spoil. o Revegetation shall be guided by the SSS(EM).				
3.22.7		Avoidance	No borrow pit shall be permitted to be used as a waste disposal site, either temporary or permanent.	**Sasol** **Foster Wheeler** **All Contractors**	NA	As per requirement.	None.
3.22.8	**Dust management (quarries and borrow pits)**	Avoidance Minimisation	A method statement must be submitted to Sasol specifying the approach to dust management. Measures could include sprays, division panels, dust screens etc. Dust generated must be minimised as far as possible.	**Foster Wheeler**	Prior to opening of quarry and during operation.	Monitoring of dust levels in environment.	None.

3.23. ROAD CONSTRUCTION

	Activity	Objective	Requirements / specifications	Responsibility	Scheduling	Performance indicator(s)	Training Requirements
3.23.1	**General**	Prevention	Any road development shall be subject to the necessary approvals from the Government.	**Foster Wheeler**	Prior to road development.	Audit findings. Approval documentation.	None.
3.23.2	**Blasting**		As per 3.17.11 to 3.17.15				
3.23.3	**Borrow pit development**		As per 3.22.				
3.23.4	**Aquatic crossings**	Avoidance	No roads shall be constructed across the Govuro River. Road development shall be as per the Foster Wheeler drawing ref. No. 25732-8312-41-1501. No additional road development shall take place unless approved by Sasol.	**Foster Wheeler**	NA	No new or unplanned road or track development.	None.
3.23.5		Avoidance	Should any road crossing need to traverse a	**Foster Wheeler**	NA	As per requirement.	None.

Ref.	Activity	Objective	Requirements / specifications	Responsibility	Scheduling	Performance indicator(s)	Training Requirements
		Prevention	drainage line, wetland or area of temporary or permanent water inundation the requirements of 3.17.28 to 3.17.45 will apply as well as those specified elsewhere in this EMP. Note: such crossings should be avoided wherever possible.				
3.23.6	**Drainage**	Prevention Minimisation	All roads and un-covered soils shall be protected from the effects of sheet wash and storm water damage by reducing the distance that water can flow overland before it is inhibited (slowed down). Drains, berms, humps, side drains, culverts etc. could be used where appropriate. All road development must make provision for proper drainage along the road and for drainage over / under the road to cater for storm events, flooding and any standing or slow moving water. Use shall be made of drains, contours, berms, culverts etc. Particular attention must be paid to measures that will prevent erosion along and on unsurfaced roads.	**Foster Wheeler**	Prior to and during construction.	Photographic record.	None.
3.23.7	**Rehabilitation**		Immediate rehabilitation will be performed along the servitude of the main access road upon completion of construction. Dry sandy loams and clayey loams shall be separately stockpiled from the wet, and more structured soils associated with the hydromorphic sandy loams. The wet and dry soils must be replaced as closely as possible to the site from which they were derived. Revegetation of the servitude will be conducted through the encouragement of natural process of secondary succession. In order to encourage the establishment of indigenous pioneer (seral) plant communities. In order to encourage the establishment of indigenous pioneer (seral) plant communities those areas where soils have been compacted, must be tilled. In those areas where soils have been removed, stockpiled subsoil and topsoil will be reintroduced correct order. Diversion ditches, swales, straw and hay will be used on steeps slopes in order to prevent erosion and encourage rapid revegetation. The SSS(EM), in consultation with appointed specialists, will guide the rehabilitation process.		During and post construction.	Photographic record.	

3.24. LANDSCAPING AND PAINTING

Ref.	Activity	Objective	Requirements / specifications	Responsibility	Scheduling	Performance indicator(s)	Training Requirements
3.24.1	**Landscaping**	Avoidance	The planting of alien plant species for landscaping purposes will not be permitted. The use of kikuyu grass (*Pennisetum clandestinum*) for the creation of lawns will not be permitted, as this species is an aggressive invader of wetland habitats within many regions of southern Africa. Only grass species that are indigenous to the study area should be used for the creation of lawns. Couch grass (*Cynodon dactylon*), Buffalo turf grass (*Stenatotaphrum secundatum*) and LM grass (*Dactyloctenium australe*) are all indigenous to the study area and are popular as lawn species throughout the subtropical parts of southern Africa.	**Foster Wheeler**	At all times.	Absence of alien grass species.	None.
3.24.2	**Painting (colour schemes) – roofs**	Minimisation	Roofs should be painted to reflect the colours of the surrounding woodland bush; in particular the colours of the larger trees. Roofs should preferably be painted a mottled green or if tiles are used, two shades of green tiles randomly installed to create the desired mottled effect (see Figures 5). Proposed roof colours are: o Plascon[12] – Fennel Seed C20-3; and o Plascon – Cactus C22-6. Note: The above represents recommendations with regard to colours and colour schemes, alternatives may be acceptable. Should an alternative be implemented this should be motivated to and approved by Sasol.	**Foster Wheeler**	Painting when possible in terms of project, but to be completed on the basis of 'as soon as possible'.	Roofs painted in acceptable colour specifications.	None.
3.24.3	**Painting (colour schemes) – structures and walls**	Minimisation	Reduce the scale of the buildings and structures and to use complimentary colours that will 'blend' the buildings and structures into the surrounding landscape. Colours should be used in a manner that will break the large vertical surfaces of the taller structures. Buildings shall be painted with horizontal bands of colour starting with the darker tones (light brown) at the base of the structures and then progressively applying lighter colours, with the lightest being near the top of the structure as the upper portions of buildings and structures will be viewed against the sky (See Figure 5). Proposed building and structures colours are: o Plascon – Wheat Germ C14-4; o Plascon – Celery C21-3; and o Plascon – Pear Salad C18-3. Note that all colours shall be matt, not glossy, to	**Foster Wheeler**	Painting when possible in terms of project, but to be completed on the basis of 'as soon as possible'.	Buildings and structures painted in colour(s) to achieve 'blending' and 'reduction of scale'.	None.

[12] Plascon paints are specified only to fix the colour scheme. Equivalent colours from other manufacturers would also be acceptable.

Ref.	Activity	Objective	Requirements / specifications	Responsibility	Scheduling	Performance Indicator(s)	Training Requirements
			reduce reflection and glare from painted surfaces. Note: The above represents recommendations with regard to colours and colour schemes, alternatives may be acceptable. Should an alternative be implemented this should be motivated to and approved by Sasol.				

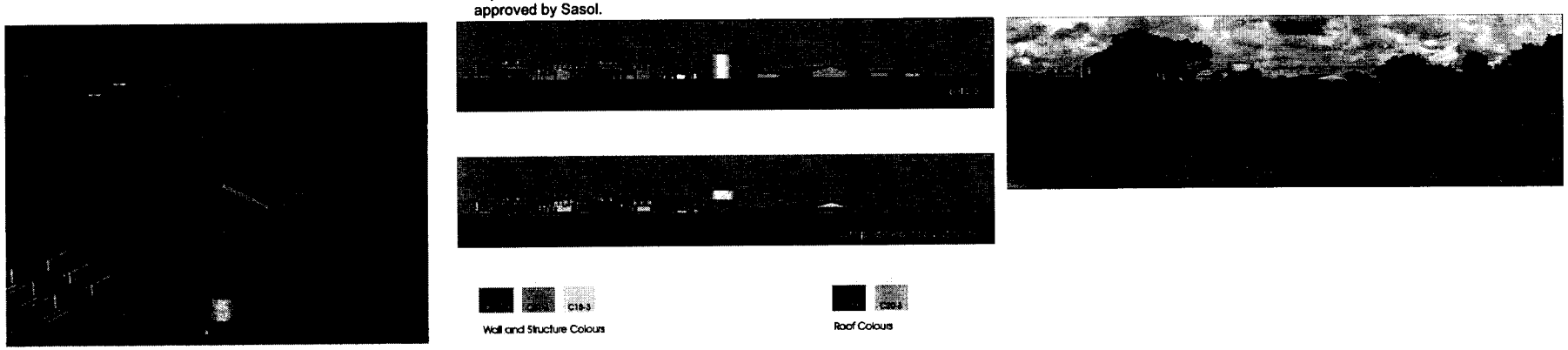

FIGURE 5. SIMULATIONS OF THE CPF SITE PAINTED IN THE COLOUR SCHEME AS SPECIFIED

3.25. LAND USE CONTROLS

Ref.	Activity	Objective	Requirements / specifications	Responsibility	Scheduling	Performance Indicator(s)	Training Requirements
3.25.1	**Access along flowline routes and access roads**	Minimisation	The network of permanent maintenance and access roads which will be situated along flowlines within the production blocks, may lead to increased accessibility to sensitive habitats. Such increased accessibility is likely to lead to the degradation or even loss of such habitats as a result of settlement and cultivation and over-utilisation of natural resources. It is therefore recommended that access along flowline maintenance and access roads that lead to areas containing sensitive habitats should be controlled. The proponent should appoint guards to monitor activities along these roads, and where necessary boom gates should be installed at points where access can be gained to the road from existing public roads. Such measures should only be implemented after consultation with the 'Dirrecao Nacional de Florestas e Fauna Bravia' and other relevant Government departments.	**Sasol**	As early as possible	Minutes of meeting(s) with the 'Dirrecao Nacional de Florestas e Fauna Bravia' and other relevant Government departments. Documentation supporting decision taken.	None.

4. PERFORMANCE ASSESSMENT, REVIEW & CORRECTIVE ACTION

The assessment of performance has three key aims:

i) Confirmation of compliance to the requirements as set out in the EMP, i.e. Sasol / contractor performance;

ii) Measurement of environmental performance (degree of success of the EMP and its specifications); and

iii) Ensuring that any deficiencies in the EMP are identified and remedied.

These aims shall be met by making use of three important tools: monitoring, auditing / inspections and management review. Corrective action will be critical in ensuring that any identified problem areas are effectively addressed. Specifications for monitoring, auditing and review are provided in the sections that follow. Each contractor will produce procedures for monitoring, auditing and inspections, management review and corrective action that will address the requirements of this section and will be submitted to Sasol as a component of the required method statements.

4.1. ENVIRONMENTAL MONITORING STRATEGY

A monitoring[13] strategy must be defined to ensure that the effectiveness of mitigation measures can be tracked and corrective action (see 5.4) identified as necessary. Note that monitoring shall be intended to evaluate the effectiveness of environmental management, independent of whether the specifications in the EMP have been complied with. Proper monitoring will enable any impacts of the project on the environment to be detected as early as possible and corrective action implemented as required.

Table 3 defines, in broad terms, the monitoring requirements necessary during the construction phase of the project. Where monitoring is specified as a requirement, the responsible party will develop a monitoring, measurement and reporting procedure that will outline:

- The monitoring objectives;

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[13] Monitoring is a process of surveillance, based on specified approaches and schedules, used to detect whether any changes have occurred in the predefined, quantifiable properties of the particular environment under consideration.

- A detailed description of the required monitoring measures, including responsibilities, parameters to be measured, methods to be used, sampling locations, frequency of measurement, detection limits and the definition of thresholds that will signal the need for corrective actions (see 5.4);

- The approach to the analysis of results and the identification of activities and impacts requiring corrective action; and

- Reporting requirements, with defined responsibilities, to ensure early detection of conditions that require corrective action and approach to initiating corrective action.

TABLE 3. MONITORING REQUIREMENTS. NOTE THAT IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO ENSURE THAT ADEQUATE MONITORING IS UNDERTAKEN TO DEMONSTRATE COMPLIANCE TO THE REQUIREMENTS OF THE EMP. IN SOME CASES PERFORMANCE INDICATORS HAVE BEEN INDICATED IN THE EMP STANDARD AND THUS ADDITIONAL MONITORING MAY BE REQUIRED IN ADDITION TO THAT PRESENTED IN THE TABLE.

Performance indicator / parameters to be monitored	Monitoring location	Frequency of monitoring	Threshold / detection limits	Reporting	Responsibility
Sewage effluent quality	Sewage outfall(s)	Daily or prior to release.	Accepted international standards, e.g. World Bank, WHO.	Report to Sasol Co-ordinator Environmental	Foster Wheeler
Site effluent (incl. runoff) water quality	All site outfalls	Prior to release from site.	Accepted international standards, e.g. World Bank, WHO.	Report to Sasol Co-ordinator Environmental	Foster Wheeler
Groundwater quality	Upgradient and downgradient of site.[14]	Baseline to be obtained as early as possible. Quarterly sampling	Accepted international standards, e.g. World Bank, WHO.	Report to Sasol Co-ordinator Environmental	Foster Wheeler
Leachate quality from waste site(s)	Waste site leachate pit.	On occurrence, at least quarterly.	Accepted international standards, e.g. World Bank, WHO.	Report to Sasol Co-ordinator Environmental	Foster Wheeler
Environmental dust	Boundary of CPF site and selected points based on the location of communities.	Baseline to be obtained prior to the initiation of construction. Thereafter monitoring biweekly as a minimum.	Accepted international standards, e.g. World Bank, WHO.	Report to Sasol Co-ordinator Environmental	Foster Wheeler

[14] Note: Groundwater monitoring boreholes are still to be sited and drilled.

Performance indicator / parameters to be monitored	Monitoring location	Frequency of monitoring	Threshold / detection limits	Reporting	Responsibility
Noise levels	Boundary of CPF site and selected points based on occurrence of communities.	Baseline to be obtained prior to the initiation of construction. Thereafter monitoring as necessary.	Accepted international standards, e.g. World Bank, WHO.	Report to Sasol Environmental Co-ordinator	Foster Wheeler
Water quality in all pans and wetlands prior to, during and after construction	All pans and wetlands to be disturbed as a result of construction activities.	Baseline to be obtained prior to the initiation of construction. Daily monitoring during construction. Weekly monitoring for a minimum of one month after construction.	Accepted international standards, e.g. World Bank, WHO.	Report to Sasol Environmental Co-ordinator	Foster Wheeler
Water quality in the Govuro River	Upstream and downstream of crossing site. (Liase with the relevant Government Authority).	Baseline to be obtained prior to the initiation of construction. Daily monitoring during construction. Weekly monitoring for a minimum of one month after construction.	Accepted international standards, e.g. World Bank, WHO.	Report to Sasol Environmental Co-ordinator	Foster Wheeler
Vegetation monitoring of rehabilitated areas disturbed during construction of flowlines and the main access road. Vegetation monitoring should be aimed at establishing the success of	Permanent monitoring sites along flowlines and the main access road. Monitoring sites should be selected so	Biannually in first year. Yearly for the next four years.	Deviation from baseline data.	Sasol Environmental Co-ordinator	Sasol (SSS(EM))

Performance indicator / parameters to be monitored	Monitoring location	Frequency of monitoring	Threshold / detection limits	Reporting	Responsibility
revegetation of disturbed areas by seral plant communities. species). Emphasis should be placed on fixed point photographic monitoring, as this is a rapid, cost effective and easily repeatable method of monitoring. At each monitoring site use should also be made of permanent plots for gathering of data pertaining to the vegetation structure of rehabilitated areas and immediately adjacent undisturbed vegetation. The following data should be gathered within each plot: density data (stem counts of woody species) and canopy cover estimates for each species (both woody and herbaceous species).	as to include sites within all major plant communities/habitat types occurring along the flowlines and access road.				

4.2. SITE INSPECTION AND AUDITS

Inspections and audits will be conducted to evaluate compliance to the requirements of the EMP. Section 4.2.1 defines the site inspection requirements and associated responsibilities for the construction phase of the project. Section 4.2.2 defines the auditing requirements for the construction phase of the project.

4.2.1. SITE INSPECTIONS

The SSS(EM) will undertake regular inspections of all works (including contractor sites and storage facilities) and campsites so as to identify any project activities or components that are causing, or may cause, a potential environmental impact. Site Supervisors of each Contractor will also undertake regular inspections for the same purpose. Inspections will be ongoing and will form part of the day to day function of the SSS(EM) and Contractor Site Supervisors. The SSS(EM) will immediately bring any identified non-conformances to the attention of the responsible party for rectification. Any potential problem areas will be logged and managed as per the requirements of 4.4 (non-conformance and preventive action).

4.2.2. AUDITS

The main goals of an EMP audit are to evaluate compliance with stipulated EMP requirements, to identify any non-conformance and to assess whether objectives and targets have been achieved.[15] An audit programme and procedure shall be developed by Sasol to ensure that they are sufficiently comprehensive and scheduled.

Auditing must consider the results obtained from monitoring to assess whether objects and targets have been met, and whether there is any non-conformance with stipulated EMP and legal requirements. The audit must also assess whether EMP implementation has been undertaken according to planned arrangements and that the EMP itself is being appropriately updated. The audit shall confirm that any identified corrective action has been undertaken and assess the effectiveness of that action.

Sasol shall develop a procedure for conducting EMP audits that shall incorporate details of:

- Audit approach

[15] Auditing of contractor performance against the EMP will be based on the concept of 'deemed to satisfy'. If the contractor, complies with the project specification then his/her/its contractual obligations will have been met.

- Scheduling
- Reporting
- Responsibilities

Table 4 defines the minimum requirements in terms of audit types and frequency that will be conducted during the construction phase of the project.

TABLE 4. MINIMUM AUDITING REQUIREMENTS FOR THE CONSTRUCTION PHASE OF THE TEMANE GAS FIELDS PROJECT.

Nature and scope of audit	Conducted by	Reported to	Frequency of audit
Internal EMP compliance audit – all works including contractor yards, campsites etc.	SSS(EM) Sasol Environmental Co-ordinator as necessary.	Sasol Environmental Co-ordinator and Contractors	At least monthly.
External EMP compliance audit - all works including contractor yards, campsites etc.	Independent consultant – appointed by Sasol	SSS(EM) Sasol Environmental Co-ordinator MICOA	At least quarterly.
Demobilisation audit All works, requirements, campsites, storage areas etc. related to the demobilising contractor. The SSC(EM) shall verify that the requirements of the EMP have been met. Where not, the Contractor, shall rectify the defects prior to project completion. The SSC(EM) shall produce a final audit report. The report shall include: A defects list for rectification by the contractor. Certification that, subject to the rectification of the identified defects, the environmental requirements of the EMP have been met. An assessment of the effectiveness of the EMP in managing the project impacts. Recommendations for any necessary post-contract maintenance and monitoring. Recommendations for further auditing following rectification of defects by the Contractor.	Sasol Environmental Coordinator with the assistance of an environmental consultant where required.	Sasol Project Manager and EPCm Contract Manager	Prior to demobilisation by any contractor
Government audit As per the requirements of Government.	MICOA	Sasol	As requested by Government

Note for Contractors:

1. It is in the nature of environmental auditing to be conservative. Wherever latitude exists in interpretation, the auditor will take the most conservative (worse-case) stance. Credit will only be given to the Contractor for management actions that demonstrably comply with the project standard.

4.3. REVIEWS

Sasol Management shall establish an environmental committee that will include as a minimum the SSS(EM), a member of the CTT and Contractor Site Supervisors for environmental management. This committee shall meet on at least a weekly basis to review environmental performance, including incidents/non-conformances reported, corrective actions implemented, monitoring results and EMP compliance. The meeting shall be documented.

In addition, a management review meeting shall be held on a quarterly basis to review the status of EMP implementation and to ensure the continued effectiveness of the EMP as well as its appropriateness. The review meeting will be attended by the SSS(EM), a member of the CTT, the Sasol Environmental Co-ordinator and the Sasol Project Manager. The meeting shall be documented.

The management review should:

- Review EMP objectives and evaluate the need for new or revised objectives;
- Set new objectives as appropriate;
- Evaluate environmental performance and the effectiveness of the EMP by reviewing monitoring and audit results;
- Evaluate changing circumstances and how these may influence and be reflected in the EMP. This could include changes to permits, contracts, loan agreements etc; and
- Examine the results of any action items from the previous management review meeting.

4.4. CORRECTIVE AND PREVENTIVE ACTION

The need for setting corrective action will arise from deviations from:

- A predetermined baseline or limit (as detected through monitoring); or

- EMP requirements.

In this regard, the EPCm Contractor shall establish an incident and non-conformance reporting procedure which shall be approved by Sasol and to which all contractors will be required to comply. This procedure must be implemented prior to the initiation of any works.

The procedure shall include details for:

- Ensuring the recording of incidents / non-conformances;
- Reporting channels for incidents / non-conformances; and
- The identification of corrective and preventative action measures.

Corrective actions shall be identified based on incident / non-conformances reported and on the results of EMP monitoring, EMP audits and/or management review. Corrective action should result in:

- The implementation of a specific action to remedy the identified deficiency(ies); or
- A change to the targets or objectives set in the EMP[16]; and
- Corrective actions implemented shall be documented.

Should it be considered by Government Authorities that construction activities are causing unacceptable environmental damage, Foster Wheeler will immediately consult with Sasol and agree in consultation with the Government, the remedial measures to be taken. Such agreed measures shall be undertaken immediately to prevent further damage and to repair any damage that may have occurred.

Should Foster Wheeler (or its appointed contractors) fail to commence any remedial measures within a reasonable period of time following the receipt of written instruction from Sasol to do so, then Sasol may undertake these measures at the cost of Foster Wheeler.

[16] Modification to the EMP may only be made by the Sasol Environmental Co-ordinator based on the recommendations of the SSS(EM). Any changes will be handled as per 10.

5. COMPETENCY, TRAINING AND AWARENESS CREATION

Those persons who are involved in activities that could result in an environmental impact(s) must receive appropriate training. Contractors shall ensure that training is provided such that all employees are made aware of Sasol's undertaking to conduct the proposed activities in a manner that is respectful to local people, their land and resources and sensitive biophysical habitats. Training will take the form of, but not be limited to: induction training, use of educational posters and daily environmental discussion topics prior to the start of each shift.

During these training sessions, the following principles should be presented / discussed:

- Sasol's corporate environmental, health and safety policies and applicable Mozambican environmental regulations.
- EIS and EMP commitments.
- Restrictions and procedures for operations.
- Restrictions and procedures for collection, treatment and disposal of waste and hazardous substances.
- Statement and clarifications of Sasol's communications policies.
- Fire fighting procedures.
- Procedure for emergency response.
- Procedures for incident reporting and handling.
- Need to refrain from destruction of animals and plants, indiscriminate defecation, waste disposal and/or pollution of local soil and water resources.

6. CONTINGENCY PLANNING

Contractors and Sasol shall make financial provision for unforeseen potential impacts that may require specific mitigation / management measures.

7. EMERGENCY PREPAREDNESS AND RESPONSE

The EPCm contractor shall establish and maintain procedures to identify the potential for, and to respond to accidents and emergency situations in accordance with recognised international standards. The procedure(s) shall also address measures to prevent such situations and to mitigate environmental impacts that may be associated with them.

The emergency procedure(s) shall include the establishment of a network of communication between Sasol, Contractors, available emergency services including police, traffic police, local medical and ambulance services, fire departments, community associations, specialist services etc., that may be available.

The emergency plan shall be tested on a regular basis through the use of drills and mock emergencies so as to identify and rectify any shortcomings.

8. IMPLEMENTATION SCHEDULE AND COST PROVISIONS

The requirements of this EMP shall be implemented prior to the initiation of any construction activity.

Costs associated with the implementation of the EMP will form part of the total project and contract costs as applicable.

9. REPORTING REQUIREMENTS

All reporting will be as per the organogram presented as Figure 1 of this report, i.e. the contractor site supervisor(s) shall report to the SSS(EM) who shall report to the Sasol Environmental Co-ordinator. The Sasol Environmental Co-ordinator will ensure reporting to the Sasol Project Manager.

In addition to all reporting requirements identified in the EMP, records shall be kept of all monitoring results, monitoring reports, incident records, audit reports and management reviews. Minutes of all environmental project meetings shall be submitted to the Sasol Environmental Co-ordinator.

All reports will be managed as per the requirements of 10.

10. DOCUMENT CONTROL

The EMP forms the basis for environmental management on site. Based on the results of the performance assessment and review process (4), the EMP may be modified as the project progresses.

Modifications will only be permitted by the Sasol Environmental Co-ordinator who shall retain a single master copy of this EMP. All changes to the EMP shall be tracked, including details of the change, date of the change and name of the reviewer. The Sasol Environmental Co-ordinator will ensure that any modifications are communicated, explained to and discussed with all affected parties (i.e. the authorities, the contractors, the SSS(EM) and any directly affected party who requests this information).

Sasol shall prepare a document control procedure to which all contractors shall comply. This procedure shall define:

- Document distribution
- Document retention
- Management of EMP revisions.

Russell Gillespie **Guy Wiid**

For Metago Environmental Engineers (Pty) Ltd

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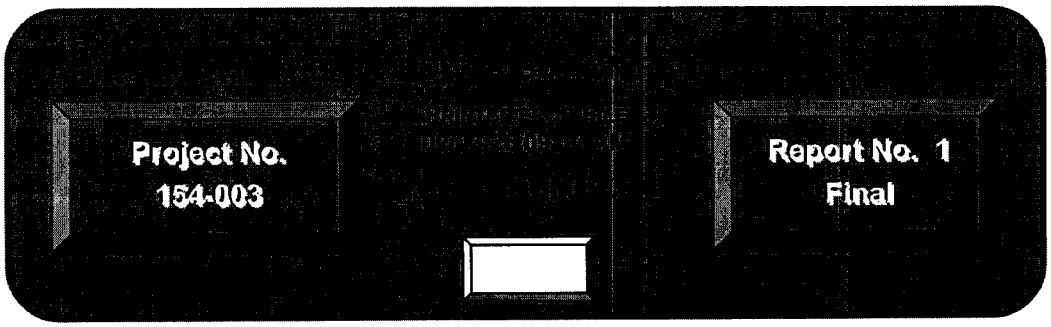
For Sasol Petroleum Temane Limitda

Record of Document Changes			
Date of change	**Detail of change**	**Reviewer**	**Signature**



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TITLE	CONSTRUCTION CMP FOR SASOL TEMANE NATURAL GAS PROJECT: CENTRAL PRODUCTION FACILITY, FLOWLINES AND WELL HEAD SITES
PROJECT FOR:	Metago Environmental Engineers
DATE:	02/03/2002
STATUS OF REPORT	Final
PREPARED BY:	DE CASTRO & BRITS
AUTHOR	A. (Tony) de Castro

CONSTRUCTION CMP FOR SASOL TEMANE NATURAL GAS PROJECT: CENTRAL PRODUCTION FACILITY, FLOWLINES AND WELL HEAD SITES

BACKGROUND

In the Environmental Impact Assessment report compiled from the Temane Production Block by Mark Wood Consultants (2001), a baseline ecological assessment of the Temane Production Block and the Exploration Area as a whole is provided. The current report is intended to provide a practical Environmental Mitigation Plan for the infrastructural components associated with the Temane Production Block on the basis of the baseline assessments provided by Mark Wood Consultants. These infrastructural components are as follows:

- Central Processing Facility (CPF)
- Main Access Road to the CPF
- Flow Lines
- Access Roads to Well Sites
- Well Sites.

In the EIA the need to conduct an ecological survey of the flow lines situated within sensitive habitats was identified. The flow lines identified were the flow line linking the Temane 8 and Temane 9 well sites (situated within the riparian and floodplain habitats of the Govuru River, and the flow lines linking the CPF to the Temane 1, Temane 5 and Temane 6 well sites (on the basis of satellite imagery potentially crossing large forest patches). For the majority of its length the flow line linking the CPF to Temane 1 is aligned along the access road to Temane 7, and only the section situated between Temane 1 and a point due east on the Temane 7 access road was surveyed. As part of the current survey the above-mentioned flow lines were briefly surveyed on the 5th and 6th of February 2002.

Section 1 of this report provides a baseline description of the ecosystems occurring along the above-mentioned flow lines, and provides measures for the mitigation of flow line construction within these ecosystems. Section 2 of this report provides mitigation measures for the construction of all other infrastructural components associated with the Temane Production Block.

Potentially sensitive habitats that could possibly be influenced by the above-mentioned infrastructural components were identified using the available aerial photographs, satellite imagery and topographical maps of the area, as well as on the basis of the information contained in the Environmental Impact Assessment report compiled from the Temane Production Block by Mark Wood Consultants (2001), and the authors personal experience of the area. The identified areas of potential sensitivity were then briefly surveyed during the site visit.

SECTION 1: Flow lines situated within the Govuru River wetlands and large forest patches

The Govuru River wetland habitats affected by the flow line between the Temane 8 and Temane 9 well sites, and the terrestrial habitats affected by the flow lines linking the CPF to well sites 1, 5 and 6, are discussed separately below.

Govuru River Crossing

Two alignments for the Govuru River crossing have been suggested by the Engineers and Mark Wood Consultants (see EMP). The alternative alignment proposed by Mark Wood Consultants (locality: 21° 44' 09" S, 35° 08' 13" E) crosses the active channel bank at a point approximately 600m to the north of the original crossing point recommended by the engineers (locality: 21° 43' 48" S, 35° 08' 10" E). Large areas of permanent and seasonal wetland are associated with the Govuru River and its floodplain. The extensive, diverse and highly productive aquatic and wetland habitats of the study area provide important habitat for a wide diversity of plant and animal species, many off which are restricted to such habitats. These habitats support eight (7 birds and 1 anuran amphibian) of the 35 Red Data listed animal species recorded in the Temane Exploration area, and provide important habitat for several of the remaining 27 species Red Data species.

Habitat description

The Govuru River catchment is relatively small (approximately 11 000 km^2) and is situated entirely within the Exploration Block. The river runs from south to north more or less parallel to the coastline and its estuary is situated in the large mangrove swamp system that is continuous with the mangrove system occurring within the Save River estuary. Mean annual rainfall within the catchment is between 800 and 1 000mm, and flows are low in winter, varying from 0.3 to 3.0 m^3/s (Telford & De Castro August 2001).

The two suggested alignments of the Govuru River crossing are situated along a reach of the river where the floodplain extends for approximately 1.4 km's on either side of the macro-channel. Halophytic plant species were not recorded within the wetland habitats of this reach of the Govuru River and it is likely that the water in these wetland systems contains low levels of salinity. The soils of almost the entire floodplain consist of deep sands (no impermeable clay or rock strata where detected within 1m of the substrate surface), though outcrops of limestone do occur at the point where the alternative alignment crosses the active channel.

The major habitat types identified within the Govuru River and its floodplain on the basis of physical habitat characteristics and vegetation structure are briefly described below. Examples of the major habitat types described below are shown in the aerial photograph provided in Appendix 1.

- Active-channel (Figure 1)

The active channel is approximately 50m in width. At both alternative crossing sites the active channel consists of a deep (greater than 2m in depth) fast flowing section bordered by shallow (approximately 0.6m in depth) terraces with slower flowing water. The deep, fast flowing channel is devoid of vegetation whereas the shallow terraces are densely vegetated by a low diversity of rooted, hydrophytic (aquatic) plant species with submerged or floating leaves. The dominant species is *Nymphaea nouchalli* subsp. *zanzibariensis*. *Potamogeton schweinfurthii* is abundant between stands of *Nymphaea* and *Ludwigia* sp. occurs sporadically within *Nymphaea* and *Potamogeton* stands. At the alternative (northern) crossing point there is a large backwater where the channel has been forced to change course in a north-westerly direction as a result of the presence of a lime stone outcrop on the east bank of the river. This vegetation of this backwater is dominated by dense emergent stands of *Phragmites australis* that have colonised the sediments deposited by the river as a result of low flow speeds.

- Active-channel banks (Figure 1)

The dominant species is the emergent sedge *Cladium mariscus* subsp. *jamaicense.* This species forms dense, and almost monospecific stands along the active channel banks and adjacent levees. These *Cladium stands* seldom extend further than approximately 30m inland from the active channel banks. *Cladium mariscus* is an obligate rheophyte (species that area adapted to regular flooding by fast flowing water and the accompanying conditions of sheer stress and indundation) that has water dispersed achenes (Gordon-Gray 1995). Between these *Cladium mariscus* stands there are numerous patches of dense hydrophytic grassland. The dominant species is *Chrysopogon* sp. Other common species include *Imperata cylindrica*, *Hemarthria altissima, Leersia hexandra, Panicum* sp., *Dactyloctenium geminatum, Pycreus macrostachys, Juncus* cf. *kraussianus*, *Pentodon pentandrus*, *Centella asiatica, Rumex* cf. *lanceolatus* and *Cuscuta* sp.

- Floodplain (Figures 2, 3 & 4)

The dominant species is *Typha capensis*. This species forms dense, almost monospecific stands throughout most of the floodplain. In shallow depressions within these *Typha* stands there are numerous small pans or depressions vegetated by the hydrophyte *Nymphaea nouchalli* subsp. *zanzibariensis*. *Ludwigia* sp. is a submerged hydrophyte that is commonly associated with *Nymphaea* in these pans. Emergent hydrophytes such as *Phragmites australis, Fuirenia* spp., *Eleocharis* sp. and *Schoenoplectus* spp. are commonly associated with the margins of these pans.

In slightly elevated areas between the *Typha* stands there are numerous small patches of hydrophytic grassland. The dominant species is *Chrysopogon* sp. Though dominant in this habitat throughout vast areas of the Govuru floodplain, this *Chrysopogon* sp. is a new record for this area of Mozambique, and is likely to be an un-described species (pers. com. L. Fich of the National Botanical Institute in Pretoria). Common species include *Andropogon eucomus, Imperata cylindrica*, *Fuirenia* spp., *Pycreus macrostachys*, *Bulbostylis* sp., *Dactyloctenium geminatum, Juncus* cf. *kraussianus*, *Pentodon pentandrus*, *Centella asiatica, Urticularia* sp. and *Cuscuta* sp.

- Islands within floodplain (Figure 5)

Various large islands occur throughout the floodplain. The soils consist of white to yellow sands with a thin organic horizon. These islands are characteristically fringed by dense stands of *Phoenix reclinata* and *Hyphaene coriacea*. *Antidesma venosum* is often associated with this fringing palm community. The vegetation of the islands consists of closed woodland with patches of thicket and comprises part of the vegetation classified as 'Mixed *Brachystegia* woodland and deciduous forest mosaic' (Telford and De Castro, August 2001). Common trees include *Julbernardia globiflora, Brachystegia spiciformis, Brachystegia* cf. *utilis, Kigelia africana, Albizia forbesii, Trichelia emetica, Ozoroa obovata, Albizia versicolor, Tamarindus indica* (restricted to termite mounds), *Plectroniella armata, Manilkara mochisia* and *Strychnos potatorum*. Common shrubs include *Alchornea laxiflora, Margaritaria discoidea, Turrea nilotica, Grewia sulcata, Dovyalis longispina, Phyllanthus* cf. *reticulatus, Tarenna* sp*., Gymnosporia* sp., *Dichrostachys cinerea, Combretum* cf. *bracteosum* and *Vitex ferruginea.* Common species in the herbaceous layer include *Perotis patens, Digitaria* sp., *Eragrostic ciliaris, Bulbostylis* sp., *Gloriosa superba* and *Sansevieria hyacinthoides*.

Numerous small (approximately 100m^2 or less) islands formed of termite mounds occur scattered throughout the floodplain. Dense stands *Phoenix reclinata* grow along the fringes of these islands. A single (sometimes 2 or 3) large tree usually grows on the central parts of each island. These trees usually belong to one of the following species: *Trichelia emetica, Ficus* sp., *Tamarindus indica, Antidesma venosum* and *Mimusops obtusifolia*.

Sensitive habitats

Wetlands are remarkably resilient ecosystems, and if construction of the flow line is undertaken during the dry season, the sensitive habitats described below are avoided, and the recommended construction mitigation measures are strictly adhered to, then it is expected that the natural process of secondary succession will rapidly lead to the revegetation of disturbed areas by indigenous pioneer (seral) plant communities. These seral plant communities comprise species that occur in undisturbed wetland areas adjacent to the pipeline servitude, and are likely to revegetate disturbed areas rapidly. Furthermore, it is considered unlikely that any threatened plant or animal species will be directly impacted by disturbance of habitat within the construction servitude. It must however be emphasised that the above is only applicable if, as expected, construction does not disturb any impermeable horizon in the substrate or modify surface flows through the wetland systems. If an impermeable horizon occurs and it is disrupted, this may lead to dewatering of the wetland that may have severe negative impacts on all riparian and floodplain habitats. The biology of these riparian and floodplain habitats is very poorly known, as illustrated by the fact that one of the dominant plant species, namely *Chrysopogon* sp., is likely to be an as yet un-described species. The riparian and floodplain habitats of the Govuru River, as a whole, must therefore be regarded as a sensitive ecosystem.

Sensitive habitats that must be avoided by the finally selected flow line alignment are briefly listed and discussed below.

- Islands in floodplain: Islands (both those formed by termite mounds and larger islands formed by sediment deposition or elevated dune crests that have resisted erosion) comprise an important component of habitat diversity within the Govuru wetlands, though they occupy a limited area. These islands also act as crucial wildlife refuges during flood periods. Construction of the flow line through these islands may lead to channelled flows through the pipeline servitude and create increased rates of erosion that may disturb or completely remove these islands.
- Floodplain pans: Provide restricted but important breeding and feeding areas for various animal species, especially fish, birds and amphibians, many of which are largely dependant on such habitats for the completion of their life cycles.
- Limestone outcrops along the active-channel: These outcrops are crucial in determining channel morphology and hydrological patterns, which in turn play and important role in determining habitat diversity and ecosystem functioning. Trenching through these outcrops may create nick points that could lead to artificially channelled flows and modification or destruction of riparian and floodplain habitats.
- Backwater situated directly upstream of limestone outcrop on east bank of the river at the alternative crossing point: Compromises part of a restricted habitat type within the Govuru River wetlands, and is likely to be an important breeding and feeding area for numerous animal species, especially fish and bird species that utilise such backwaters as preferred breeding and/or feeding areas.

Mitigation

- Route alignment

Both the original and the alternative crossing points are regarded as suitable, providing that minor alterations to the proposed alignments are implemented in order to avoid the sensitive habitats listed above. A geo-technical survey of the selected route alignment should be conducted in order to insure that no impermeable horizon within the substrates of the selected alignment servitude are affected.

- Construction methods and rehabilitation

Mitigation measures for construction are provided in Section 2 of this report.

Flow lines linking the CPF to well sites 1, 5 and 6

In the EIA compiled by Mark Wood Consultants, examination of satellite imagery indicated that the flow lines linking the CPF to the Temane 1, Temane 5 and Temane 6 well sites may have been situated within large patches of un-transformed tall forest. Such forest patches within the vegetation type that occurs within this area (Mixed *Brachystegia* Woodland and Decidious Forest Mosaic) are characterised by canopy species such *Brachystegia* cf. *utilis, Cordyla africana, Pteleopsis myrtifolia, Hymenocardia ulmoides*, *Afzelia quanzensis, Milletia stuhlmanii, Adansonia digitata, Carpodiptera africana* and *Albizia forbesii.* The dense understory comprises of many woody climbers and is characterised by species such as *Xylotheca kraussiana, Acacia*

cf. *adenocalyx, Landolphia kirkii, Uvaria gracilipes, Monodora junodii, Grewia* spp., *Diospyros natalensis* and *Baphia massaiensis*. Such forests are regarded as sensitive habitats as a result of their restricted are of occupancy and unique assemblages of constituent plant and animal species.

Habitat description

During the current survey, examination of the available aerial photography and groundtruthing was conducted along the three above-mentioned flow lines in areas described in the satellite imagery maps as 'Tall Canopy Forest'. Groundtruthing and the examination of aerial photographs have shown that these patches of 'Tall Canopy Forest' are in fact patches of dense short thicket (with numerous emergent trees) on sandy soils of ancient dune crests (see Figure 6). Such patches of dense short thicket are widespread with the 'Mixed *Brachystegia* Woodland and Decidious Forest Mosaic' vegetation type of the study area, as well as in other vegetation types within the exploration block and to the south of the exploration block along the northern sections of the Temane-Ressano Garcia gas pipeline route. Common trees include *Tamarindus indica* (restricted to termite mounds), *Strychnos potatorum, Strychnos madagascariensis, Strychnos spinosa, Combretum molle, Combretum hereoense, Spirostchys africana, Acacia karoo, Albizia forbessi, Berchemia discolor* and *Lannea schweinfurthii* var. *stuhlmanii.* Common shrubs include *Hymenocardia ulmoides, Clerodendrum glabrum, Sapium itegerrinum, Olax dissitiflora, Margaritaria discoidea, Dichrostchys cinerea, Vitex ferruginea, Uvaria gracilipes, Hugonia orientalis, Monodora* cf. *junodii* and *Artabotrys brachypetalus*. Common to dominant species in the sparse herbaceous layer include *Digitaria* sp., *Panicum maximum* and *Pogonarthria squarossa.*

Proposed route alignment

No alterations to the currently proposed flow line alignments are envisaged as necessary.

Mitigation of Construction Impacts

No specific mitigation measures are required. The general mitigation measures that are applicable to all flow lines (see Section 2) are regarded as adequate.

SECTION 2: Mitigation

It should be emphasised that the successful interpretation and implementation of the mitigation measures proposed here is dependent on the continual presence of an environmental site officer (ESO) during the construction of all the various infrastructural components proposed for the Temane Production Block. This ESO should have a sound knowledge of the ecology of the area and should have access to specialist input wherever he deems this necessary.

Alterations to alignment/location of construction camps and well sites

The ESO should survey all proposed construction camp sites, well sites in order to ensure that impacts on the biological environment are kept to a minimum and are of acceptable levels. Wherever possible construction camps should be located within secondary vegetation of previously disturbed areas.

The exact location of each of the proposed well sites will only be determined on the basis of the results of the seismic exploration programme that has yet to be finalised. The finally selected location of each well site must also be subjected to a survey by the ESO in order to ensure that impacts on the biological environment are kept to a minimum and are of acceptable levels. Alterations to the location of two of the proposed well sites are however recommended on the basis of the preliminary locations provided.

The Temane 3 well site is situated in very close proximity to, and possibly within the permanent wetland areas of the Govuru River floodplain. The final location of this well site must not be situated within the temporary or permanent wetland habitats of the Govuru River floodplain if at all possible.

The Temane 9 well site is situated in close proximity to, and possibly within, the eulittoral zone (seasonally flooded zone) of a small barrier lake. The final location of this well site must not be situated within 50m of the eulittoral zone (seasonally or periodically flooded zone) of the barrier lake.

Construction of flow Lines, main access road, well sites and the CPF site

Flow Lines

- The width of the flow line servitude is 20m and all construction activities must be restricted to the width of the servitude.
- An ESO with a sound understanding of the ecology of the area, is to be on site at all times during construction.
- Within the servitude, topsoil should only be removed from the area to be excavated for the trench within which the pipe is to be placed, and from the access road within the servitude. Topsoil and vegetation 'rootstock' is to be left in place within the rest of the servitude. The access road must become the all weather maintenance and access road that will be required during the operation phase, and the width of this road will not exceed 6m.
- Topsoil removed from the trench and the access road must be separately stockpiled within the servitude. Topsoil should be placed in piles not exceeding 1.5m in height, so as to avoid compaction, and should be placed along the edge of the servitude. These topsoil stockpiles may not be compacted in any way by construction personnel or vehicles. Estimates of topsoil volumes to be removed will be provided by the ESO, and these volumes must be stockpiled. These topsoil stockpiles must be immediately vegetated using *Eragrostis teff,* an annual species which quickly produces a dense cover, and which will not invade adjacent areas of indigenous vegetation.
- No topsoil is to be used as fill or for any other construction purposes.

- In order to prevent the introduction of alien plant species brush-cutters and bulldozers and all other construction equipment should be cleaned each day prior to commencement of construction activities and no soil is to be imported into the construction area.
- Construction of the Govuru River crossing must take place at low flow periods during the dry season. A geotechnical survey of the flow line servitude must be conducted in order to ensure that any impermeable horizon that may be present in the soils is not disrupted by trenching. The use of coffer dams should be avoided, but where these are necessary, it is essential that all material used for construction of the coffer dam is removed from the wetland upon completion of construction. Material used for coffer dam construction must be sourced from areas free of alien invasive plant species so as to prevent the introduction of propagules of such species into the wetland areas (the ESO will guide the engineers and contractors in this regard).
- Access to the Flow Line servitude during construction may only be gained via previously constructed sections of Flow Line or via existing tracks.
- Local wood is not to be used as fuel or construction material.

Main access road

- The currently proposed width of the Main access road servitude, namely 50m, is regarded as excessive. Width of servitude should be reduced to a maximum of 30m. This lead to a reduction of 40% of the area of vegetation to be cleared as a result of the construction of the Main access road.
- An ESO with a sound understanding of the ecology of the area, is to be on site at all times during construction.
- Topsoil removed during construction must be separately stockpiled within the servitude. Topsoil should be placed in piles not exceeding 1.5m in height, so as to avoid compaction, and should be placed along the edge of the servitude. These topsoil stockpiles may not be compacted in any way by construction personnel or vehicles. Estimates of topsoil volumes to be removed will be provided by the ESO, and these volumes must be stockpiled.
- No topsoil is to be used as fill or for any other construction purposes.
- In order to prevent the introduction of alien plant species bulldozers and all other construction equipment should be cleaned each day prior to commencement of construction activities and no soil is to be imported into the construction area.
- Access to the Main access road servitude during construction may only be gained via previously constructed sections of the road.
- Local wood is not to be used as fuel or construction material.

Well sites

- Areas cleared for the construction of well sites during this project must be kept to a maximum of 100m by 100m (1ha).
- Topsoil must be carefully removed and stockpiled separately to subsoil and spoil. Estimates of topsoil volumes to be removed will be provided by the ESO, and these volumes must be stockpiled
- Attention must be placed on proper husbandry of topsoil, as it will be essential for the rehabilitation of well sites upon decommissioning of the well. Topsoil must be

stockpiled in a fenced area within the cleared area. Piles of topsoil should not exceed 1.5m in height so as to avoid compaction. These topsoil stockpiles must be immediately vegetated using *Eragrostis teff,* an annual species which quickly produces a dense cover, and which will not invade adjacent indigenous vegetation.

- No soil shall be imported into the well site for the purposes of construction, so as to prevent the introduction of alien species.
- In order to prevent the introduction of alien plant species construction equipment such as bulldozers should be cleaned prior to commencement of construction activities.
- Access to well sites must be gained only via the permanent access and maintenance roads constructed along existing tracks and seismic lines or within the servitude's of the flow lines leading to the well sites.
- Local wood is not to be used as fuel or construction material.

<u>CPF site</u>

- The area to be cleared for the construction of the CPF site will be clearly demarcated and all construction activities must be restricted to this demarcated area.
- An ESO with a sound understanding of the ecology of the area is to be on site at all times during construction.
- Those parts of the site where the processing facility is to be located may be completely cleared of vegetation and topsoil. Those parts of the site where the residential areas are to be located must not be completely cleared of soils and vegetation. Wherever possible natural features such as large trees and forest clumps on termite mounds should be retained. The ESO will clearly demarcate those natural features that are to be maintained using whitewash and danger tape.
- Topsoil must be carefully removed and stockpiled separately to subsoil and spoil. Estimates of topsoil volumes to be removed will be provided by the ESO, and these volumes must be stockpiled
- Attention must be placed on proper husbandry of topsoil, as it will be essential for the rehabilitation of the site upon completion of construction activities. Topsoil must be stockpiled in a fenced area within the construction site. Piles of topsoil should not exceed 1.5m in height so as to avoid compaction. These topsoil stockpiles must be immediately vegetated using *Eragrostis teff,* an annual species which quickly produces a dense cover, and which will not invade adjacent indigenous vegetation.
- No soil shall be imported into the construction site for the purposes of construction, so as to prevent the introduction of alien species.
- In order to prevent the introduction of alien plant species construction equipment such as bulldozers should be cleaned prior to commencement of construction activities.
- Access to construction site must be gained only via the Main access road.
- Local wood is not to be used as fuel or construction material.

Rehabilitation of disturbed areas

Flow lines

- Upon completion of construction, immediate rehabilitation will be performed within all parts of the flow line servitude situated outside the permanent maintenance and access road.
- Revegetation of the servitude will be conducted through the encouragement of natural process of secondary succession, except in areas with steeper gradients and/or highly erodable soils, where the contractor must revegetate disturbed areas using a seed mix not containing any species not indigenous to the area.
- In order to encourage the establishment of indigenous pioneer (seral) plant communities those areas where soils have been compacted, must be tilled. In those areas where excavation has taken place, stockpiled subsoil and topsoil will be reintroduced correct order.
- Rehabilitation of relatively steep (approximately 8°) slopes within the flow line servitude on the banks of the edge of the Govuru River floodplain near the Temane 8 well site, must be revegetated using seeds and plugs of indigenous hydrophytic pioneer species such as *Imperata cylindrica, Stenatotaphorum secundatum, Dactyloctenium geminatum* and *Dactyloctenium aegyptium*.
- Diversion ditches, swales, straw and hay will be used on steeps slopes in order to prevent erosion and encourage rapid revegetation.
- The ESO, in consultation with appointed specialists, will guide the rehabilitation process.

Main access road

- Immediate rehabilitation will be performed along the servitude of the main access road upon completion of construction.
- Revegetation of the servitude will be conducted through the encouragement of natural process of secondary succession. In order to encourage the establishment of indigenous pioneer (seral) plant communities.
- In order to encourage the establishment of indigenous pioneer (seral) plant communities those areas where soils have been compacted, must be tilled. In those areas where soils have been removed, stockpiled subsoil and topsoil will be reintroduced correct order.
- Diversion ditches, swales, straw and hay will be used on steeps slopes in order to prevent erosion and encourage rapid revegetation.
- The Environmental Officer, in consultation with appointed specialists, will guide the rehabilitation process.

Well Head sites

- Rehabilitation of well sites must be performed immediately upon completeion of construction.
- Revegetation of well sites will be conducted through the encouragement of natural process of secondary succession. Stockpiled subsoil and topsoil will be reintroduced the cleared area in the correct order, and the original surface contours of the site will be reinstated. In order to encourage the establishment of indigenous

pioneer (seral) plant communities, any areas on the periphery of the site, where the topsoil was not removed and has become compacted, must be tilled.
- Diversion ditches, swales, straw and hay will be used on steeps slopes in order to prevent erosion and encourage rapid revegetation. Due to the extremely flat topography of almost the entire exploration area, such measures will probably not be necessary.
- The ESO, in consultation with appointed specialists, will guide the rehabilitation process.

CPF

- In those parts of the CPF sites that are to be rehabilitated, stockpiled subsoil and topsoil will be reintroduced the cleared area in the correct order, and the original surface contours of the site will be reinstated.
- The planting of alien plant species for landscaping purposes will not be permitted. The use of kikuyu grass (*Pennisetum clandestinum*) for the creation of lawns will not be permitted, as this species is an aggressive invader of wetland habitats within many regions of southern Africa. Only grass species that are indigenous to the study area should be used for the creation of lawns. Couch grass (*Cynodon dactylon*), Buffalo turf grass (*Stenatotaphrum secundatum*) and LM grass (*Dactyloctenium australe*) are all indigenous to the study area and are popular as lawn species throughout the subtropical parts of southern Africa.
- Diversion ditches, swales, straw and hay will be used on steeps slopes in order to prevent erosion and encourage rapid revegetation. Due to the extremely flat topography of almost the entire exploration area, such measures will probably not be necessary.
- The ESO, in consultation with appointed specialists, will guide the rehabilitation process.

Control of access along Flow Lines

The network of permanent maintenance and access roads that will be situated along Flow Lines within the production blocks, may lead to increased accessibility to sensitive habitats. Such increased accessibility is likely to lead to the degradation or even loss of such habitats as a result of settlement and cultivation and over-utilisation of natural resources. It is therefore recommended that access along flow line maintenance and access roads that lead to areas containing sensitive habitats should be controlled. The proponent should appoint guards to continuously monitor activities along these roads, and where necessary boom gates should be installed at points where access can be gained to the road from existing public roads. Such measures should only be implemented after consultation with the 'Dirrecao Nacional de Florestas e Fauna Bravia' and other relevant Government departments.

Monitoring

An ecological/biological monitoring programme should be development and implemented. This monitoring programme should focus on the monitoring of threatened and sensitive species and habitats identified within the Temane Production

Block and surrounding parts of the study area, and the provision of practical management plans that are aimed at ensuring the minimisation of negative impacts associated with the project. Management plans resulting from monitoring should be refined on the basis of input received from the 'Dirrecao Nacional de Florestas e Fauna Bravia', in order to ensure compatibility with national conservation objectives for the area. Monitoring should furthermore be conducted annually and for the entire period of the duration of the project.

Vegetation monitoring of rehabilitated areas disturbed during construction of flow lines and the main access road should be conducted twice in the first year, and yearly for the next 4 years. Vegetation monitoring should be aimed at establishing the success of revegetation of disturbed areas by seral plant communities. This should be achieved by establishing permanent monitoring sites along flow lines and the main access road. Monitoring sites should be selected so as to include sites within all major plant communities/habitat types occurring along the flow lines and access road. Emphasis should be placed on fixed point photographic monitoring, as this is a rapid, cost effective and easily repeatable method of monitoring. At each monitoring site use should also be made of permanent plots for gathering of data pertaining to the vegetation structure of rehabilitated areas and immediately adjacent undisturbed vegetation. The following data should be gathered within each plot: density data (stem counts of woody species) and canopy cover estimates for each species (both woody and herbaceous species).

REFERENCES

Gordon-Gray, K.D. (1995). Cyperaceae in Natal. *Strelitzia* 2.

Telford, S. and De Castro, A. (August 2001). Sasol Natural Gas Project Environmental Impact Study: Specialist Study 4 (Impact on Flora and Fauna). Unpublished report by Mark Wood Consultants.

Sasol Temane EMP Preparation Project Visuals

Report

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12 January 2002

1.0 Introduction

Newtown Landscape Architects cc (NLA) has been commissioned by Metago Environmental Engineers (Pty) Ltd to provide specialist input in the preparation of Environmental Management Plans (EMP) for the Sasol Temane project.

2.0 Terms of Reference

NLA are to *'make use of existing visual assessment information to specify the most appropriate colour scheme for the project infrastructure'.*

3.0 Background

The visual impact assessment (VIA) for the project focused on the Central Processing Facility (CPF) of the proposed Sasol Gas Project at Temane gas field in Mozambique. This report therefore deals only with this aspect of the project. In addressing the terms of reference, NLA will follow the approach established in the VIA to mitigate the visual impact of the project infrastructure.

Whilst the terms of reference for this study cover only the specification of a colour scheme for CPF infrastructure, it is important to refer to the mitigation proposals made in the VIA. The colour scheme taken together with all the other proposed actions, will be the most effective means of mitigating the visual impact of the project.

The VIA states that "in considering mitigating measures three rules must be considered - the measures should be feasible (economically), effective (how long will it take to implement and what provision is made for management/maintenance) and acceptable (within the framework of the existing landscape). To address these measures the following principles have been considered:

- Mitigation measures should be designed to suite the existing landscape character and needs of the locality. They should respect and build upon landscape distinctiveness.
- It should be recognized that many mitigation measures, especially planting/rehabilitation, are not immediately effective.

The following general actions must be considered.

Site Establishment

- The absolute minimum amount of vegetation and topsoil should be removed from building and infrastructure areas. Ensure that all existing natural vegetation is retained wherever possible and incorporated into the site design. Cuts to remove vegetation should be done in natural manner and harsh straight lines must be avoided.

Structures

- Paint buildings and structures with colours that reflect and complement the natural colour of the surrounding landscape. Avoid pure whites and pure blacks.
- To reduce the potential of glare external surfaces of buildings and structures should be articulated or textured to create interplay of light and shade. Avoid shiny or bare metal.
- Roofs of workshops to be a mottled green and brown.

Landscaping

- Where the natural vegetation intrudes onto the site it should be retained and the removal of vegetation at the edges of the site should be done as described in 7.1.
- An ecological approach to landscaping is recommended. Should plants be introduced into the project site, plant choice should be guided by ecological rather than horticultural principles. For example ecological communities of indigenous plants provide more bio-diversity and habitat opportunities and would blend with the natural vegetation. This approach is also less costly to maintain and sustainable in the long term.

Access and Haul Roads

- Haul roads during construction will require an effective dust suppression management programme, such as regular watering and/or the use of non-polluting chemicals that will retain moisture in the road surface
- Where a paved surface is required use dark paving materials that complement the natural brown/black colours and textures of the soil in the area rather. Light coloured materials i.e. concrete colours should be avoided.

Lighting

The negative impact of night lighting, glare and spotlight effects, can be mitigated using a variety of methods:

- Install light fixtures that provide precisely directed illumination to reduce light Aspillage@ beyond the immediate surrounds of the plant and workshop complexes but which still illuminate the buildings/roads.
- Avoid high pole top flood and security lighting in the workshop areas and along roads.

Air traffic

To avoid the impact on the 'scaring of the landscape' when viewed by tourists landing at the nearby Vilanculos airport or the landing strips on the islands, a landing pattern should be considered that avoids a fly over of the Sasol project. This would maintain the expectation of tourists visiting the area of a relatively unspoilt natural environment".

3.0 Colour Scheme

It is within the context of the above mitigating measures that the colour scheme is proposed. The approach is twofold.

Roofs

The first is to mitigate views from the air. In this case the colour of roofs is important and should be painted to reflect the colours of the surrounding woodland bush. In particular, the colours of the larger trees. Roofs should be painted a mottled green or if tiles are used, two shades of green tiles randomly installed to create the mottled effect can be used. Proposed roof colours are:

- Plascon - Fennel Seed C20-3
- Plascon – Cactus C22-6

Refer to Figure 1 which illustrates aerial views of the CPF ‘before’ and ‘after’ it has been painted in the proposed colour scheme.

Structures and Walls

Views from the ground will primarily focus on the walls of buildings and other vertical structures. Here it is important to reduce the scale of the buildings and structures and to use complimentary colours that will ‘blend’ the buildings and structures into the surrounding landscape. Colours should be used in a manner that will break the large vertical surfaces of the taller structures. It is proposed that buildings and structures be painted with horizontal bands of colour starting with the darker tones (light brown) at the base of the structures and then progressively applying lighter colours, with the lightest being near the top of the structure as the upper portions of buildings and structures will be viewed against the sky.

Figure 2 illustrates this application in ‘before’ and ‘after’ scenarios. Figure 3 is a simulation of the CPF in its landscape context, painted in the proposed colour scheme. Proposed building and structures colours:

- Plascon - Wheat Germ C14-4
- Plascon - Celery C21-3
- Plascon - Pear Salad C18-3

All colours should be matt, not glossy, to reduce reflection and glare from painted surfaces.

It should be noted that Plascon paints are being specified only to fix the colour scheme. Equivalent colours from other manufactures would also be acceptable.

*** NLA ***

Figure 1: Active channel of Govuru River.

Figure 2: Typical *Typha capensis* marsh vegetation in the floodplain of the Govuru River.

Figure 3: Shallow pan within *Typha capensis* march in the floodplain of the Govuru River.

Figure 4: Hydrophytic grassland within Govuru River floodplain.

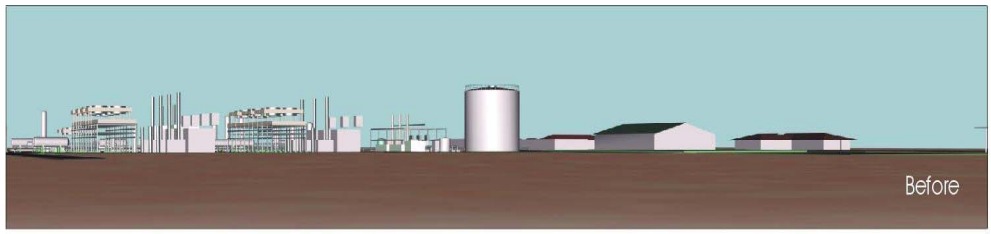
Figure 5: Large island in Govuru River floodplain, with typical palm community fringing island and *Tyhpa capensis* and hydrophytic grassland patch in foreground.

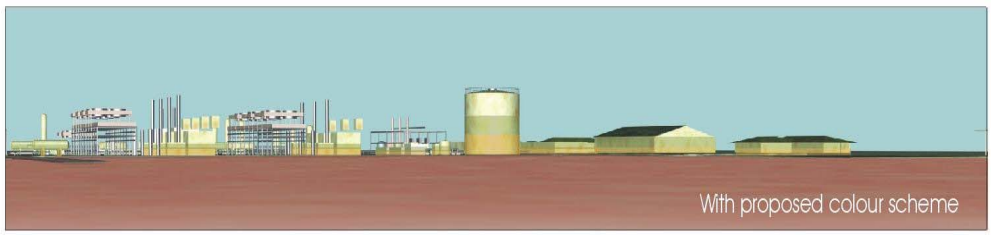
Figure 6: Dense short thicket along proposed flow line, approximately 100m east of the Temane 1 well site.

APPENDIX 1: Aerial photograph of section of Govuru River floodplain at point of flow line crossing

Legend:

A = Active channel
B = Backwater vegetated by Phragmites ‘reedbeds’
C = Active channel banks
D = Floodplain
E = Large island in floodplain
F = Termite mound island in floodplain

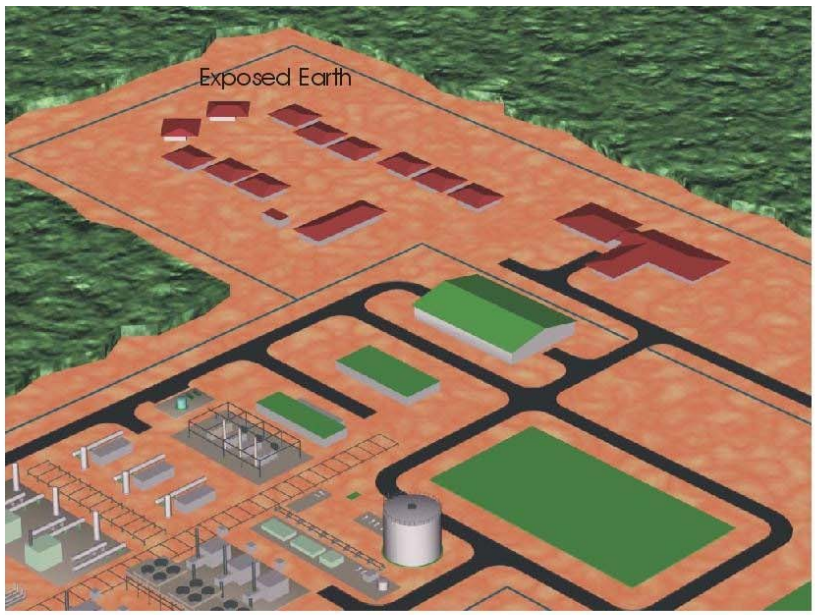




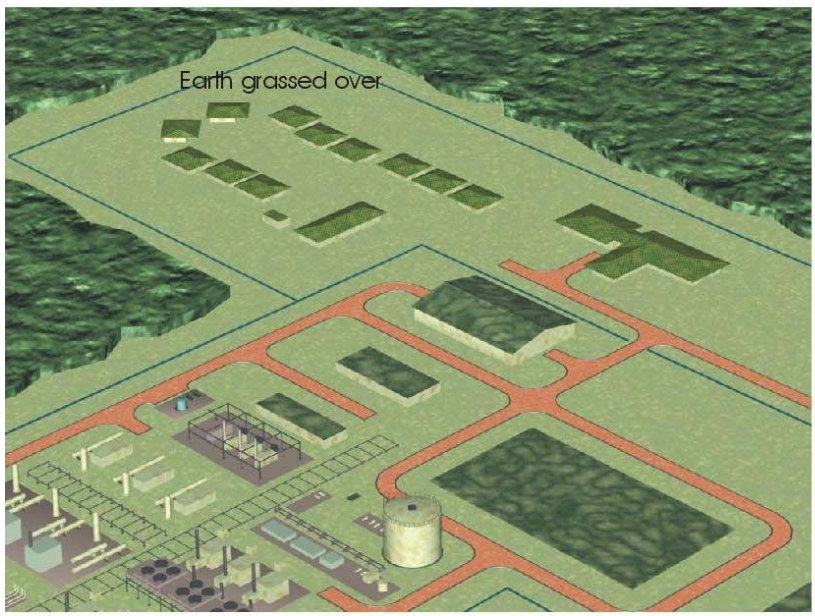
Wall and Structure Colours

Roof Colours

Figure 2: **Illustrative Elevations and Colour Palette**



Before



Painted with proposed colour scheme

Figure 1: **Illustrative Aerial View of CPF**

LANDFILL

Contract: 25731/9 Document Category: CLASS 4

Client's Name: SASOL PETROLEUM TEMANE LIMITADA

Project Title: TEMANE PANDE DEVELOPMENT PROJECT

Project Location: MOZAMBIQUE Originating Discipline: CONSTRUCTION

REVISION	REV E1	REV P1
SMILE REV	REV 00	REV 01
DATE	JUL 02	AUG 02
ORIG. BY	P MOSS	P MOSS
CHIEF ENG.	E KRULL	
SCOPE APP. BY	A RUNNACLES	

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1.0	INTRODUCTION
2.0	PROJECT DESCRIPTION AND LOCATION
3.0	LANDFILL SITE AT TEMANE
4.0	SCOPE OF SUPPLY
5.0	RECORDS

1.0 INTRODUCTION

This Contract is for a suitably qualified CONTRACTOR to carry out consultancy for the design SERVICES for a Landfill Site required for the construction phase of the Temane Pande Development Project.

As a further option, the Landfill site may be used during the operating phase of the project. Any additional requirements for this option will be determined at a later stage. The current site shall be designed for the construction phase only.

2.0 PROJECT DESCRIPTION AND LOCATION

The Temane Pande Development Project comprises the design and construction of a natural gas gathering and Central Processing Facility (CPF) in the Republic of Mozambique.

The Temane Site is located in a rural area of the Republic of Mozambique in the Temane Gasfield, approximately 60 km NW of Vilankulos, 4.5 km west of the EN1 coastal highway. The site is remote with limited existing access.

3.0 LANDFILL SITE AT TEMANE

Foster Wheeler recognise that there are no existing suitable landfill sites close to the Temane Site that could be utilised during the construction phase of the project. In accordance with the requirements of the Construction Environmental Management Plan (C-EMP), FW propose to design and construct a landfill site within the boundary of the CPF Site. FW shall utilise the services of a CONTRACTOR for the purposes of designing the landfill site.

A proposed location has been identified for the landfill site within the flare area at the Temane Project Site.

4.0 SCOPE OF SUPPLY

CONTRACTOR shall be thoroughly familiar with the existing information contained in the Environmental Impact Assessment (EIA) and Construction Environmental Management Plan (C-EMP) and the environmental specifications.

CONTRACTOR shall be responsible for Design SERVICES as described below.

4.1 DESCRIPTION OF SERVICES

CONTRACTOR shall be responsible for the following design works associated with the Landfill Site:

- Assessing the suitability of the potential landfill site.
- Undertake a detailed investigation of the preferred site utilising data in the existing Environmental Impact Assessment and Construction Environmental Management Plan, and verify by site visits where required.
- Assess the waste streams and volumes to determine the most suitable type and classification for the site.
- Carry out preliminary engineering designs and produce technical drawings for FW review and approval.
- Carry out detailed engineering designs and produce construction drawings.
- Produce an operating plan to operate the site.
- Produce a monitoring plan for the site.
- Produce a closure plan for the site.
- Produce a list of recommended contractors to execute the construction works.
- Provide guidance on any relevant local authority requirements and for the design.

4.2 PROGRAMME OF SERVICES

CONTRACTOR shall be responsible for completing the design works in accordance with the following schedule:

	Duration	Start	Finish
Phase 1			
Mobilisation	5 days	29 July	2 August
Enviro. Screening	5 days	5 August	9 August
Assessment	10 days	5 August	16 August

Phase 1 completion meeting to finalise Landfill type and classification prior to detailed engineering 20 August.

Phase 2			
Env. Input to design	3 days	21 August	23 August
Conceptual Design	15 days	21 August	10 Sept.
Detailed drawings	5 days	11 Sept.	17 Sept.
Operating Plan	10 days	16 Sept.	27 Sept.
Cost Estimate	5 days	19 Sept.	25 Sept.

5.0 RECORDS

The CONTRACTOR shall furnish FW with a detailed schedule of activities and a list of engineering drawings and documents for review and approval.

Temane Pande Development Project

Sasol Petroleum Temane Limitade : Mozambique

Landfill Site for Construction Phase

Operating Plan

November 2002

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Temane Pande Development Project
Sasol Petroleum Temane Limitade : Mozambique
Landfill Site for Construction Phase
Operating Plan

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1 INTRODUCTION

1.1 BACKGROUND

The Temane Pande Development Project comprises the design and construction of a natural gas gathering and central processing facility (CPF) in Mozambique. The Temane site is located some 60km north west of Vilankulos

Foster Wheeler South Africa is responsible for the design and coordination of construction for the Temane Pande Development Project facility in northern Mozambique. The construction of the facility is well underway. Due to environmental concerns revolving around the safe disposal of solid waste from the plant and contractor camp, Bergman Ingerop were contracted to design a landfill site to be constructed for the safe disposal of waste generated during construction.

The waste to be disposed of will comprise the following:

- Domestic waste from the contractor camp
- Solids from sewerage treatment
- Construction waste
- Certain hazardous waste (oils, greases etc)

See waste details: 6.2

A landfill site was identified at the project site, and groundwater analysis data is available for the site as well as soils data. The overall Central Processing Facility has an approved Environmental Impact Assessment.

Sasol Petroleum Temane Limitade : Mozambique is the project owner, and it is noted that Sasol's environmental policy states clearly that internationally recognised environmental management systems will be implemented.

1.2 OBJECTIVES

The objectives of the Operating Plan are to ensure that all waste is disposed in a manner, which is both environmentally and socially acceptable and that the disposal operation is acceptable to those whom it may affect. This Operating Plan has been drawn up using South Africa's Department of Water Affairs and Forestry Minimum Requirements documents as a basis for landfill operations.

An operating plan is site-specific and describes the way in which the landfill site should be operated, addressing aspects such as access, controls, drainage, etc.

1.3 SCOPE

This Operating Plan will describe the way in which the landfill site is to be operated, commencing at the level and detail of daily cell construction and continuing through to the projected development of the landfill with time. The Operating Plan will include the following:

- Health and Safety requirements
- Resource requirements
- Waste Acceptance procedures
- Waste disposal procedures
- Site development and deposition sequence
- Site operational procedures
- Site maintenance
- Rehabilitation and closure
- Auditing and monitoring

The operating plan must be seen as a "live" document and should be updated should significant changes in circumstances regarding the site occur, e.g. changes in the waste stream, etc.

2 LANDFILL BACKGROUND

2.1 INTRODUCTION

The area identified by FW for the landfill area is located on the north side of the CPF site. With the exception of the flare stack there are no other facilities within 50-60 m of the proposed area. Offices and staff housing for construction are located just south of the main entrance gate some 450m away.

It can be concluded from an assessment of the waste types and the environmental aspects that the site is suitable for the development of a properly designed and constructed landfill. Furthermore proper management of the site and ultimately closure will ensure that there will be insignificant impacts.

The recommendations are as follows:

- A GB- site in accordance with the South African DWAF Minimum Requirements is constructed.
- As much as possible of waste oils are removed from the CPF for recycling or proper disposal.
- That the site will comprise constructed cells some 2m deep below existing ground level.
- A soil liner to be provided with leachate collection drains and sump.
- The site to be enclosed within an earth berm

2.2 DESIGN

2.2.1 Surface Water Management

The topography of the land is flat with a slow fall from west to east. The on-site inspection would indicate that likelihood of sheet flow entering the site to be insignificant and the main source of surface water would occur from the site itself. Provision will be made to prevent surface water from entering the landfill and to be diverted around the site.

2.2.2 Leachate Management

The landfill has been divided into two sections, the first and smallest is for the disposal of domestic waste and the second for inert construction material. The domestic waste cell is lines with a stone leachate drain which is graded to fall towards a collector drain comprising a 150mm diameter geopipe laid in a HDPE lined drain. The drain falls to a manhole in the centre of the landfill where leachate is collected in a sump. In the event of large generation of leachate due to heavy rainfall, polluted water will be retained within the site until such time as it can be removed or is allowed to evaporate.

The inert material cell is graded to fall to a central low-lying area. Surface water from rainfall will be retained here and allowed to evaporate, in the event that there is significant quantities of water, water should be tested for pollutants and if acceptable then discharged to land.

Where retained leachate becomes a nuisance or is excessive then it shall be removed and discharged to the sewage treatment works. Care shall be taken to ensure that the treatment capacity of the plants is not overloaded to the extent of destroying the biological process.

2.2.3 Final Landform Design

The landfill is essentially a formed trench below existing ground level. The capping to the final landform will be at ground level and slope away from the centre of the site to improve stormwater run-

off. The perimeter stormwater channel will be retained to continue intercepting surface runoff and discharge away from the site.

3 DEFINITIONS AND INTERPRETATIONS

"Area Method of Landfilling" is a method whereby non-putrescible waste is spread in layers not exceeding 0,5m in thickness.

"Closure" is the act of terminating the operation of a landfill. Closure is preceded by rehabilitation, and followed by end-use and post-closure monitoring.

"Compaction" is the compaction of waste achieved by using purpose built approved plant (the unit of measurement is kilogram mass per cubic metre kg/m^3.)

"Cover" is the material used to cover and seal off putrescible waste. It is usually soil but may comprise builders' rubble, ash or other approved material.

"Development Plan" is the planned phased development of the landfill from the existing landform through the operation, which is usually divided into several phases, to the final completed landfill planned for the desired end use.

"General Waste" is waste that does not pose an immediate threat to man or to the environment, i.e. household, builders, garden, dry industrial and commercial waste. It may, however, due to infiltration and percolation, produce leachate with high pollution potential.

"Hazard rating" is a system for classifying and ranking hazardous wastes according to how great a hazard they present. This is based on Mammalian Acute and Chronic Toxicity, Ecotoxicity and Environmental Fate. Based on this, Hazardous Waste is classified into: Hazard Rating 1: Extreme Hazard, Hazard Rating 2: High Hazard, Hazard Rating 3, Moderate Hazard, and Hazard Rating 4: Low Hazard[(2)].

"Hazardous Waste" is waste that, by circumstance of use, quantity, concentration or inherent physical, chemical or infectious characteristics, may cause ill health or increase mortality in humans, *fauna* or *flora*, or may adversely affect the environment when improperly treated, stored, transported or disposed of.

"Landfilling" is the deposition of waste on land, whether it is the filling in of excavations, or the creation of a landform above grade, where the term "fill" is used in the engineering sense.

"Leachate Management" is the collection and drainage of leachate to a point where it can be concentrated for treatment.

"Leachate" is an aqueous solution with variable pollution potential. It results when water percolates through decomposing waste and contains final and intermediate products of decomposition, various solutes and waste residues. It may contain carcinogens and/or pathogens.

"Operation Plan" is the way in which the landfill is actually operated, commencing at the level and detail of daily deposition, spreading, etc. (micro) and continuing to the development and rehabilitation sequence, access, drainage, etc., within a given phase of the development plan (macro).

"Operation" means all the work to be performed in accordance with the Operating Plan.

"Responsible person" is the legally appointed representative who takes responsibility for ensuring that all or some of the facets of any or all of the following are properly directed, guided and executed in a professionally justifiable manner: investigatory work, design, preparation, operation, closure and monitoring.

"Sanitary Landfill" describes a method of disposing of refuse on land without causing nuisances or hazards to public health or safety, by utilising the principles of engineering to confine the refuse to the smallest practical area, to reduce it to the smallest practical volume, and to cover it with a layer of earth or inert material at the conclusion of each day's operations, or at such more frequent intervals as may be necessary in order to adequately seal the deposited refuse.

"Site" means the land including the existing services and waste disposal site known as the Temane Pande Landfill Site provided by Sasol for the purposes of the execution of the Operating Plan.

Waste" is an undesirable or superfluous by-product, emission or residue of any process or activity, which has been discarded, accumulated or stored for the purposes of discarding or processing. This definition excludes industrial wastewater, sewage, radioactive substances, mining, metallurgical and power generation waste.

Working Face" is the active part of the landfill where waste is deposited by incoming vehicles, then spread and compacted on the working level by a landfill compactor or alternate suitable equipment, e.g. bulldozer, TLB, etc.

4 LEGAL AND HEALTH & SAFETY REQUIREMENTS

4.1 LEGAL REQUIREMENTS

The Contractor is required to comply with all acts, regulations and bylaws of the Republic of Mozambique applicable to the nature of work . The legislation relating to waste management and landfill sites in Mozambique is not as yet in line with international standards. However, Sasol is the project owner, and it is noted that Sasol's policy is to operate to international standards. Its environmental policy states clearly that internationally recognised environmental management systems will be implemented.

Therefore, as a basis for the landfill design and operations, we have considered in addition to the Mozambique legislation, the South African legislative requirements. These include, where applicable and as amended, but are not limited to:

- Environment Conservation Act (Act 73 of 1989)
- National Environmental Management Act (Act 107 of 1998)
- Occupational Health and Safety Act (Act 85 of 1993)
- Health Act (Act 63 of 1977)
- Hazardous Substances Act (Act 15 of 1973)
- Atmospheric Pollution Act (Act 45 of 1965)
- Regulation of Disposal of Pesticides Act
- Conversion of Agricultural Resources Act (Act 43 of 1983)

4.2 HEALTH AND SAFETY REQUIREMENTS

4.2.1 Health

The site shall be operated so as to avoid, or if unavoidable, reduce to a minimum, health risks such as:

- **Odour**: the main control shall be by using approved sanitary landfill procedures of compaction and covering.
- **Dust**: this shall be controlled by means of watering.
- **Vectors and rodents**: shall be controlled by applying sanitary landfill procedures of compaction and covering, as well as a erecting flytraps or other appropriate means.

4.2.2 Safety

The operator shall be responsible for ensuring the safety of all site users. In this regard, the operator shall be responsible for taking all necessary measures to ensure and maintain safety of all persons over the entire site. The operator shall ensure compliance with applicable Safety Regulations.

The operator is responsible for training their staff to be aware of the safety risks on the landfill site. In particular, staff must be aware of the following:

- No smoking is permitted on site at all
- Protective clothing requirements (Safety shoes, overalls, dust masks in some circumstances, high visibility vests, and any other requirements Sasol may specify)
- All access roads must be clear of mud and potentially slippery wastes
- Dust suppression is required
- The stability of permanent and temporary embankments must be ensured
- Fire prevention and control procedures
- Dangers of landfill gas
- Dangers of leachate

It is noted that accumulations of landfill gas can be extremely dangerous. Concentrations higher than 5% can result in fires and explosions. Landfill gas can also cause suffocation and possibly poisoning. Extreme care should therefore be taken when working in confined spaces such as leachate manholes and boreholes. Leachate can also be dangerous depending on the constituents and concentrations thereof

5 RESOURCE REQUIREMENTS

5.1 SITE FACILITIES

The relevant resources and infrastructure required for a G:B- site are listed in Table 10 of the Minimum Requirements. These include a site office, adequate plant and equipment, a Responsible Person (see definition in Section 3), and sufficiently qualified staff. The use of a weighbridge is not seen as necessary, because no disposal tariffs are being charged, and the incoming waste volumes will be recorded manually.

The operator shall provide the following facilities for the duration of the landfill operation:

- Security Gate (or security hut)
- Ablution facilities (the facilities at the main operation may be used)
- Equipment shelter and maintenance facilities (the facilities at the main operation may be used)
- Diesel tank with correctly sized and sealed bund (the facilities at the main operation may be used)
- Site roads
- Site notice board
- Traffic control and direction signs (see below)

5.1.1 Site Roads

Access roads shall be provided and maintained by the operator to endure all-weather access for all vehicles to and from the site and for any other necessary movements.

5.1.2 Notice Board

It is a Minimum Requirement that the Contractor shall supply and erect, at an approved location, one weatherproof notice board, in the official languages, which gives:

- The site name,
- The site classification,
- Names, addresses, telephone numbers and logos of Sasol as well as the responsible person,
- The waste types the site may accept

The information must be kept up to date and in good repair for the duration of the site life.

5.2 PERSONNEL

It is a Minimum Requirement that the operational and support staff are competent and adequate in numbers.

The key personnel as listed below shall be properly qualified and experienced.

Key Personnel required (not necessarily full-time):

a) Superintendent (Minimum Requirement for a G:B$^-$ site)
b) Foreman
c) Machine Operator for Consolidating and Covering the Landfill.

Back-up staff not permanently assigned to the operation must also be appointed. Back-up staff shall be available in the event of any absence of permanent staff. If not full time on site, the Superintendent must at all times be accessible.

The Minimum Requirements specifies that the Responsible Person must ensure that the requirements of the Occupational Health and Safety Act are met, with regard to visitors and site staff.

Sasol are to have suitably qualified staff assigned to provide assistance and support to the landfill operation when required as well as monitoring the operation.

5.3 PLANT

5.3.1 General

It is a Minimum Requirement that all plant used on the site shall be suitable for the application and prevailing site conditions, of adequate rated capacity, in good working condition, and shall be so designed and constructed as to cause a minimum of dust, noise and air pollution. Properly qualified and experienced operators shall operate the plant. The plant and equipment necessary for the operation shall be properly maintained to ensure availability as necessary for the proper operation of the landfill. Plant shall be properly sized and adequate for the duty.

In the event of a breakdown occurring, back-up plant shall be provided as is necessary to ensure that the proper operation and maintenance of the Site is not placed in jeopardy

5.3.2 Plant Requirements

As determined from the projected waste stream volumes a bulldozer or a TLB of acceptable manufacture and condition able to handle the waste generated shall be provided.

6 WASTE ACCEPTANCE PROCEDURES

The approach used for the management of construction wastes is based on the principles of Integrated Waste Management, i.e. that the order of preference for the management of wastes is waste avoidance; waste recycling, re-use and utilisation; treatment to minimise potential environmental risks, followed by landfilling, as a last resort.

The objective is to utilise a general waste landfill, i.e. GB- in terms of the South African Minimum Requirements for Waste Disposal to Landfill, and, where possible, to treat any problem wastes so that they effectively delist and can be disposed in such a facility. Hazardous wastes that cannot be treated sufficiently for disposal in such a facility shall be stored and transported off site to acceptable treatment facilities or, where possible, recycled and/or utilised.

6.1 WASTES

6.1.1 Source of the Waste

The use of the site is limited to the construction phase of the central processing facility for the Temane Pande Development Project owned by Sasol Petroleum Temane Limitade: Mozambique.

6.1.2 Types and Quantities of Wastes

A list of wastes and estimated quantities were provided by Foster Wheeler. It has been agreed that all waste oils shall be disposed of off site and that the volume of sewage sludge will be in the order of 130m3. The total volume of waste generated during the construction phase is estimated to be in the order of 1,645 m3.

The list of wastes that are expected to be generated during the construction phase of the project are presented in Table 1, 6.2.3 below with proposed waste management options for the wastes.

6.2 WASTE ACCEPTANCE

6.2.1 Access

It is a Minimum Requirement that prior to waste being accepted at the disposal site it must be inspected by suitably qualified staff who must confirm its acceptance. In the case of doubt, any industrial waste should be considered as potentially hazardous until proven otherwise,). The operator at the landfill must also ensure that only wastes for which approval has been given and procedures are written for are disposed of.

6.2.2 Records

The operator shall record details of waste category as listed in Table 1, quantities and origin of all wastes brought to the site each day prepare a daily summary. A written report shall be provided at the end of each month.

6.2.3 Waste Disposal / Management Options

Table 1: : Proposed Waste Management Options for Wastes Generated during the Temane Pande Construction Phase

Waste	Quantity	Preferred Option	Alternative Option
General and Non-Hazardous Waste			
Excavation Spoil	5700 tons	Use for landscaping on construction site and at the General Waste Landfill for construction purposes, e.g. at entrance and internal road to provide improved access for vehicles during wet weather.	
Concrete	750 tons		
Bricks/Blockwork	250 tons		
Timber	300 tons	Recycle where possible. Note that careful management of wood and other waste is required to ensure that no hazardous material is allowed to go into use among the general population.	Dispose to General Waste Landfill. The waste should be chopped or shredded, as far as possible, and scavenging on site discouraged.
Plastic Bottles/Containers	10 tons		
Glass	2 tons		
Cable Scrap	50 tons		
Scrap Metal	300 tons		
Cable Drums	300 No.		
Insulation materials	20 tons	Disposal to General Waste Landfill: note that most insulation is made from PVC and, therefore, burning should be avoided at all costs.	
Food Waste	150 tons	Co-dispose to General Waste Landfill: note that scavenging of the food waste should be avoided.	
Office Waste	30 tons	Some paper and cardboard waste may be worth recovery but the bulk of the waste should be o-disposed to the General Waste Landfill: note that the waste may contain used aerosol cans and other "household hazardous waste items" but a landfill constructed according to the South Africa Minimum Requirements is designed to accept small amounts of such items.	
Tyres	30	The number of tyres is extremely small and, therefore, they could be used either on site or at the landfill as barriers, plant containers, etc. or alternatively taken to Maputo or other large centre for recycling.	Disposal to the General Waste Landfill: any metal, e.g. from the rim of the tyres, can be stripped and recycled with other metal items. Preferably the tyres should be chopped or, at least, cut into quarters, before landfilling.
Potentially Hazardous Waste			
Grit (sand blasting)	10 tons	Co-dispose to the General Waste Landfill after treatment with 2.5% slaked lime: this treatment reduces the leachability of heavy metals, which become incorporated into the sand during use. Leaching studies have shown that lime treatment delists the great majority of sandblasting waste.	

Waste	Quantity	Preferred Option	Alternative Option
Engine Oil	10000 litres	Engine oil and waste fuels should be collected and stored in a bunded area until adequate amounts are available and then sold to a reputable recycling/recovery company.	*Small quantities* of diesel, engine oil and other high molecular weight petroleum based wastes, including sludges from sumps, e.g. from mechanical workshops, contaminated soil and oily rags can be absorbed onto sawdust, ash, soil or other absorbent waste material and co-disposed to the general waste landfill: the blended product should be fairly dry to the touch. Petrol, which contains significant amounts of volatile BETX compounds, requires a high quantity of absorbed material to restrict the mobility of the volatile components. Soil or other material contaminated with petrol should be weathered at the landfill and co-disposed when the flash point is >61°C and the odour has diminished significantly.
Waste Fuel	1200 litres		
Waste Oil	30000 litres		
Oil Filters	600	The oil should be allowed to drain from the filters or, preferably, they should be crushed to release any entrained oil and the recovered oil added to the other waste oils. The drained or crushed filters can be co-disposed to the General Waste Landfill with sawdust or other waste to absorb any excess oil. Small quantities of lime – say 2.5% or one 25kg bag/ton can also be added to reduce the mobility of heavy metals.	
Empty Chemical Drums	500	Drums should be sold to an approved drum recycling company. Note that careful management of chemical drums is essential, as they have considerable value to the population in poorer countries, such as Mozambique.	Drums should be carefully separated at source: - Drums that contained high hazard chemicals should be disposed to an HH site. - Drums containing low hazard materials can be co-disposed to the General waste landfill provided the drums are essentially "empty". The drums should be "destroyed", i.e. be punctured and/or crushed to make them unusable before disposal to the General waste Landfill.

Waste	Quantity	Preferred Option	Alternative Option
Cooking Oil	2000 litres	Cooking oil should preferably be recycled, i.e. sold to a reputable recycling company.	*Small quantities* of cooking oil can be absorbed onto sawdust, ash, soil or other absorbent waste material and co-disposed to the general waste landfill: the blended product should be fairly dry to the touch.
Batteries	50	Lead acid batteries should be recycled and, therefore, transported to Maputo or other major centre where recycling is an option. Batteries, either empty or full of acid, are classified as hazardous waste in terms of the Basel Convention. The South Africa Government would have to approve import into the country for lead recovery.	The batteries can be transported to Maputo and disposed at the proposed HH landfill: removal of the acid, which is treated separately (see below), followed by landfilling of the battery to an HH landfill is acceptable.
Contaminated waste	100 drums	It is not understood what is meant by this description of the waste or its origin: contaminated with what? Evaluation of the type of contaminant is required before a decision can be made on the management options.	
Medical Waste	15 boxes	Medical waste should preferably be incinerated or otherwise sterilised followed by disposal of the ash or residue to landfill.	In terms of WHO guidelines, if appropriate treatment facilities are absent, disposal of infectious waste to landfill is an acceptable disposal route. Treatment, e.g. by placing a small amount of a disinfectant, such as glutaraldehyde into the box or sharps container, before trenching in a General Waste Landfill or alternatively trenching the infectious waste with lime can greatly reduce the potential risks. The waste must be disposed, in such a way, that no person or animal can gain access to the waste after disposal.
Toner	150	Small quantities of empty toner bottles or cartridges can be co-disposed to the general waste landfill.	
Battery Acid	20 litres	The amount of acid generated is very small and neutralisation with lime to pH 9 to 10 is recommended before co-disposal/ash blending to the general waste landfill. For larger amounts disposal to an HH landfill would be more appropriate.	

Waste	Quantity	Preferred Option	Alternative Option
Solvents/Paints	300 litres	Solvents should, where possible be recycled or alternatively incinerated in an approved facility: providing a green products purchasing policy is in place no chlorinated solvents should be available for disposal. Chlorinated solvents should, however, only be recycled or disposed to the Maputo HH landfill and not be disposed to the General Waste Landfill. Water and organic solvent-based paints should be exposed to air and allowed to harden before co-disposing the container and any residues to the General Waste Landfill. If minor quantities of solvents are still suspected, the waste can be blended with ash or other absorbent material to reduce the environmental impact on the landfill.	
Sealants/mastic	500 litres	Most sealants and other material containing solvents should, if possible be hardened by exposure to air or otherwise blended with large amounts of ash, sawdust or other absorbent material and co-disposed to the General Waste Landfill. Each material should be assessed for its hazardous characteristics, prior to disposal and, if appropriate highly hazardous products should be avoided or disposed to an HH landfill.	
Sewage Sludge	130 m^3 -	Sewage sludge can contain more than 95% moisture and high levels of e-coli and other pathogenic bacteria. The sludge should be dried in a concreted and bunded area to reduce the moisture content and sterilise the solid. Provided the sludge is derived from a plant accepting sewage from only domestic sources, the resulting "dry solid" should contain low amounts of heavy metals, and can be used as an organic fertiliser or mixed with greens and composted.	The "dried solid" can be co-disposed to the General Waste Landfill, if necessary, after treatment with 2.5% to 5% of burnt lime to reduce heavy metal mobility, kill remaining pathogens and aid in drying the waste.

7 SITE DEVELOPMENT AND DEPOSITION SEQUENCE

7.1 SITE DEVELOPMENT

7.1.1 Landfill Operation

The operator must confirm that he understands the Operating Plan based on the Area Method of deposition in accordance with the Staged Development Plan before commencement of landfilling operations. The area method of deposition is defined in Section 3 of this report. The Staged Development Plan with the final landform of the landfill site is indicated on drawing number C.03.

7.1.2 Staged Development Plan

On behalf of Sasol, the consultant has provided a Staged Development Plan in the form of Drawing C.03, which shows the typical development of the phases of the operation, to assist the operator in the operation of the landfill site. Though this plan shall be followed and adhered to, modifications or alterations proposed by the operator shall be considered and may be approved by Sasol if considered advantageous.

The landfill shall be operated starting on the south side working northwards to the centre berm. The domestic waste section shall be developed in cells adequately sized to contain a weeks waste (assuming that waste is collected once a week). The cells shall be developed progressively and brought to final level as soon as practical.

The construction waste section shall also be filled progressively and covered.

Once airspace is utilised in the southern section, landfilling shall commence from the north side in the same sequence.

7.1.3 Final Cover

The approved final capping design comprises 2 x 150mm compacted sandy clay layers covered by 200mm of topsoil. Topsoil applied over the final cover layers shall be capable of supporting indigenous vegetation.

The final landform shall be raised along the north south axis of the site graded at 3% to the sides. Cells progressively filled and brought to final height shall be capped on completion in order to reduce moisture entering the landfill.

8 SITE OPERATIONAL PROCEDURES

The compaction procedure of waste being spread in thin layers and compacted by purpose-built equipment, as well as fully covering waste at the end of each working day, are Minimum Requirements, and must be adhered to.

8.1 INTRODUCTION

8.1.1 General

The landfill site shall be operated as specified in this document. Operations will be in terms of the Development Plan.

8.1.2 Scope of Site Operation

The Operating Plan is for the full operation of the landfill site and the scope of the operation will include the activities necessary to manage this entire operation efficiently and effectively.

Activities will include:

- Control of the acceptance, or refusal, of wastes arriving at the landfill.
- Maintaining records of all quantities and categories of wastes accepted.
- Ensuring the direction of all wastes accepted to appropriate designated points for disposal.
- Operating the landfill effectively and efficiently in accordance with this operating plan, and in accordance with the Minimum Requirements and Sasol's Environmental Policy, including spreading and compaction of waste, and application of final cover and rehabilitation.
- Maintaining security of the entire site, in particular to avoid pilfering, vandalism and scavenging.
- Maintaining access roads in trafficable condition.
- Reviewing the development and operation plan as necessary.
- Taking any necessary remedial action as may be directed in the event of an emergency.
- Other activities found necessary for the proper operation of the landfill as directed by Sasol or the Consultant.

8.2 LANDFILL

8.2.1 Manoeuvring Space at the Working Face

Space must be made available by the operator to enable vehicles to manoeuvre and reverse without causing excessive congestion and safety risks. In order to avoid overturning of vehicles, the operator shall grade completed cells so that the vehicles operate on acceptably level ground.

8.2.2 Site Appearance

The operator shall keep all completed areas of the landfill in a neat and tidy condition. All horizontal surfaces shall have the minimum required cross fall and be of even grade. Completed areas are to have final cover and topsoil applied and shall be rehabilitated by the operator, once final levels as shown on Drg C02B are reached.

8.3 WASTE DEPOSITION

8.3.1 Routine Deposition

Deposition of general waste is to be conducted in accordance with proven sanitary landfill principles of spreading, compacting and daily covering of putrescible wastes. The "Area Method" of landfill, whereby predominantly non-putrescible waste is spread in layers less than 0,5m thick, as defined by the Minimum Requirements, is recommended for use on the landfill site. The Area Method is considered suitable for the site, as the majority of the waste is non-putrescible. The site therefore meets the Minimum Requirements for the use of the area method. This method is suited to the disposal of construction waste

8.3.2 Compaction

Waste compaction is a Minimum Requirement and shall be carried out as part of the spreading operation by using a bulldozer or a TLB to produce a nominal compaction density. The vehicles passing over the waste, as they approach the working face, will also increase the compaction densities on site.

8.3.3 Covering

It is a Minimum Requirement that cover is applied to the waste body at the end of each working day. It is intended that the majority of the cover material to be used in the daily operation will be from the

excavation of the landfill site, which has been stockpiled for this use. Builder's rubble and excavation spoil from the construction site will also be used as cover material. Where the construction waste site comprises mainly inert material covering can take place at longer intervals.

On completion of an area, the landfill is to be appropriately shaped and graded, and final cover applied.

8.3.4 Highly Putrescible Waste

Organic putrescible matter shall immediately be worked into the working face and shall be covered completely to seal the material without delay.

8.3.5 Bulky Waste

The Contractor shall reduce the volume of items of bulky waste as far as practical by the use of his plant.

8.3.6 Protection of Boreholes

Any boreholes on site are to be protected during landfilling operations. Boreholes must have lockable borehole caps and locks.

8.3.7 Cover Integrity

Final cover shall regularly be checked for breaches through which malodorous gases can escape. Any breaches such as cracks, erosion furrows or subsidences, which occur, shall be identified, filled in and re-vegetated.

8.3.8 Litter Control

The site and its surrounds shall be kept neat and clean by picking up scattered refuse and all litter on a daily basis.

8.3.9 Dust Control

All un-surfaced roads shall be kept sprayed with water or otherwise kept moist to control dust.

8.3.10 Grassing

All completed sections of the landfill shall be vegetated with suitable indigenous grasses as soon as possible with a view to preventing erosion and improving aesthetics.

8.4 DRAINAGE AND POLLUTION CONTROL

8.4.1 Site Drainage

The Minimum Requirements specify that the principles of landfill site drainage be as follows:

- Upslope runoff must be diverted away from the waste, to prevent water contamination and to minimise leachate generation.
- Where contaminated water or leachate does arise on a site, it must be managed. This means that it must be kept out of the environment.

The operation shall be such that contact between waste and surface water is controlled so as to minimise contamination. Two drainage systems are accordingly required to be operated and

maintained during the course of the operation. One system for clean and uncontaminated run-off and the other for contaminated storm water and leachate.

8.4.2 Clean /Uncontaminated Run-off Water

Surface water and storm water shall be controlled by a system of berms and cut-off drains, which are constructed on the periphery of the site. The purpose of this shall be to prevent storm water run-off from entering the working area and for draining uncontaminated water away from the landfill. The object of the drainage system is to divert run-off round one or both sides of the waste body and into the natural watercourse.

The continued extension and maintenance of this system is required throughout the operation. For this purpose the covered surface of the completed landfill is to be graded and kept clean and free from any obstruction to ensure that rainwater will be kept clear of exposed waste. This water can then be drained into the natural watercourse.

The peripheral drain shall be retained after closure of the site to collect and convey away surface water from the capped area.

8.4.3 Contaminated Water and Leachate

All water, which has been in contact with the waste, shall be treated as contaminated water. This will include leachate, which may be generated on the site.

All contaminated water and leachate shall drain to the leachate sump. The contaminated water and leachate is to be recycled over the landfill thereby reducing the volume by evaporation. In the event excessive leachate is generated from high rainfall it shall be removed from the landfill and discharged to the sewage treatment plant. Precautions shall be taken to ensure that the plant is not overloaded disrupting the biological process.

The operator is responsible for:

- Ensuring that drains function as intended from day to day including continuous updating and modification of drainage systems, and
- For identifying major drainage problems, and repairing these.

8.4.4 Control of Nuisances

The site shall be operated so as to avoid, or if unavoidable, reduce to a minimum nuisances such as:

- Odour: the main control shall be by using approved sanitary landfill procedures of compaction and covering.
- Dust: this shall be controlled by means of watering.
- Applying sanitary landfill procedures of compaction and covering, as well as by flytraps or other appropriate means shall control flies and rodents.

8.4.5 Records

Records on waste acceptances will be maintained as specified in Clause 6.2.2. Records required shall include:

- Quantity of waste handled per day
- Airspace used per month
- Incidents
- Breakdowns and stoppages
- Rainfall
- Leachate volumes pumped
- Variations from operation plan

The Operator is responsible for maintaining all site records.

8.5 RESOURCE RECOVERY AND SALVAGING

8.5.1 Salvaging

The Contractor is to ensure that no resource recovery or salvaging of materials from the landfill shall be permitted.

8.5.2 Methane Control

No gas control or methane recovery is planned. Should gas prove a problem, for example by bubbling through cracks in the waste, or by cracking the final cover to be applied, Sasol must measure the flow and constituents of the gas. The operator is responsible for identifying any problem areas. Should a gas management system be required, such system must comply with the Minimum Requirements.

9 MAINTENANCE OF THE SITE

9.1 GENERAL

All aspects of the site shall be maintained in order to ensure its smooth and efficient operation and prevent undue deterioration of any item.

9.2 ROUTINE MAINTENANCE TASKS

9.2.1 Scattered Waste

The Site and its surrounds shall be kept neat and clean by the removal of all wind blown or scattered refuse.

9.2.2 Access Roads

The operator shall be responsible for the maintenance of all access to and on the Site. The work will include watering the surface to prevent excessive dust, the grading and filling in of potholes on a regular basis and the resurfacing of the roads with suitable material. All maintenance and repair work shall be timeously carried out to ensure that all-weather access to the working face is provided in a safe and useable condition.

9.2.3 Berms and Storm Water Drainage Channels

The operator shall be responsible for keeping all berms and storm water channels in good condition, so that they will adequately perform their intended function.

9.2.4 Fences, Gates, Access Control and Security Lighting

The landfill will be readily accessible from within the CPF. The entire CPF is fenced to prevent external access. The landfill site itself will not be fenced. The operator shall ensure that the fencing and gates of the site perimeter and of any access control facility are in good order and shall ensure that any damage caused to them is repaired without delay. All lighting required for safe working conditions must also be maintained in good working order.

9.2.5 Completed Areas

The operator shall be responsible for the watering of all vegetation established on the Site until such time that the vegetation is sustained and is sufficiently established not to require further watering. Any erosion furrows and subsidences that form shall be filled and re-grassed. All completed areas shall be kept in a neat and tidy condition. The control of litter, the cutting of grass at appropriate intervals during the rainy season and the maintenance of effective firebreaks must also be carried out by the operator.

9.3 GRASSING

Newly planted grass must be protected against erosion. An acceptable grass cover shall be achieved. In general this will be taken to mean that the area planted shall be covered with grass showing no bare patches exceeding 0,25m^2 in any area of 1m by 1m, within 2 months after planting.

10 GENERAL ENVIRONMENTAL CONSIDERATIONS

10.1 DIESEL / OIL SPILLS

Properly sized and sealed bunds are required beneath any diesel tanks installed on site, or around any storage area. The operator is responsible for maintenance of the bund, and for ensuring that the outlet valve is kept closed. Diesel or oil that is spilled must be collected in sand placed around the filling area. The sand must be inspected weekly and must be replaced with clean sand when necessary. Contaminated sand must be disposed of responsibly by way of co-disposal. Spillage must be minimised, and pipes must be kept leak free.

10.2 WASTE SPILLAGE ON ACCESS ROADS

Waste spillage on access roads by waste transport vehicles may pose an environmental threat should such waste be washed into uncontaminated water drainage systems. Any spillage must be loaded, transported and disposed of on site immediately.

11 REHABILITATION AND CLOSURE

11.1 INTRODUCTION

The Minimum Requirements give that closure is the final step in the operation of a landfill. In order to close a landfill properly, however, closure must be preceded by rehabilitation, to ensure that the site is environmentally acceptable. The objective of landfill closure is to rehabilitate the landfill so as to ensure that the site is environmentally and publicly acceptable and suited to the implementation of the end-use.

The landfill must be investigated before rehabilitation and closure can commence so as to identify any closure requirements that must be implemented. Based on the results of the investigations the closure design shown on the Development plan and construction drawings shall be amended where required. The site may then be closed and thereafter, the site must be monitored on an ongoing basis, for which Sasol will be responsible.

11.2 SHAPING TO FINAL LEVELS

The operator will be responsible for shaping the landfill to final levels. The final landform plan is shown on Drawings C.02 and C.03.

11.3 FINAL COVER / CAPPING

Once the site has reached final levels, the site is to be rehabilitated and closed. It is proposed that progressive rehabilitation and capping occur.

12 AUDITING AND MONITORING

The objectives of landfill operation auditing and monitoring are to:

- Verify that the landfill conforms to the required standards
- Ensure that the site design is properly implemented
- Quantify any effect the site may be having on the environment and in particular the water regime
- Serve as an early warning system so that any problems are timeously identified and rectified

12.1 INSPECTIONS

Sasol should carry out quarterly audits internally by way of checklists to measure the effectiveness of the general operation. Routine inspections, to check for compliance with the Operating Plan, must also be carried out by the responsible person.

12.2 WATER QUALITY MONITORING

12.2.1 Introduction

In accordance with the Minimum Requirements, a Water Quality Monitoring Plan for the Landfill Site is required. This involves background analyses, detection monitoring, investigative monitoring and post closure monitoring. Sasol is responsible for carrying out the Water Quality Monitoring Plan.

The objectives of the water quality monitoring plans are therefore:

- To indicate any escape of leachate into the water environment and to quantify its effect.
- To serve as an early warning system, so that any pollution problems that arise can be identified and rectified.

The boreholes are to be used as a water quality monitoring system.

Surface and ground water samples are to be collected and analysed for water quality parameters, as required in the document "Minimum Requirements for the Monitoring of Water at Waste Management Facilities"[3]. The water quality monitoring system therefore includes the monitoring of surface water bodies, ground water and leachate in the vicinity of the landfill site.

12.2.2 Surface water

There are no permanent surface water bodies associated with the landfill site.

12.2.3 Ground water

It is recommended that one upgrade boreholes and two downgrade boreholes be installed to monitor the groundwater. Detection monitoring shall be undertaken at intervals and should include at least the following:

Bi-annually	Alkalinity Chlorides PH Total Dissolved Solids	Chemical Oxygen Demand Nitrate Potassium
Annually	Calcium Sodium Fluoride	Magnesium Sulphate Conductivity

The monitoring program will continue post-closure in accordance with the Permit. Water quality will be analysed according to methods and standards as set out by the SABS.

12.2.4 Leachate

The leachate collected in the sump is to be monitored on a monthly basis to determine the quantity of leachate collected, and sampled and analysed at six-monthly intervals for the variables listed above.

12.2.5 Method of Sampling

For the sampling of the boreholes, composite borehole sampling should be acceptable. The procedure for composite sampling is as follows:

- Activate the pump and remove / purge at least three times the volume of water contained in the hole, or until such time as the conductivity has stabilised. If the borehole is pumped dry before the conductivity has stabilised or three times the volume removed, then a sample should be taken of the newly accumulated groundwater after recovery or partial recovery.
- Collect a water sample in a clean sampling bottle. Glass bottles are to be used for organic constituents such as oils, grease and phonemics.
- Preserve the sample according to the DWAF Minimum Requirements for Water Monitoring at Waste Management Facilities, Appendix 1 [3]. pH must be analysed for when samples are taken.

12.2.6 Methods of Analysis

Sasol must ensure that samples are analysed in accordance with the DWAF Minimum Requirements for Water Monitoring at Waste Management Facilities, Appendix 1 [3].

12.2.7 Interpretation of Data

In order to interpret the water quality monitoring data, time series plots for all boreholes and sampling points should be developed by Sasol. In addition, developing Piper diagrams would be of benefit. The interpretation of data together with the water quality results must be recorded and kept with all the other relevant landfill records. Sasol must maintain records of all samples taken.

12.2.8 Post closure monitoring

Sasol must maintain the water quality-monitoring plan for a period of 30 years after closure of the landfill site, or until such time that the landfill no longer poses a threat to the water environment.

13 REFERENCES

1. Department of Water Affairs & Forestry, Second Edition, 1998. Waste Management Series. Minimum Requirements for Waste Disposal by Landfill.

2. Department of Water Affairs & Forestry, Second Edition, 1998. Waste Management Series. Minimum Requirements for Handling, Classification and Disposal of Hazardous Waste

3. Department of Water Affairs & Forestry, Second Edition, 1998. Waste Management Series. Minimum Requirements for Monitoring at Waste Management Facilities

EFFLUENT TREATMENT

Howden
Howden Energy Systems

Howden Energy Systems	65006-COMPGA	Rev. 1
COMPRESSOR GA DRAWING		
Effluent Treatment Plant		
FWSA Order No 25733/0009012	G31-7175	
Sasol Petroleum Temane Limitada	Temane Pande Development Project	

HOWDEN ENERGY SYSTEMS

FOSTER WHEELER TEMANE EFFLUENT TREATMENT PLANT

COMPRESSOR GA

KC 9001

65006-COMPGA

Foster Wheeler South Africa (Pty) Ltd.

1. Rejected. ☐
2. Comments As Noted. ☐
3. Minor Comments (Acceptable) ☐
4. No Comments. ☒
5. Information Only. ☐

BY:	DEPT:	DATE:
	186	11/2/2003

Compliance with comments does not relieve Supplier Contractor of Responsibility for the Correctness of his work or of any requirements, warranties or guarantees stated or implied in the order.

FWSA DOCUMENT NO	SUPPLIER SUBMISSION NO
G31 ~ 7175	2

FOR FWSA USE ONLY

Please find applicable drawing attached.

CERTIFIED FINAL
Signature: .....
Date: 29/1/2003

FWSA DOCUMENT NO	SUPPLIER SUBMISSION NO
G39-4017	2

FOR FWSA USE ONLY

Howden
Howden Energy Systems

Howden Energy Systems	65006-MIXGA	Rev. 1
AGITATOR GENERAL ARRANGEMENT DRAWING		
Effluent Treatment Plant		
FWSA Order No 25733/0009012	G39	
Sasol Petroleum Temane Limitada	Temane Pande Development Project	

HOWDEN ENERGY SYSTEMS

FOSTER WHEELER TEMANE EFFLUENT TREATMENT PLANT

GENERAL ARRANGEMENT DRAWINGS

AG 9005 ALUM MIXER

65006-MIXGA

Foster Wheeler South Africa (Pty) Ltd.

1. Rejected.
2. Comments As Noted.
3. Minor Comments (Acceptable)
4. No Comments.
5. Information Only.

BY: DEPT: Mechanical DATE: 4/10/2002

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G39-4016	2

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Howden
Howden Energy Systems

Howden Energy Systems	65006-MIXGA	Rev. 1
AGITATOR GENERAL ARRANGEMENT DRAWING		
Effluent Treatment Plant		
FWSA Order No 25733/0009012	G39	
Sasol Petroleum Temane Limitada	Temane Pande Development Project	

HOWDEN ENERGY SYSTEMS

FOSTER WHEELER TEMANE EFFLUENT TREATMENT PLANT

GENERAL ARRANGEMENT DRAWINGS

AG 9004 CAUSTIC MIXER

65006-MIXGA

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Effluent Treatment Plant		
FWSA Order No 25733/0009012	G39	
Sasol Petroleum Temane Limitada	Temane Pande Development Project	

HOWDEN ENERGY SYSTEMS

FOSTER WHEELER TEMANE EFFLUENT TREATMENT PLANT

GENERAL ARRANGEMENT DRAWINGS

AG 9006 FLOC MIXER

65006-MIXGA

Foster Wheeler South Africa (Pty) Ltd.

1. Rejected. ☐
2. Comments As Noted. ☐
3. Minor Comments (Acceptable) ☐
4. No Comments. ■
5. Information Only. ☐

BY:	DEPT:	DATE:
[illegible]	Mech Dept	4/12/2002

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Howden Energy Systems

Howden Energy Systems	65006-PUMPGA	Rev. 1
EQUIPMENT GENERAL ARRANGEMENT DRAWING		
Effluent Treatment Plant		
FWSA Order No 25733/0009012	G31-7441	
Sasol Petroleum Temane Limitada	Temane Pande Development Project	

HOWDEN ENERGY SYSTEMS

FOSTER WHEELER TEMANE EFFLUENT TREATMENT PLANT

GENERAL ARRANGEMENT DRAWING

WILDEN PORTABLE PUMPS

(Supplied by – ROGENE PUMPS(PTY)LTD, SEBENZA)

65006-PUMPGA

Foster Wheeler South Africa (Pty)
1. Rejected.
2. Comments As Noted.
3. Minor Comments. (Acceptable)
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Date: 9/1/2003

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Howden
Howden Energy Systems

Howden Energy Systems	65006-PUMPGA	Rev. 1
EQUIPMENT GENERAL ARRANGEMENT DRAWING		
Effluent Treatment Plant		
FWSA Order No 25733/0009012	G31-5314	
Sasol Petroleum Temane Limitada	Temane Pande Development Project	

HOWDEN ENERGY SYSTEMS

FOSTER WHEELER TEMANE EFFLUENT TREATMENT PLANT

GENERAL ARRANGEMENT DRAWING

PUMPS PX 9007 A&B

(Supplied by – ROGENE PUMPS(PTY)LTD, SEBENZA)

65006-PUMPGA

Foster Wheeler South Africa (Pty) Ltd.

1. Rejected.
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3. Minor Comments (Acceptable)
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Signature: .....

Date: 28/10/2002

FWSA DOCUMENT NO	SUPPLIER SUBMISSION NO
G31-4827	3

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Howden
Howden Energy Systems

Howden Energy Systems	65006-PUMPGA	Rev. 2
EQUIPMENT GENERAL ARRANGEMENT DRAWING		
Effluent Treatment Plant		
FWSA Order No 25733/0009012	G31-4827	
Sasol Petroleum Temane Limitada	Temane Pande Development Project	

HOWDEN ENERGY SYSTEMS

FOSTER WHEELER TEMANE EFFLUENT TREATMENT PLANT

GENERAL ARRANGEMENT DRAWINGS

PX 8902 RECIPROCATING PUMP

65006-PUMPGA

Foster Wheeler South Africa (Pty) Ltd.
1. Rejected.
2. Comments As Noted.
3. Minor Comments (Acceptable)
4. No Comments.
5. Information Only.
BY: DEPT: DATE: 16/01/2003
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Also see PX 8902 operating and maintenance manual 65006-OMM-01

Please find applicable drawing attached.

CERTIFIED FINAL
Signature:
Date: 13/1/2003

FWSA DOCUMENT NO	SUPPLIER SUBMISSION NO
G31-4334	2

FOR FWSA USE ONLY

Howden
Howden Energy Systems

Howden Energy Systems	65006-PUMPGA	Rev. 1
EQUIPMENT GENERAL ARRANGEMENT DRAWING		
Effluent Treatment Plant		
FWSA Order No 25733/0009012	G31	
Sasol Petroleum Temane Limitada	Temane Pande Development Project	

HOWDEN ENERGY SYSTEMS

FOSTER WHEELER TEMANE EFFLUENT TREATMENT PLANT

GENERAL ARRANGEMENT DRAWINGS

Foster Wheeler South Africa (Pty) Ltd.
1. Rejected.
2. Comments As Noted.
3. Minor Comments. (Acceptable) ■
4. No Comments.
5. Information Only.
BY: DEPT: DATE: 5/11/2002
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PC 8904 A & B PUMPS

65006-PUMPGA

Please find all applicable drawing attached.

SCOPE OF SUPPLY:

2 off 50mm discharge connection with 2" BSP Threading
2 off 20mm top bracket
2 off 6m galvanised lifting chain
4 off 6mx20mm guide rails

PLEASE NOTE:

- Discharge connection is BSP, not NPT
- Ignore ALT. DES. on top bracket arrangement

FWSA DOCUMENT NO	SUPPLIER SUBMISSION NO
G31-4333	2

FOR FWSA USE ONLY

Howden
Howden Energy Systems

Howden Energy Systems	65006-PUMPGA	Rev. 1
EQUIPMENT GENERAL ARRANGEMENT DRAWING		
Effluent Treatment Plant		
FWSA Order No 25733/0009012	G31	
Sasol Petroleum Temane Limitada	Temane Pande Development Project	

HOWDEN ENERGY SYSTEMS

FOSTER WHEELER TEMANE EFFLUENT TREATMENT PLANT

GENERAL ARRANGEMENT DRAWING

Foster Wheeler South Africa (Pty) Ltd.
1. Rejected.
2. Comments As Noted.
3. Minor Comments (Acceptable)
4. No Comments.
5. Information Only.

BY: DEPT: DATE: 11/2002

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PC 9009 A & B(Final) PUMPS

65006-PUMPGA

Please find all applicable drawing attached.

SCOPE OF SUPPLY:

2 off 80mm discharge connection with flanged drilled to ANSI B16.1-89
2 off 50mm top bracket
2 off 6m galvanised lifting chain
4 off 6mx50mm guide rails

PLEASE NOTE:

- Discharge connection is BSP, not NPT
- Ignore ALT. DES. on top bracket arrangement

FWSA DOCUMENT NO	SUPPLIER SUBMISSION NO
G31-4331	2

FOR FWSA USE ONLY

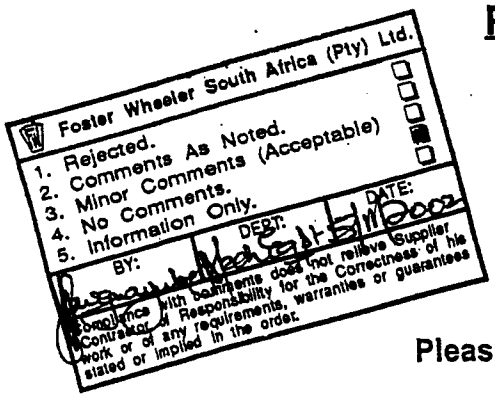
Howden
Howden Energy Systems

Howden Energy Systems	65006-PUMPGA	Rev. 1
EQUIPMENT GENERAL ARRANGEMENT DRAWING		
Effluent Treatment Plant		
FWSA Order No 25733/0009012	G31	
Sasol Petroleum Temane Limitada	Temane Pande Development Project	

HOWDEN ENERGY SYSTEMS

FOSTER WHEELER TEMANE EFFLUENT TREATMENT PLANT

GENERAL ARRANGEMENT DRAWINGS



PC 8903 A & B PUMPS

65006-PUMPGA

Please find applicable drawing attached.

SCOPE OF SUPPLY:

2 off 50mm discharge connection with 2" BSP Threading
2 off 20mm top bracket
2 off 6m galvanised lifting chain
4 off 6mx20mm guide rails

PLEASE NOTE:

- Discharge connection is BSP, not NPT
- Ignore ALT. DES. on top bracket arrangement

FWSA DOCUMENT NO	SUPPLIER SUBMISSION NO
A30-6356	2

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Howden
Howden Energy Systems

Howden Energy Systems	65006-EQDATA06	Rev. 1
Equipment Data – AGITATOR DATA SHEET		
Effluent Treatment Plant		
FWSA Order No 25733/0009012	A30-6356	
Sasol Petroleum Temane Limitada	Temane Pande Development Project	

HOWDEN ENERGY SYSTEMS

FOSTER WHEELER TEMANE EFFLUENT TREATMENT PLANT

FLOC TANK AGITATOR

AG 9008

Foster Wheeler South Africa (Pty) Ltd
1. Rejected.
2. Comments As Noted.
3. Minor Comments (Acceptable)
4. No Comments.
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65006-EQDATA06

Please find applicable equipment data attached.

CERTIFIED FINAL
Signature: .....
Date: 13/11/2002

FWSA DOCUMENT NO	SUPPLIER SUBMISSION NO
B06-6573	1

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Howden
Howden Energy Systems

Howden Energy Systems	65006-PRDESCR (SBR)	Rev. 0
PROCESS DESCRIPTION OF SEWAGE TREATMENT PLANT (ME9010)		
Effluent Treatment Plant		
FWSA Order No 25733/0009012		
Sasol Petroleum Temane Limitada	Temane Pande Development Project	

HOWDEN ENERGY SYSTEMS

FOSTER WHEELER TEMANE EFFLUENT TREATMENT PLANT (ME9018)

PROCESS DESCRIPTION

SBR

SUBMERGED BIOLOGICAL REACTOR (ME9010)

Foster Wheeler South Africa (Pty) Ltd

1. Rejected.
2. Comments As Noted.
3. Minor Comments (Acceptable) X
4. No Comments.
5. Information Only.

BY Engineer/Mechanical DEPT DATE 23/10/2002

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65006-PRDESCR (SBR)

Please find applicable document attached.

CERTIFIED FINAL
Signature: .....
Date: 14/10/2002

FWSA DOCUMENT NO	SUPPLIER SUBMISSION NO
B06-3932	3

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Howden
Howden Energy Systems

Howden Energy Systems	65006-PRDESCR	Rev. 03
Process Description		
Effluent Treatment Plant (ME9018)		
FWSA Order No 25733/0009012		
Sasol Petroleum Temane Limitada	Temane Pande Development Project	

HOWDEN ENERGY SYSTEMS

FOSTER WHEELER TEMANE EFFLUENT TREATMENT PLANT (ME9018)

PROCESS DESCRIPTION

Foster Wheeler South Africa (Pty) Ltd

1. Rejected.
2. Comments As Noted.
3. Minor Comments (Acceptable) X
4. No Comments.
5. Information Only.

BY [illegible] DEPT MechEngN DATE 15/10/2002

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65006-PRDESCR

CERTIFIED FINAL
Signature: .....
Date: 11/10/2002

Howden
Howden Energy Systems

Howden Energy Systems	65006-VESSELGA	Rev. 4
BATCH SEPARATOR GENERAL ARRANGEMENT DRAWING		
Effluent Treatment Plant ME9018		
FWSA Order No 25733/0009012	G91-5102 / D90-3406	
Sasol Petroleum Temane Limitada	Temane Pande Development Project	

HOWDEN ENERGY SYSTEMS

FOSTER WHEELER TEMANE EFFLUENT TREATMENT PLANT ME9018

GENERAL ARRANGEMENT DRAWINGS

BATCH SEPARATOR – DM 8903

Foster Wheeler South Africa (Pty) Ltd
1. Rejected.
2. Comment, As Noted.
3. Minor Comments (Acceptable)
4. No Comments.
5. Information Only.
BY: DEPT: 156 DATE: 19 Dec 03
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65006-VESSELGA
Drawing no. 2950/1 rev 4

Please find all applicable drawing attached.

PLEASE NOTE: **As agreed in Progress meeting held on August 14, 2002 only the wall thickness was upgraded to 8mm in order to adhere to SASOL specification.**

FWSA DOCUMENT NO	SUPPLIER SUBMISSION NO
G91 ~ 3406	4

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INCINERATOR

SUPPLIER DOCUMENT COVER SHEET

FWSA DOCUMENT NO	SUPPLIER SUBMISSION NO
F50-4613	8.

FOR FWSA USE ONLY

Supplier :Howden Energy Systems

Document No :24137PID/2

Document Title :Piping and Instrumentation Diagrams (Ceramic Filter)

TEMANE PANDE DEVELOPMENT PROJECT	
Client Name	SASOL PETROLEUM TEMANE LIMITADA
Project Location	Temane Pande Mozambique
FWSA Contract No.	25731/9
FWSA Order No.	25733/0009013
FWSA Requisition No.	25733-
FWSA Document No.	F50-4613
Item	Waste Incinerator (Ceramic Filter)
Drawing No.	50381B-500
Item No.	ME 9015

Foster Wheeler South Africa (Pty)

1. Rejected. ☐
2. Comments As Noted. ☐
3. Minor Comments (Acceptable) ☐
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AUTHORISED INSPECTION AUTHORITY

REV	SUPPLIER APPROVAL SIGNATURE	DATE
N		05/03/03

SUPPLIER DOCUMENT COVER SHEET

FWSA DOCUMENT NO	SUPPLIER SUBMISSION NO
F50-4612	7

FOR FWSA USE ONLY

Supplier :Howden Energy Systems

Document No :24137PID/1

Document Title :Piping and Instrumentation Diagrams (Waste Incinerator)

TEMANE PANDE DEVELOPMENT PROJECT	
Client Name	SASOL PETROLEUM TEMANE LIMITADA
Project Location	Temane Pande Mozambique
FWSA Contract No.	25731/9
FWSA Order No.	25733/0009013
FWSA Requisition No.	25733-
FWSA Document No.	F50-4612
Item	Waste Incinerator – Piping and Instrumentation Diagrams (Incinerator)
Drawing No.	50381A-500
Item No.	ME 9015

Foster Wheeler South Africa (Pty)	
1. Rejected.	☐
2. Comments As Noted.	☐
3. Minor Comments (Acceptable)	☐
4. No Comments.	☐
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REV	SUPPLIER APPROVAL SIGNATURE	DATE
N		05/03/03

SUPPLIER DOCUMENT COVER SHEET

Supplier :Howden Energy Systems

Document No :24137COP/2

FWSA DOCUMENT NO	SUPPLIER SUBMISSION NO
B09-6442	2

FOR FWSA USE ONLY

Document Title :Utility Plant Description (Waste Incinerator)

TEMANE PANDE DEVELOPMENT PROJECT	
Client Name	SASOL PETROLEUM TEMANE LIMITADA
Project Location	Temane Pande Mozambique
FWSA Contract No.	25731/9
FWSA Order No.	25733/0009013
FWSA Requisition No.	25733-
FWSA Document No.	B09-6442
Item	Waste Incinerator
Item No.	ME-9015

Foster Wheeler South Africa (Pty)

1. Rejected. ☐
2. Comments As Noted. ☐
3. Minor Comments (Acceptable) ☐
4. No Comments. ☐
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B		
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SUPPLIER DOCUMENT COVER SHEET

Supplier :Howden Energy Systems

Document No :24137PFD

FWSA DOCUMENT NO	SUPPLIER SUBMISSION NO
F50-4340	4

FOR FWSA USE ONLY

Document Title :Process Flow Diagram

TEMANE PANDE DEVELOPMENT PROJECT	
Client Name	SASOL PETROLEUM TEMANE LIMITADA
Project Location	Temane Pande Mozambique
FWSA Contract No.	25731/9
FWSA Order No.	25733/0009013
FWSA Requisition No.	25733-
FWSA Document No.	F50-4340
Item	Waste Incinerator (Process Flow Diagram)
Supplier Doc. No.	24137PFD
Item No.	ME 9015

Foster Wheeler South Africa (Pty)		
1. Rejected. ☐		
2. Comments As Noted. ☐		
3. Minor Comments (Acceptable) ☐		
4. No Comments. ☐		
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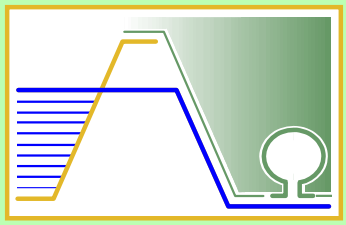
REV	SUPPLIER APPROVAL SIGNATURE	DATE
A		03/10/02
B		07/02/03
C		05/03/03

Metago

Environmental Engineers (Pty) Ltd



Prepared For

Sasol Petroleum Temane Limitada

- ENVIRONMENTAL MANAGEMENT PLAN -

Operation of the Temane Well-heads, Flowlines, Access Roads and a Central Processing Facility

- Inhambane Province, Mozambique -

PROJECT NUMBER 154-003

REPORT NO. 7 Final Draft - English version

May 2003

- ENVIRONMENTAL MANAGEMENT PLAN -

Operation of the Temane Well-Heads, Flowlines, Access Roads and a Central Processing Facility, Inhambane Province, Mozambique

Prepared For

Sasol Petroleum Temane Limitada

PROJECT NUMBER 154-003

REPORT NO. 7 Final Draft - English version

May 2003

DOCUMENT INFORMATION

Confidentiality	Strictly Confidential.
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Reviewer	Guy Wiid
Client	Sasol Petroleum Temane Limitada
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DEFINITIONS AND ACRONYMNS

EIA – Environmental Impact Assessment.

EIS – Environmental Impact Statement.

EMP – Environmental Management Plan. (dEMP – design EMP; cEMP – construction EMP; oEMP – operations EMP)

Environmental Consultant – An independent environmental consultant with experience in the environmental management of industrial projects.

Environmental Management Plan (EMP) – i) Defines the measures to be taken during the life of a project, including design, construction, operation and decommissioning to prevent and/or manage adverse environmental impacts; ii) defines the actions needed to implement these measures; and iii) describes how this will be achieved.

Environmental Management Plan Audit – A systematic, documented and objective evaluation of the environmental performance of a project by objectively obtaining and analysing evidence to determine whether the implementation of the EMP conforms with its requirements.

Environmental Management System – The part of the overall management system that includes organisational structure, planning activities, responsibilities, procedures, processes and resources for developing, implementing, achieving, reviewing and maintaining an environmental policy.

The Government – The National Government of Mozambique.

Metago – Metago Environmental Engineers (Pty) Ltd.

MICOA – Ministry for the Co-ordination of Environmental Affairs, Mozambique.

Sasol – Refers to Sasol (Pty) Ltd and all its affiliate organisations.

SPI – Sasol Petroleum International (Pty) Ltd

SPT – Sasol Petroleum Temane Limitada

SHERQ – Safety, Health, Environment, Risk, Quality.

The Project – the Temane Well-Heads, Flowlines, Access Roads and Central Processing Facility.

Project No. 154-003 May 2003

Report No. 7 Final Draft - English version

- ENVIRONMENTAL MANAGEMENT PLAN - OPERATION OF THE TEMANE WELL-HEADS, FLOWLINES, ACCESS ROADS AND A CENTRAL PROCESSING FACILITY, INHAMBANE PROVINCE, MOZAMBIQUE

1. INTRODUCTION

During October 2000, Sasol Petroleum Temane Limitada (Sasol), Empresa Nacional de Hidrocarbonetos de Moçambique, E.P. (ENH), Companhia Moçambicana de Hidrocarbonetos S.A.R.L. (CMH) and the Government of Mozambique signed a Petroleum Production Agreement for the production and processing of the Temane and Pande gas fields in Inhambane Province, Mozambique. The outcome of these agreements will be the production and processing of natural gas resources and the export of the processed natural gas to Secunda in South Africa via an underground pipeline.

The key project elements are as follows:

1. Exploration activities to determine the extent of the gas reserves and optimal locations for extraction. Exploration will take place over the lifespan of the project.

2. Development of a network of production wells and gas flowlines within the Temane and Pande well-fields and the construction and operation of a central processing facility (CPF) for the cleaning and drying of the gas.

3. Transportation of the gas from Temane to Secunda (South Africa) and Maputo (Mozambique) via underground transmission pipeline.

4. Upgrading and conversion of Sasol's plant infrastructure at Secunda and Sasolburg (South Africa) to accommodate the natural gas.

The project was structured into several components and an Environmental Impact Statement (EIS) was produced for each of the following:

1. Gas field environmental impact study for the establishment of the well fields at Temane and Pande and the central processing facility at Temane.

2. Exploration environmental impact study for all seismic and drilling activities within the Temane and Pande exploration area.

3. Mozambique pipeline environmental impact study for the proposed pipeline between the central processing facility (CPF) at Temane and the Mozambique / South Africa border crossing at Ressano Garcia.

4. South African pipeline environmental impact study for the proposed pipeline from the border crossing at Komatipoort to Sasol's production plant at Secunda.

5. Secunda plant upgrading environmental impact study to prepare for the introduction of natural gas at the plant.

6. Sasolburg plant conversion environmental impact study to prepare for the introduction of natural gas at the plant.

7. Natural gas network conversion environmental impact study for the establishment of a natural gas network in South Africa.

Environmental management for each of these project components will be governed by specific and separate environmental management plans. **This document is relevant for *component 1* listed above (gas field EIS) and addresses the operational environmental management requirements of the Central Processing Facility, associated well-heads, flowlines and access road infrastructure**. Construction of the project commenced in 2002 with commissioning scheduled to take place during the last quarter of 2003.

1.1. PURPOSE OF THE OPERATIONS ENVIRONMENTAL MANAGEMENT PLAN

The EMP is a means for Sasol (and its project partners), contractors, the Government of Mozambique (GOM) and others to reach agreement on the project's environmental performance standards. In so doing the risk and hence potential liability to those involved with the project can be effectively managed and environmental requirements met, to the satisfaction of all concerned. The EMP aims to present management measures that will eliminate, offset or reduce adverse environmental impacts.

1.2. ENVIRONMENTAL POLICY

As the project owner, Sasol Petroleum International (Pty) Ltd (SPI) has implemented the following environmental policy that shall set the framework for environmental management for the project. All visitors, contractors and employees are required to comply with the requirements of the policy.

SPI believes that the health and safety of human life, as well as the quality of the environment should be protected.

SPI is committed to act responsibly with regard to the effect of its operations and products on human existence and the environment.

SPI is committed to:

- Advise our partners and contractors on our health, safety and environmental strategy and program;
- As a minimum requirement, comply with all applicable health, safety and environmental legislation, Responsible Care and with all other agreed requirements;
- Ensure that impact assessments and systematic safety studies are done for all projects which pose a potential threat;
- The responsible utilisation of natural resources;
- Minimise or prevent the generation of pollutants through prudent design and the use of best economically viable technologies;
- Monitor and review the performance of our environmental management system to achieve continual improvement;
- Prominently display this Health, Safety and Environmental policy and make it available to all employees and other interested and affected parties;
- Facilitate the sharing of best health, safety and environmental practices;

SPI will achieve these by:

- Implementing internationally recognised safety, health, environmental and quality management systems;
- Inform and provide appropriate training to all employees and contractors as required to ensure awareness and enhance understanding on health, safety and environmental matters;
- Benchmarking internationally on best safety, health and environmental practices;
- Responding effectively to safety, health and environmental emergencies involving our operations and products;
- Appoint responsible contractors and execute conformance audits to ensure compliance;
- Provide appropriate resources required to implement the above.

1.3. COMPONENTS OF THE ENVIRONMENTAL MANAGEMENT PLAN

This operations environmental management plan (oEMP) is one of three documents comprising the overall environmental management plan for the Temane Gas Fields and Central Processing Facility Project. In addition there is a set of specialist studies produced to assist in the preparation of the environmental management plans. The complete set of documents is as follows:

1. Design EMP	Metago Environmental Engineers (Pty) Ltd. 2002. *Environmental Management Plan. Design of the Temane Well-heads, Access Roads and a Central Processing Facility. Inhambane Province. Mozambique.* (Metago ref. 154-003 report 5*).*
2. Construction EMP	Metago Environmental Engineers (Pty) Ltd. 2002. *Environmental Management Plan. Construction of the Temane Well-heads, Access Roads and a Central Processing Facility. Inhambane Province. Mozambique.* (Metago ref. 154-003 report 1).
3. Commissioning and operations EMP	***This document.***
4. Specialist studies	*Air quality assessment (Metago / Environmental Management Services cc. 2002)* *Ecological assessment (Metago / De Castro and Brits, 2002)* *Effluent management review (Metago, 2002)* *Govuro River crossing assessment (Metago / Wetland Construction (Pty) Ltd, 2002)* *Groundwater model and monitoring report (in preparation)*[1] *Soil study (Groundwater Consulting Services, 2002)* *Visual report (colour schemes; Newtown Landscape Architects, 2002)* *Waste management review (Metago, 2002)*

[1] The groundwater specialist study is currently under preparation, the results and recommendations of which shall result in an upgrade to this EMP. (This upgrade shall be the responsibility of Sasol).

1.4. SCOPE OF THE OPERATIONS EMP

The operations EMP (this document) contains environmental management requirements for all activities related to the commissioning and operation (and decommissioning to the extent that information was available at the time of writing) of the following project components within the Temane Development Block:

- Well-heads (i.e. gas extraction wells);
- Flowlines (i.e. pipelines from the well-heads to the central processing facility);
- Access roads (to the well-heads and the central processing facility); and
- Central Processing Facility (CPF).

Note / limitations to the scope of the EMS:

1. *Issues related to compensation, resettlement and relocation have not been addressed in this document and the reader is referred to Mr Peter Stuart-Thompson for queries / information in this regard.*

Name	Peter Stuart-Thompson
Organisation	Sasol Petroleum International (Pty) Ltd
Postal address	P.O. Box 5486, Johannesburg, 2000, South Africa
Physical address	Avenida de Marginal, no 237, Maputo, Mozambique
Telephone	+ 258-1-311 711 (office-hours)
Fax	+ 258-1-497 707
E-mail	peter.stuartthompson@sasol.co.mz

2. *The EMP does not include specifications regarding occupational health, hygiene or safety requirements. Sasol's obligations in this regard are set by legislation and policy commitments.*

4. *Except where specified, this EMP has been prepared based on information provided to Metago Environmental Engineers (Pty) Ltd (environmental consultant) predominantly by Sasol and Foster Wheeler (project EPCm contractors).*

1.5. APPROACH TO THE PREPARATION OF THE ENVIRONMENTAL MANAGEMENT PLAN

Metago Environmental Engineers (Pty) Ltd was contracted by Sasol Technology (Pty) Ltd to compile the environmental management plans (EMP) for the project. The EMP documents were to draw primarily on the environmental impact statement report that was prepared for the project. In summary, the approach followed by Metago included:

i) A review of available project information produced to date, including the EIS produced by Mark Wood Consultants and Impacto (December 2001) on behalf of Sasol, design documentation provided by Foster Wheeler and the draft operating manual produced by Foster Wheeler (ref. 25732-8130-OM-0001, Rev 01, 2002).

ii) A meeting and discussions with Sasol Petroleum International (Pty) Ltd (SPI) and Sasol Petroleum Temane Limitada (SPT) representatives concerning the activities and aspects associated with the commissioning and operation of the CPF and associated infrastructure.

iii) Knowledge of the site based on several site visits.

iv) Conducting specialist studies where necessary (as per the contract terms of reference) to close gaps identified in the EIS.

v) Compiling management requirements based on the above and professional experience.

The EMP has been developed to include:

- Mitigation / management measures required during the commissioning and operational phase of the project (as well as any available information regarding the decommissioning phase);
- A description, where necessary, of the activities necessary to achieve the mitigation measures;
- Scheduling requirements;
- Responsibilities, communication and reporting structures; and
- Specifying performance evaluation requirements.

Note:

1. Environmental management needs for the project may change, new activities may be performed and previously identified activities modified. Environmental management must focus on continual improvement and thus wherever possible the EMP must be upgraded and improved based on changing circumstances, new techniques and better information.

2. The EMP represents the minimum requirements for environmental management for the project. The EMP documents the actions, approaches and measures required to mitigate and manage environmental risk associated with the project, recording not only changes to the project itself but also the impact of external factors such as legislation, policy and public and social accountability. To make provision for these changes responsibilities have been assigned for identifying and making changes to the EMP (see Sections 4.3, 4.4 and 9).

2. ENVIRONMENTAL MANAGEMENT STRUCTURE

2.1. ORGANISATIONAL STRUCTURE AND RESPONSIBILITY

The organisational structure between the various Sasol companies and project partners is summarised in Figure 1 below.

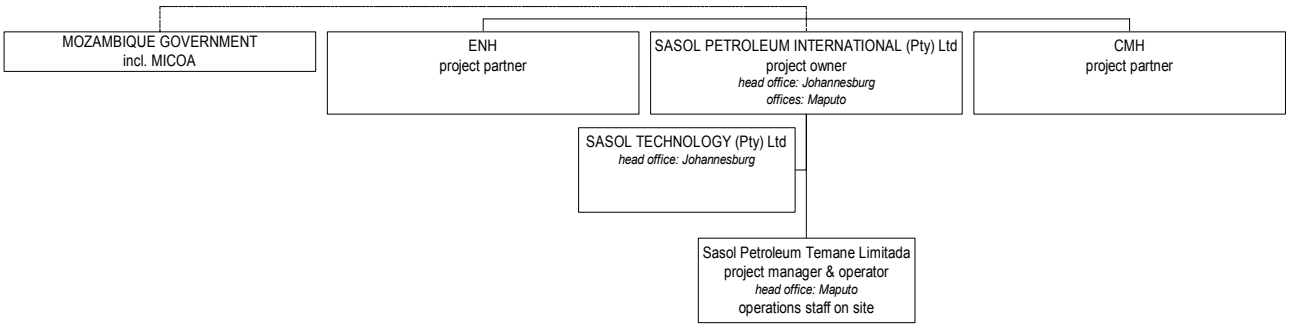


FIGURE 1. COMPANY ORGANISATIONAL STRUCTURE ON THE TEMANE GAS FIELDS PROJECT (IN ADDITION VARIOUS FUNDING BODIES PLAY A ROLE IN THE PROJECT).

The overall organisational structure for environmental management on the Temane Project will be as presented in Figure 2.

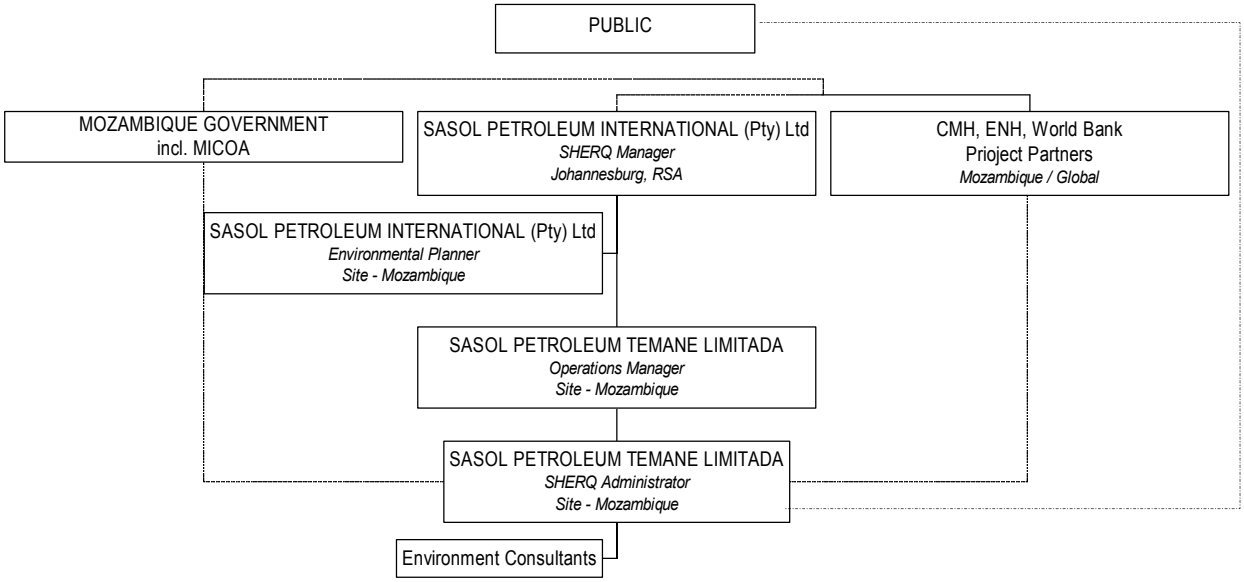


FIGURE 2. OVERALL ENVIRONMENTAL ORGANISATION STRUCTURE BETWEEN KEY ROLE PLAYERS DURING THE OPERATIONAL PHASE OF THE PROJECT.

With regard to environmental management during the operational phase of the project, the principal responsibilities of each party within this structure will be as follows:

All parties	*All parties shall comply with all the requirements of the project EIA and EMP and shall, in accordance with accepted standards of the international petroleum, oil and gas industry and the World Bank, employ such up to date techniques, practices and methods that will ensure compliance to this standard and, in general, minimise environmental damage, control waste, avoid pollution, prevent loss or damage to natural resources and minimise effects on surrounding landowners, occupants and the general public.* *All parties shall prevent or minimise the occurrence of accidents which may cause damage to the environment, prevent or minimise the effects of such accidents and shall return the environment to a state as close to the condition existing prior to any such accident as possible.* *All parties shall take proactive steps to ensure that the standards in the EMP are met during operation. These shall include, but not be limited to, the following:* o *Employment of competent and dedicated members of staff to oversee the implementation of the EMP.* o *Instruction of staff about the relevant environmental sensitivities and the specific measures that each employee will implement to meet the environmental protection and management standards defined by the EMP.*
SHERQ Manager: Sasol Petroleum	*Ensure the provision of sufficient and suitable resources both on- and off-site to ensure that pollution is prevented, waste minimised and the rights of the environment protected.*

International	*Ensure compliance to all environmental legislation and commitments at all times.* *Ensure the implementation of an environmental management system to achieve all of the above.* *Visit the site from time to time and ensure that he/she is fully familiar with site happenings so as to actively initiate any planning or take any decisions that may be required to ensure the protection of the environment.* *Assume responsibility for all decisions on all environmental matters.*
Environmental Planner: Sasol Petroleum International	*Ensure strategic planning with regard to medium and long-term environmental management for the Gas-fields Project by:* o *Keeping abreast of local, regional and national developments in Mozambique.* o *Setting plans for meeting these developments as necessary.* o *Developing and implementing means and approaches for Sasol to understand its effects on the broader region in which it operates in Mozambique and to liaise with the Government of Mozambique and SPI management to encourage and plan for the effective management of these issues.* o *Defining proactive measures to ensure that SPI remains at the forefront of environmental management performance in Mozambique and in the oil and gas industry globally.*
Operations Manager: Sasol Petroleum Temane	*The Operations Manager shall ensure that all parties comply to all the requirements of the EIA and EMP and shall, in accordance with accepted standards of the international petroleum, oil and gas industry and the World Bank, employ such up to date techniques, practices and methods of operations that will ensure compliance to this standard and, in general, minimise environmental damage, control waste, avoid pollution, prevent loss or damage to natural resources and minimise effects on surrounding landowners, occupants and the general public.* *The Operations Manager shall establish systems and approaches to prevent or minimise the occurrence of accidents which may cause damage to the environment, prevent or minimise the effects of such accidents and shall return the environment to a state as close to the condition existing prior to any such accident as possible.* *The Operations Manager shall take proactive steps to ensure that the standards in the EMP are met during operation. These shall include, but not be limited to, the following:* o *Employment of competent and dedicated members of staff to oversee the implementation of the EMP; and the* o *Instruction of staff about the relevant environmental sensitivities and the specific measures that each employee will implement to meet the environmental protection and management standards defined by the EMP.* *The Operations Manager shall ensure the availability of sufficient and suitable resources to ensure the aforementioned.*
SHERQ Administrator: Sasol Petroleum Temane	*The SHERQ Administrator will act as a guide and advisor to employees and contractors on environmental issues during the operational phase of the project. This will be achieved by ongoing inspections / auditing of the project, identification of problem areas and provision of actions plans to ensure environment protection.* *The SHERQ Administrator will ensure compliance to the requirements of the EMP by all parties, as well as with any other requirements related to environmental issues as they become known. Specific responsibilities of the SHERQ*

Administrator will be as follows:

- *To thoroughly familiarise him/herself with existing information regarding the project area and the EMP.*
- *Ensure the protection of the environment.*
- *Perform all of the day-to-day tasks necessary to monitor performance with regard to the requirements of the EMP and any other relevant requirements and / or commitments.*
- *Update the EMP based on requirements of the project, the Government or internal Sasol requirements.*
- *Monitor the impact of the project on the environment with particular emphasis on areas of environmental sensitivity.*
- *Audit compliance by employees, contractor(s) and suppliers with this environmental standard.*
- *To liase with the Operations Manager and SHERQ Manager in the case of incidents, non-compliance or any matter where the course of action is unclear.*
- *Prepare environmental audit reports documenting the effectiveness of environmental management, problem areas, remedial actions proposed and taken and compliance/non-compliance by the Contractor(s) with the project standard.*
- *Verify the accuracy of the information contained in the EMP and to bring any errors, omissions, oversights to the attention of all parties as necessary.*

The SHERQ Administrator will initiate, co-ordinate and manage all communication with the Government (local, provincial and national) and public on environmental matters.

The SHERQ Administrator should have experience in environmental management and will be required to be able to evaluate the effectiveness of specified management measures and be familiar with environmental management techniques. He / she should be able to propose solutions to problems identified as regards the implementation of the plans.

The SHERQ Administrator will liase closely with the Operations Manager, the SHERQ Manager and environmental supervisors of all appointed contractors. The SHERQ Administrator will be based on site.

2.2. LIAISON, CO-ORDINATION AND REPORTING

The structure for all communication, correspondence and reporting between project stakeholders will be as per the overall project organisational structure (for environmental matters) as presented in Figure 2. Specific requirements regarding communication between project stakeholders are presented in Sections 3.4 and 3.5.

2.3. ENVIRONMENTAL MANAGEMENT SYSTEM

There are three main tools for the environmental management of projects:

- The Environmental Impact Assessment (EIA);
- The Environmental Management Plan (EMP); and
- The Environmental Management System (EMS).

The links between these three important tools are illustrated graphically in Figure 3.

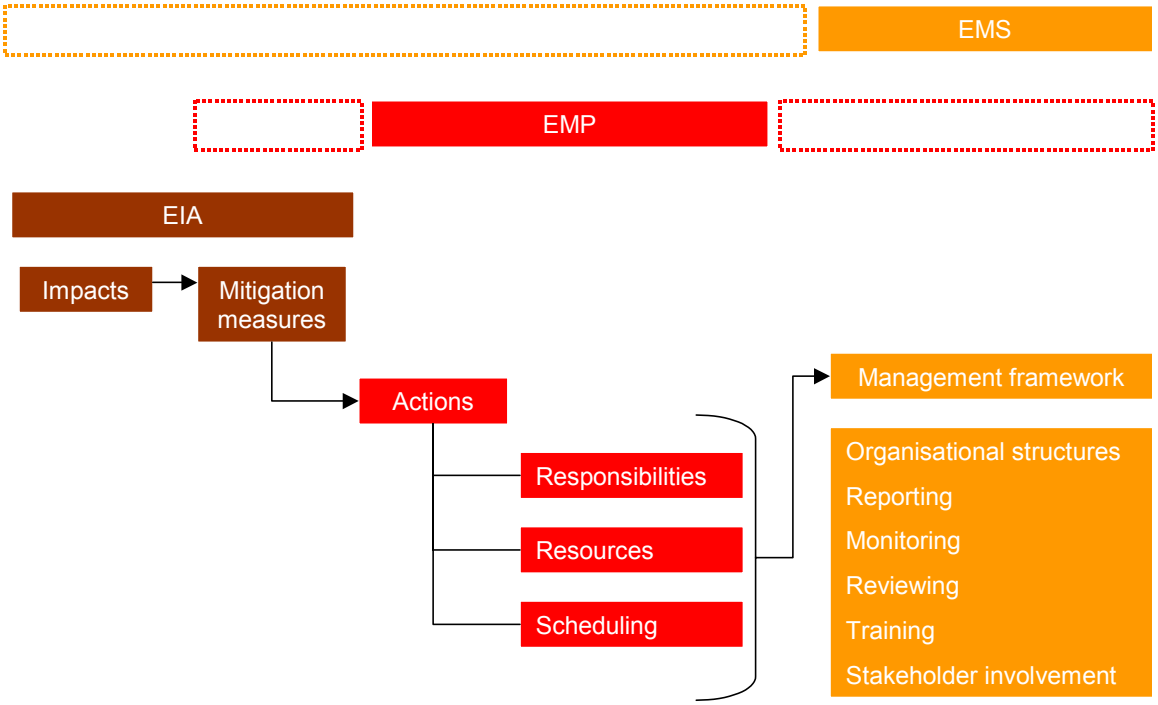


FIGURE 3. THE LINKS BETWEEN THREE IMPORTANT ENVIRONMENTAL MANAGEMENT TOOLS, THE ENVIRONMENTAL IMPACT ASSESSMENT (EIA), THE ENVIRONMENTAL MANAGEMENT PLAN (EMP) AND THE ENVIRONMENTAL MANAGEMENT SYSTEM (EMS). THE DOTTED LINE BLOCKS INDICATE THE FULL SET OF COMPONENTS FOR EACH TOOL.

The EMP is intended to guide impact management and mitigation associated with the project. It converts EIA mitigation measures into actions and allocates responsibility and deadlines to those actions. The EMS confirms management commitment to the EMP and describes how the requirements of the EMP will be achieved. It sets the management framework in terms of environmental organisational structure, reporting, review and monitoring, training and public disclosure. While this EMP has specified requirements in this regard, it is the responsibility of the SHERQ Manager to ensure that a suitable management system is implemented to ensure compliance (and be able to demonstrate compliance) to the EMP.

3. ACTIVITY AND IMPACT MANAGEMENT PLAN

This section presents specific environmental management requirements for the commissioning and operational phases of the Temane Gas-fields Project.

3.1. BACKGROUND TO ENVIRONMENTAL IMPACT MITIGATION AND MANAGEMENT

For environmental management to be effective the primary focus of this management must be placed on managing activities so as to prevent or minimise the occurrence of impacts. Environmental management measures can be varied and the measures themselves can have a variety of objectives, however the first priority is always to **prevent adverse impacts**, thereafter management measures with other objectives should be considered. The various objectives for management measures should be remembered when using this Environmental Management Plan (Table 1).

TABLE 1. OBJECTIVES OF MITIGATION MEASURES FOR ADVERSE ENVIRONMENTAL IMPACTS. FIRST PRIORITY IS AVOIDANCE OF NEGATIVE IMPACTS; THE OBJECTIVES ARE LISTED IN DECREASING ORDER OF PRIORITY.

Avoidance	• Avoiding activities that could result in adverse impacts. • Avoiding resources or areas considered as sensitive.
Prevention	• Preventing the occurrence of negative environmental impacts and / or preventing such an occurrence having negative environmental impacts.
Preservation	• Preventing any future actions that might adversely affect an environmental resource. Typically achieved by extending legal protection to selected resources beyond the immediate needs of the project.
Minimisation	• Limiting or reducing the degree, extent, magnitude or duration of adverse impacts. This can be achieved by scaling down, relocating, redesigning elements of a project.
Rehabilitation	• Repairing or enhancing affected resources, such as natural habitats or water sources, particularly when previous development has resulted in significant resource degradation.
Restoration	• Restoring affected resources to an earlier (and possibly more stable and productive) state, typically 'background / pristine' condition.
Compensation	• Creation, enhancement or protection of the same type of resource at another suitable and acceptable location, compensating for lost resources.

Ref: The World Bank. Environment Department. January 1999. Environmental Management Plans. Environmental Sourcebook Update. Number 25.

3.2. ENVIRONMENTAL MANAGEMENT REQUIREMENTS

The management requirements presented in this section have been compiled based on activities required during the operational phase of the project. While specifications have been listed under activities, the requirements are not necessarily mutually exclusive to the activity under which the specification or requirement is listed. Should any specification be applicable to any other activity, listed or otherwise, the intent remains.

Table 2 summarises the activities, sub-categories, page and specification references for the activity and impact management measures specified in this section.

TABLE 2. REGISTER OF ACTIVITY CATEGORY AND SUB-CATEGORIES INCLUDED IN THE ACTIVITY MANAGEMENT PROGRAMME.

Activity category	Activity sub-categories	Specification reference
Administration & general issues	Release of contracts	3.3.1
	Compliance to legislation	3.3.2 – 3.3.3
	Environmental management system	3.3.4
	Personnel management	3.3.5
	Archaeological / cultural sites	3.3.6
	Collecting / harvesting plant material	3.3.7
	Hunting / poaching animals	3.3.8
	House-keeping	3.3.9
	Sex worker management	3.3.10
	Access to the CPF, well-heads & flowlines	3.3.11
	Site lighting	3.3.12
	Advertising on roads	3.3.13
Employment & labour management	Employment	3.4.1
	Procurement of goods and services	3.4.2
	Employee supervision	3.4.3
	Bush fire prevention and management	3.4.4
Community, stakeholder & government liaison	General	3.5.1
	Management of expectations	3.5.2
	Communication / liaison	3.5.3 – 3.5.5
	Access to property	3.5.6
	Reporting	3.5.7 – 3.5.8
	Government liaison	3.5.9
Camp, accommodation & office management	Effluent management (kitchen & other wash water)	3.6.1
	Effluent management (laundry)	3.6.2
	Sewage management	3.6.3
	Shower water	3.6.4
	Waste management	3.6.5
	Electricity	3.6.6 – 3.6.8
	Food purchases	3.6.9
	Food usage	3.6.10
	Air conditioner usage	3.6.11
	Fluorescent tubes	3.6.12
Mosquito / vector control	Mosquito control	3.7.1
	Pesticide and larvicide management	3.7.2 – 3.7.3
Medical services & facilities	Health management – HIV	3.8.1
	Medical waste storage	3.8.2
	Medical waste disposal	3.8.3
	Clinic & consulting facilities to communities	3.8.4
Water & effluent management	Water provision	3.9.1
	Effluent management	3.9.2 – 3.9.4
	Stormwater management	3.9.5
	Open drain system	3.9.6
Waste management	General	3.10.1 – 3.10.2
	Waste storage and transport – general	3.10.3 – 3.10.6
	Waste disposal	3.10.7 – 3.10.12

Activity category	Activity sub-categories	Specification reference
	Landfill management	3.10.13
	Incinerator operation	3.10.14
Business services	Environmental expenditure	3.11.1
Production	Fire prevention	3.12.1
	Well-head management	3.12.2
	Access to well-heads	3.12.3
	Revegetation of old well-head sites (or sites no longer needed)	3.12.4
	Use of compressors and generators at well-heads	3.12.5
	Radioactivity from wells	3.12.6
Maintenance	General	3.13.1
	Topsoil management	3.13.2
	Excavations	3.13.3
	Refuelling and maintenance	3.13.4
	Vehicle and equipment maintenance	3.13.5 – 7
	Vehicle washing	3.13.8
Support services	General	3.14.1 – 3.14.2
	Establishment of temporary work areas outside of the CPF	3.14.3
	Storage and handling of hazardous materials on site	3.14.4 – 3.14.8
	Purchasing	3.14.9 – 3.14.10
Commissioning and initial startup	Internal cleaning of piping	3.15.1
	Pigging	3.15.2
	Water flushing of lines / Pump testing using water	3.15.3
	Accumulation of hydrocarbons in the plan – potential for re-injection into the re-injection well	3.15.4
	Initial loading of machinery and equipment with fuel, lubricants, chemicals	3.15.5
	Reduced labour requirements	3.15.6
Normal startup	Accumulation of hydrocarbons in the plant – potential for re-injection into the re-injection well	3.16.1
	Water washing of process service sections	3.16.2
	Flushing POC drains with firewater	3.16.3
Operation	Use of unsurfaced access roads	3.17.1
	(External) cleaning / painting of piping and equipment	3.17.2
	Chemical disposal from laboratory / other	3.17.3
	Condensate sales and transport	3.17.4 – 3.17.8
	Condensate loading	3.17.9
	TEG storage and handling	3.17.10
	Washing down of paved areas with utility water / bund cleaning	3.17.11
	Emergency situations	3.17.12
	Effluent management	3.17.13
	Emissions management	3.17.14
	Re-injection of produced water	3.17.15

Activity category	Activity sub-categories	Specification reference
	Condensate storage tank – penstock valve on tank bunds	3.17.16
	General plant operations	3.17.17
	Sand / silt production from wells	3.17.18
Normal shutdown	Disposal of liquid hydrocarbon from the closed drain sump	3.18.1
	Flushing of hydrocarbon piping and equipment with utility water	3.18.2
		3.18.3
Emergency shutdown	Effluent management	3.19.1
	Incinerator management	3.19.2
Land use controls	General	3.20.1
	Road usage	3.20.2

For each activity identified, the following items are specified in the management plan:

Ref.: A reference number for the specified management requirement / specification.

Management requirements: Detail on the management requirements / specifications required.

Responsible party: The person that will assume overall responsibility for ensuring that the requirement / specification is met.

Scheduling: The date by which the requirement shall be achieved. Should the requirement be applicable throughout the life of the project or a period thereof, the date will be indicated as 'ongoing'.

Compliance indicator(s): Indicates means to determine if the requirement has been met. Additional monitoring requirements are specified under Section 4. Note that the number of incidents, audit findings etc. shall also be used as indicators of performance.

Priority: This provides the EMP user, SHERQ Manager, SHERQ Administrator and external parties with a means to evaluate the priority of the management requirements specified. The matrix presented in Figure 4 has been used to evaluate priority.

Status (ref): This space is provided for the SHERQ Administrator to update the status of the management requirement (*to be initiated, in progress, completed etc.*) and / or to provide a reference to a document(s) that adequately describes the action(s) taken to meet the requirement(s).

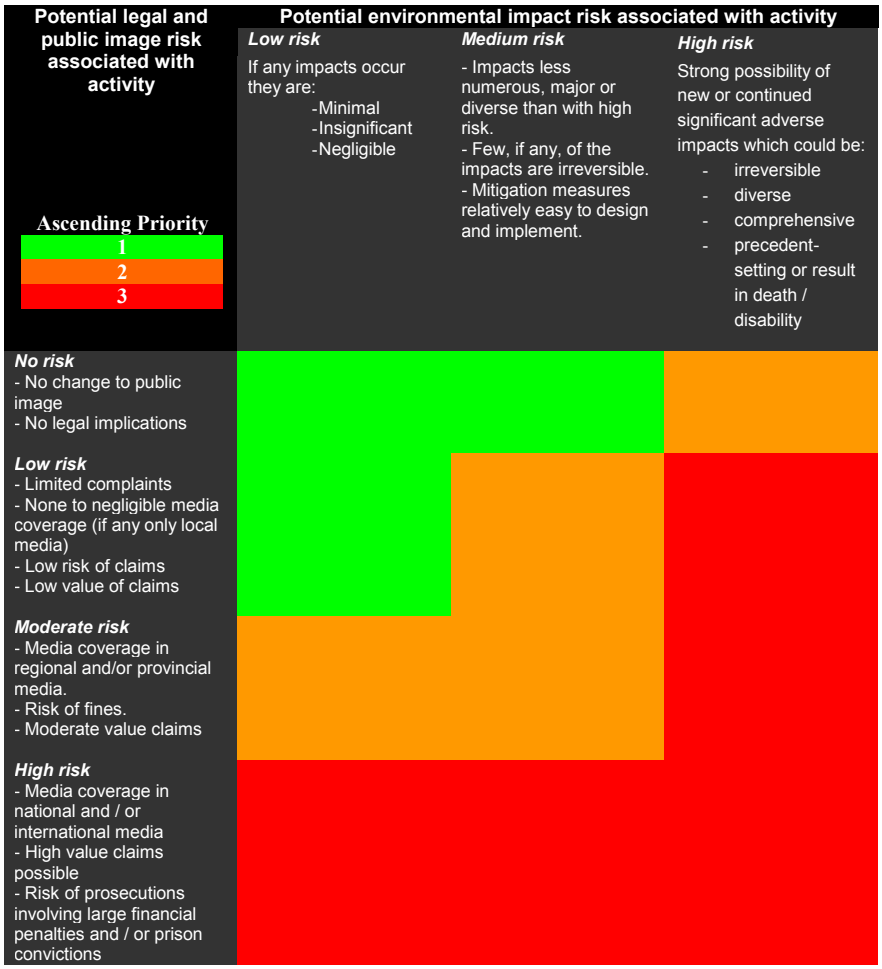
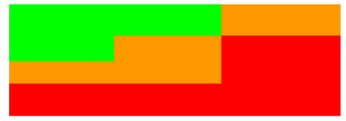
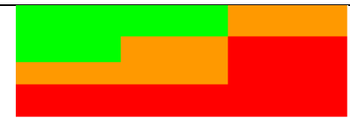
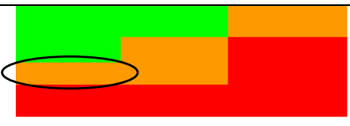
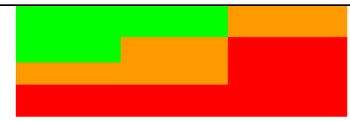
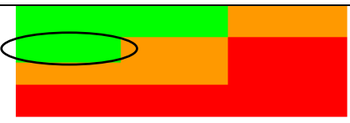
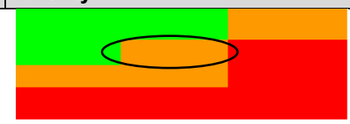
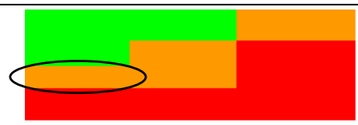
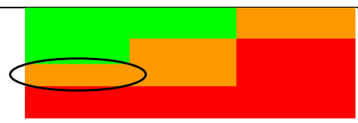
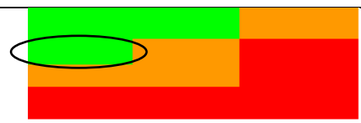
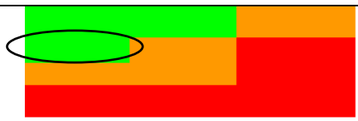
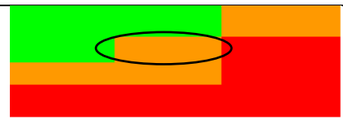
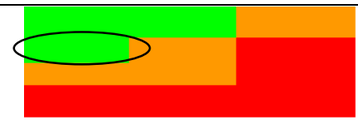
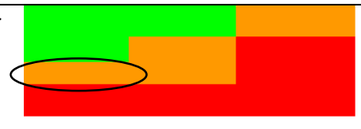


FIGURE 4. PRIORITY EVALUATION MATRIX FOR MANAGEMENT REQUIREMENTS / SPECIFICATIONS

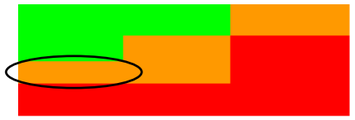
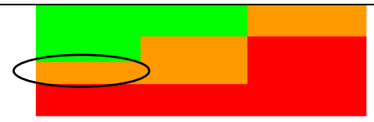
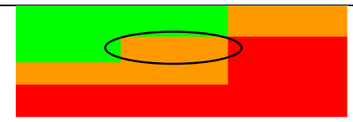
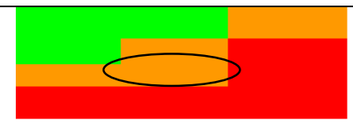
Note: In addition to the requirements specified in this operations EMP, the activity management requirements contained in the construction and design EMPs for the project continue to be applicable for any activities still applicable in the operations phase. However, where there is a conflict between the requirements of the operations EMP and the construction or design EMP, the requirements of the operations EMP shall be applicable.

3.3. ADMINISTRATION AND GENERAL ISSUES

Ref.	Activity	Requirements / specifications	Responsibility	Scheduling	Compliance indicator(s)	Priority	Status / Ref.
3.3.1	**Release of contracts**	The EMP will be included as part of tender documentation and form part of all contracts.	***Senior Commercial Officer***	At the time of release of requests for quotation. At the time of contract preparation.	Inclusion of EMP as part of all contracts, orders and tenders.		
3.3.2	**Compliance to legislation**	In all cases, the requirements of Mozambican (and other where relevant) legislation will be met. (SPI has committed to meeting the requirements of South African legislation in the absence of relevant legislation in Mozambique).	***Operations Manager*** ***SHERQ Manager*** ***SHERQ Administrator***	Ongoing	Results of audit findings. Absence of legal warnings / prosecutions.		
3.3.3		Develop a legal register specifying all environmental legislation relevant to the operation. This register shall describe the relevance of applicable legislation to the project as well as any permits / licenses that may be required. A register of all permits and licences (and associated conditions) issued to Sasol for the project shall be maintained. Examples of approvals required include: ○ Licence to operate medical facilities – Ministry of Health ○ Environmental approvals – MICOA ○ Project water permit(s) – Ara Sul	***Operations Manager***	March 2004, updated as required.	Legal register document. Permit / licence register.		
3.3.4	**Environmental management system**	Develop an environmental management system for the project which shall be compliant with the requirements of ISO 14001 and shall include, but not be limited to: ○ A description of roles, responsibilities and lines of communication in terms of environmental management on the project and the implementation of the EMP. ○ Details of incident and non-conformance identification and management. ○ Details of performance assessment and review regarding the EMP.	***SHERQ Administrator***	June 2004	Environment Management System Manual		
3.3.5	**Personnel management**	A site and project specific code of conduct for all employees and contractors must be prepared and made available. Issues that should be addressed include, but are not restricted to: • Possession of firearms. • Use of alcohol on duty. • Use / possession of drugs. • Poaching of animals / collection of plant life. • Respect for the rights of local communities / inhabitants and the environment.	***HR Officer***	October 2003	Implementation of code of conduct.		

Ref.	Activity	Requirements / specifications	Responsibility	Scheduling	Compliance indicator(s)	Priority	Status / Ref.
3.3.6	**Disturbance of archaeological or cultural sites (e.g. graves) / collecting specimens or artefacts**	PROHIBITED. Should any cultural site be discovered this should be reported to the SHERQ Administrator who shall determine a course of action based on consultation with local, provincial and national government as necessary.	***SHERQ Administrator***	Ongoing	As per requirement. Inclusion in training / induction programme(s).		
3.3.7	**Collecting or harvesting fruits, vegetables, grains and any other plant material**	All employees must be actively discouraged from collecting or harvesting fruits, vegetables, grains and any other plant material. The harvesting or collection of such material shall be prohibited within the boundaries, or in the near vicinity of the CPF, any campsite, well-head or flowline.	***SHERQ Administrator***	Ongoing	As per requirement. Inclusion in training / induction programme(s).		
3.3.8	**Hunting / harassing / poaching wild animals – including fishing**	No employee may hunt animals for food or sport purposes, except with the written permission of the SHERQ Administrator **and** the Operations Manager.	***Operations Manager***	Ongoing	As per requirement. Inclusion in training / induction programme(s).		
3.3.9	**House-keeping**	At all times the works will be maintained in tidy order. No littering will be permitted. Where necessary, open containers shall be covered with lids of netting to prevent the occurrence of wind-blown litter.	***SHERQ Administrator***	Ongoing	Absence of litter on site.		
3.3.10	**Sex worker management**	The presence of sex-workers inside the CPF boundary is prohibited. The presence of sex-workers outside of the CPF and campsite must be actively discouraged. Condoms must be distributed free of charge to employees and should be readily available.	***Operations Manager*** ***Operations Manager*** ***HR Officer***	Ongoing	Absence of sex workers on site. Visual observations Availability of condoms.		
3.3.11	**Access to the CPF, well-heads, flowlines**	Access shall only be via existing access routes. New route development is prohibited. Vehicles may not be used off-road without the written permission of the SHERQ Administrator. Access to well-heads shall be restricted to Sasol employees and the employees of contractors working at the well-heads. Access over flowlines and along flowlines access roads shall not be restricted.	***SHERQ Administrator***	Ongoing	Absence of new track development.		
3.3.12	**Site lighting**	No spotlights shall be directed away from the site so as to cause a disturbance to surrounding inhabitants.	*Operations Manager*	Ongoing	Absence of complaints from surrounding communities.		
3.3.13	**Advertising on roads**	SPI shall ensure that road-side advertising is well considered so as to cause minimal visual pollution as well as negligible driver distraction. SPI should obtain government approval for all road-side advertising.	*SHERQ Manager*	Prior to erecting any road-side advertising	Government approvals for roadside advertising.		

3.4. EMPLOYMENT AND LABOUR MANAGEMENT

Ref.	Activity	Requirements / specifications	Responsibility	Scheduling	Compliance indicator(s)	Priority	Status / Ref.
3.4.1	**Employment**	Employment will be undertaken and managed according to Mozambican labour law and the approved labour agreement between Sasol and the Mozambican Government and following liaison with local authorities and communities. In particular the following should be addressed: ○ The employment and skills development of Mozambican employees is an important success factor and therefore local labour should be utilised as far as possible and within the constraints of Mozambican law. This should be complimented with applicable skills training. ○ Labour broking shall not be encouraged. No fees shall be levied for recruitment of admission to employment.	***HR Officer***	Ongoing	Minutes of liaison with authorities / communities. Statistics reflecting percentage Mozambican employees. Training records.		
3.4.2	**Procurement of goods and services**	SPI shall prepare a local content plan that describes a strategy for the procurement of goods and services from Mozambican suppliers. This plan should address the support of local, regional and national economies.	***HR Officer***	October 2003	Implementation of plan.		
3.4.3	**Employee supervision**	Sasol must ensure proper supervision / management of employees, including after hours where employees are resident on site.	***Operations Manager***	Ongoing	Inspection findings. Audit findings.		
3.4.4	**Bush fire prevention and management**	A fire prevention and fire emergency management plan shall be prepared. The plan shall include, but not be limited to, the following: ○ Sources of fire risk; ○ Measures to comply with any requirements of local authority fire departments; ○ Measures to minimise the risk of accidental bush fires caused by any activity related to the works; and ○ Measures to control an accidental bush fire.	***Field Operations Manager***	October 2003	Fire prevention and fire emergency management plan.		

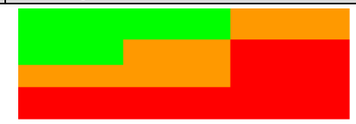
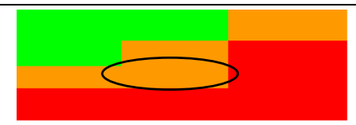
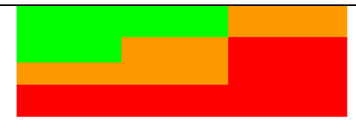
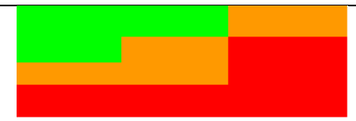
3.5. COMMUNITY, STAKEHOLDER AND GOVERNMENT LIAISON

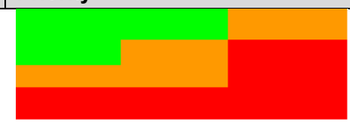
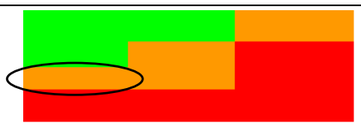
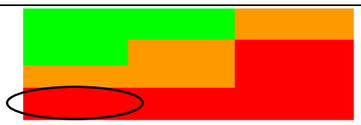
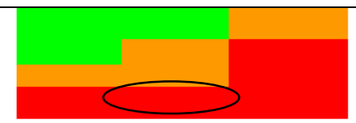
A key management principle during the operational phase of the project shall be that of respect of the rights of the surrounding community and the land and resources that belong to them.

The project area is characterised by the following socio-economic conditions, which shall at all times be taken into consideration:

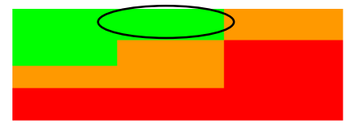
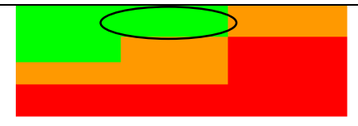
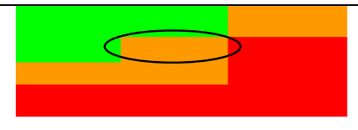
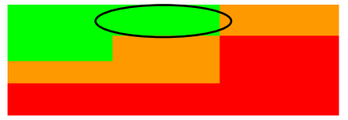
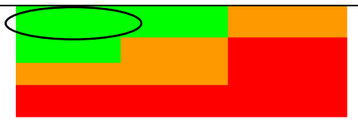
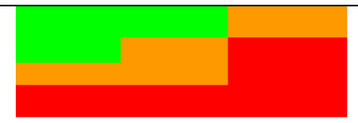
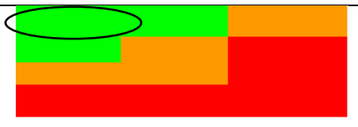
- Subsistence living;
- Extreme poverty;
- Strong dependence on local natural resources;

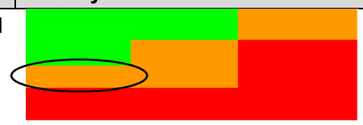
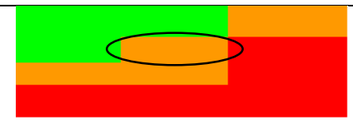
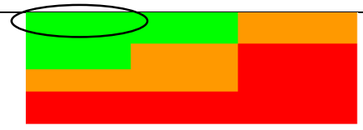
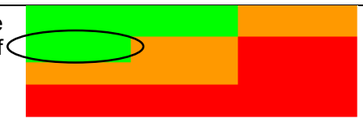
- Lack of health and education facilities, access roads (basic services); and
- Very limited employment opportunities.

Ref.	Activity	Requirements / specifications	Responsibility	Scheduling	Compliance indicator(s)	Priority	Status / Ref.
3.5.1	**General**	Access over land, the integrity of fences (boundaries), control of bush fires, littering, dust control, noise abatement, harassment of domestic and wild animals, sedimentation and contamination of ground and surface water, damage to the landscape and vegetation and all such environmental matters, shall be controlled in the best interests of the land owner / occupier, the environment and the general public.	***Operations Manager*** ***SHERQ Administrator***	Ongoing	Record of communication / complaints Monitoring records Audit findings		
3.5.2	**Management of expectations**	Community leaders and residents may have expectations that Sasol will play a supporting and developmental role within the area and that the project will have other positive economic benefits. In order to maintain realistic expectations, close communication shall be maintained between local communities and government with the objective of clarifying roles, responsibilities and involvement throughout the life of the project.	***PR Officer*** ***Environmental Planner***	Ongoing	Minutes of meetings and records of correspondence.		
3.5.3	**Communication / liaison**	Sasol shall employ a Public Relations Officer that is actively involved in the project area. This person(s) shall liase with the local communities and authorities regarding the activities of Sasol. In this task, the PR Officer shall ensure the involvement of the SHERQ Administrator on any environmental matters. Similarly the SHERQ Administrator will ensure that the PR Officer is informed of and involved with any environmental issues that might relate to the community, government etc.	***SHERQ Administrator*** ***PR Officer***	Ongoing (PR Officer appointed prior to project commissioning)	Communications register		
3.5.4		The SHERQ Administrator and PR Officer must inform the surrounding communities of any activity that may affect these communities in any way.	***SHERQ Administrator*** ***PR Officer***	Ongoing	Communications register		

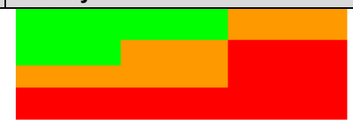
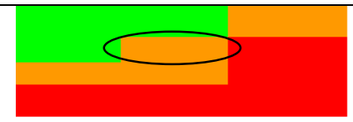
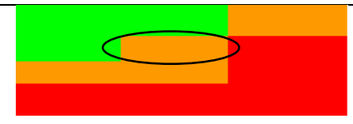
Ref.	Activity	Requirements / specifications	Responsibility	Scheduling	Compliance indicator(s)	Priority	Status / Ref.
3.5.5		SPT shall produce a procedure that defines, but is not limited to, the following: o Locations at which community members can raise issues; o Means by which community members can raise issues; o How the community will be notified of the opportunity and means for communication with regard to project issues; and o How these issues will be captured, handled, responded to as necessary. Sasol must keep and maintain a communications register in which issues raised by external parties can be logged. The register should include, but not be limited to: o The name of the communicator; o Contact details of the communicator; o Nature of the communication; and o Any action taken or that needs to be taken to address the issue raised.	***SHERQ Administrator***	October 2003	Implemented procedure(s) Communications register		
3.5.6	**Access to private / government property**	The property and rights of all persons must be respected at all times. Access by Sasol, its employees and / or contractors to homesteads and lands outside of right of way boundaries shall be prohibited.	***Operations Manager***	Ongoing	As per requirement.		
3.5.7	**Reporting**	Sasol shall report on environmental performance for the project as part of its annual environmental reporting.	***SHERQ Manager***	Annual	Content of annual report.		
3.5.8		Sasol should consider placing articles related to the project and environmental performance in the local, regional and even national media.	***SHERQ Manager***	Quarterly	Record of articles.		
3.5.9	**Government liaison**	SPI shall actively seek to participate with the Government on task teams and forums that relate to the Project and its influence on the environment. This should include forums that address the following issues in relation to Sasol's activities in Mozambique: o Resource use and exploitation. o Management of exclusion zones. o Land use planning and zoning.	*Environmental Planner*	Ongoing	SPI representation on Government forums. Minutes of meetings.		

3.6. CAMP, ACCOMMODATION AND OFFICE MANAGEMENT

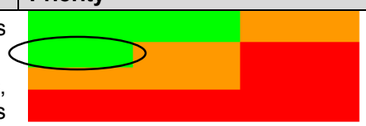
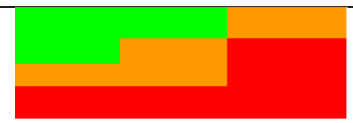
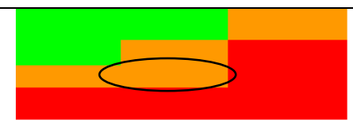
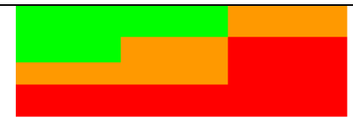
Ref.	Activity	Requirements / specifications	Responsibility	Scheduling	Compliance indicator(s)	Priority	Status / Ref.
3.6.1	**Effluent management (kitchen and other wash water)**	All kitchen waste-water shall be vented through a grease / oil trap(s) into the oily water system for processing through the industrial effluent treatment plant. Collected grease and oil shall be disposed of via the incinerator. Efforts shall be made to avoid odours from the grease traps. Care should be taken to use efficient and environmentally friendly cleaning materials.	***Catering contractor***	October 2003 Ongoing Ongoing Ongoing	Grease / oil traps installed. Records of oil and grease disposal. Inspection reports. Records of products used and alternatives considered. Purchasing procedure reflecting approach to product selection.		
3.6.2	**Effluent management (laundry water)**	Laundry water shall be vented to the oily water system for processing through the industrial effluent treatment plant. Care should be taken to use efficient and environmentally friendly cleaning materials.	***Cleaning contractor***	Ongoing	Drainage design to industrial effluent treatment plant. Records of products used and alternatives considered. Purchasing procedure reflecting approach to product selection.		
3.6.3	**Sewage management**	Toilet facilities must be properly maintained. No disposal or leakage of un- or partially treated sewage may occur on or near the site.	***Services Manager***	Ongoing	Inspection records. Audit findings. Monitoring records.		
3.6.4	**Shower water**	Shower water shall be vented to the sewage treatment facility. SPT shall educate employees and contractors on the need to minimise water use during showering. Low-water use shower heads shall be installed.	***SHERQ Administrator*** ***SHERQ Administrator*** ***Accommodation contractors***	Ongoing Ongoing October 2003	Effluent design Education programme Installed shower heads		
3.6.5	**Waste management**	Waste management should be as per the requirements of Section 3.10.	***SHERQ Administrator***	Ongoing	As per Section 3.10.		
3.6.6	**Electricity**	Accommodation and offices shall be electrified. Fires should not be used for cooking or heating (except for barbecues).	***Services Manager***	Ongoing	Electrification of offices and accommodation.		
3.6.7		Transformers should be free of polychlorinated biphenyls (PCBs) and must be bunded and regularly inspected and maintained.	***Electrical technician*** ***Maintenance planner***	Ongoing	No PCBs on site. Bunded transformer areas. Inspection records		
3.6.8		Any generators used must comply with project environmental noise and emission standards. (refer to Air Quality and Acoustic specialist studies).	***Commercial Officer***	Ongoing	Emission and noise specifications for generators.		

Ref.	Activity	Requirements / specifications	Responsibility	Scheduling	Compliance indicator(s)	Priority	Status / Ref.
3.6.9	**Food purchases**	Where possible use should be made of local suppliers.	*Catering contractor*	Ongoing	Records of sources of food purchases.		
3.6.10	**Food usage**	Left over food shall be minimised. No left over food shall be provided on an ad hoc basis to local communities. The possibility of providing left over food to pig farmers shall be investigated as an option.	*Catering contractor*	Ongoing	Waste disposal records.		
3.6.11	**Air conditioner usage**	Employees shall be encouraged to turn air conditioners off in rooms not being used.	***Services Manager***	Ongoing	Employee education programmes.		
3.6.12	**Fluorescent tubes**	Fluorescent tubes shall be treated as a hazardous waste. Suppliers shall be encouraged to take back used tubes. Should this not be possible tubes shall be disposed of to the site landfill as per the Bergman Ingerop landfill operating manual.	*Maintenance Manager*	Ongoing	Waste management procedure describing disposal of fluorescent tubes.		

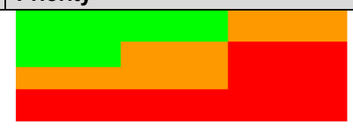
3.7. MOSQUITO / VECTOR CONTROL

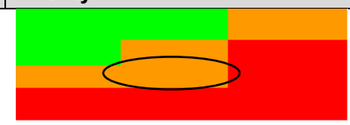
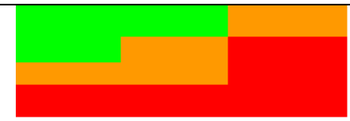
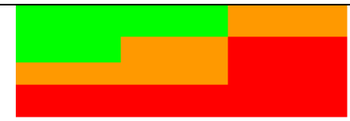
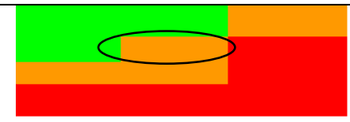
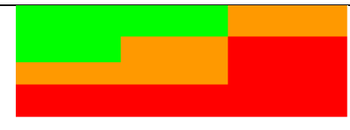
Ref.	Activity	Requirements / specifications	Responsibility	Scheduling	Compliance indicator(s)	Priority	Status / Ref.
3.7.1	**Mosquito control**	Implement and maintain a programme to minimise malarial incidence among employees.	***Doctor***	Ongoing from construction phase	Vector control programme implemented.		
3.7.2	**Pesticide & larvicide management**	The disposal of waste pesticide and pesticide containers will be as per the requirements of Section 3.10.	***Doctor***	Ongoing	Waste disposal records.		
3.7.3		Diesel shall not be used as a dispersant during 'fogging' operations.	***Doctor***	Ongoing	Procedure(s) for fogging.		

3.8. MEDICAL SERVICES AND FACILITIES

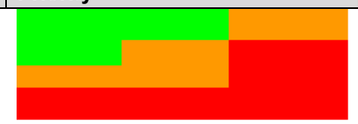
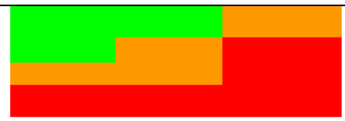
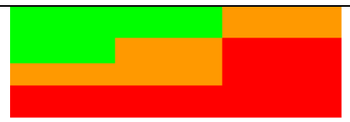
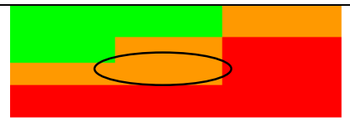
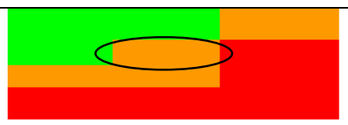
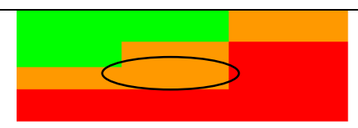
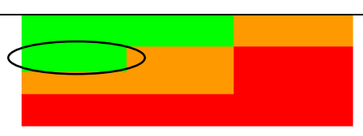
Ref.	Activity	Requirements / specifications	Responsibility	Scheduling	Compliance indicator(s)	Priority	Status / Ref.
3.8.1	**Health management - HIV**	Prepare and implement a programme and procedure(s) to minimise the spread of HIV infection. A typical programme would include, among other things, the implementation of the following: o An HIV / Aids training course and on-going education on transmission of HIV / Aids and STDs to employees, through workshops, posters and informal information sessions; o Encouragement of employees to determine their HIV status; o Supply of condoms to employees.	***HR Officer***	Ongoing	Implementation of procedures and programmes. Records of workshops, posters, educations sessions etc.		
3.8.2	**Medical waste storage**	Medical waste shall be stored, separately from other waste, prior to incineration as per the requirements laid down by the World Health Organisation.	***Doctor***	Ongoing	Inspection records. Audit findings.		
3.8.3	**Medical waste disposal**	Medical waste shall be disposed of by on-site incineration. Records shall be kept of all medical waste disposed as per the requirements specified in Section 3.10.	*Doctor*	Ongoing	Waste disposal records.		
3.8.4	**Clinic and consulting facilities to communities**	SPT shall consider the provision of medical services to the local community through at least doctor involvement in the surrounding communities. A policy on this involvement shall be prepared and made available to the public.	***SHERQ Manager***	Ongoing	Medical services policy.		

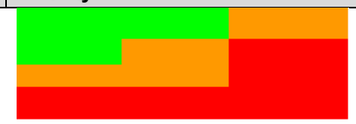
3.9. WATER AND EFFLUENT MANAGEMENT

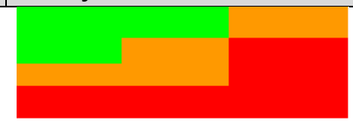
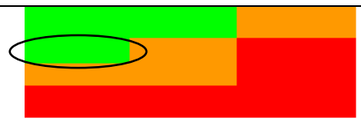
Ref.	Activity	Requirements / specifications	Responsibility	Scheduling	Compliance indicator	Priority	Status / Ref.
3.9.1	**Water provision**	Water for the project will be obtained from groundwater wells (and not from the perched water table or surface water resources). The project must have no detrimental impact on water volumes (surface or groundwater) available to existing users in the area. SPT shall ensure the possession of the relevant licences / approvals from Ara Sul for the abstraction of groundwater for industrial purposes. Water may not be abstracted from surface water resources.	***SHERQ Administrator***	Ongoing	Groundwater monitoring programme (volumes; water levels). Communication with community / complaints recorded. Government approvals.		

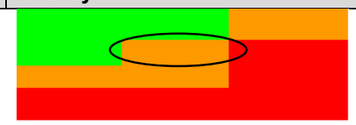
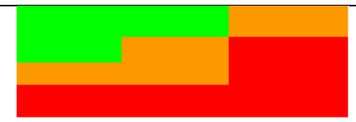
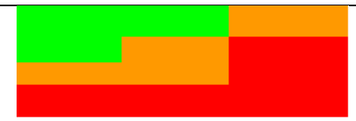
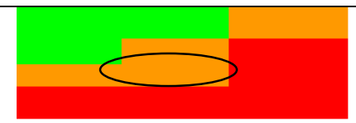
Ref.	Activity	Requirements / specifications	Responsibility	Scheduling	Compliance indicator	Priority	Status / Ref.
3.9.2	**Effluent management**	No seepage fields, 'soakaways' or evaporation ponds shall be developed without the approval of the SHERQ Administrator and SHERQ manager and based on a specialist evaluation commensurate with the level of risk involved.	***SHERQ Administrator***	Ongoing	As per requirement.		
3.9.3		All effluent shall be required to meet internationally and nationally accepted effluent quality standards and guidelines. In the absence of detailed guidelines in Mozambique, Sasol has undertaken to meet the specification defined by the Department of Water Affairs and Forestry's (DWAF; RSA) waste discharge specification for release to a public water body, as well as the specifications of the World Health Organisation and the World Bank. No effluent may be released from site unless it is within the required specifications (see Section 4.1). This may require re-treatment of effluent to ensure that specifications are met.	***SHERQ Administrator***	Ongoing	Monitoring records.		
3.9.4		SPT shall ensure that the effluent outfall to the Govuro River floodplain: o Is not accessible to persons as a source of drinking or washing water; o Does not cause channelled flow in the floodplain; o Does not result in erosion in the floodplain; o Does not result in eutrophication in the floodplain.	***SHERQ Administrator***	Ongoing	Inspection records. Monitoring records (see Section 4.1).		
3.9.5	**Stormwater management**	Stormwater falling off-site must not be allowed to run onto the site. Use must be made of measures such as stormwater diversions, drainage channels etc. The principle to be followed is that of the separation of clean and dirty water at all times. Any stormwater falling on site will be channelled into the dirty water system (for treatment) prior to release from site. A contingency plan for flood events shall be prepared to ensure that no water that is outside of specification shall be released from site.	***SHERQ Administrator***	Ongoing	Stormwater management system design as per requirements. Contingency plan.		
3.9.6	**Open drain system**	No water shall be discharged directly to the environment. Site stormwater shall be routed to the effluent holding pond and will be subject to testing prior to release to ensure that no effluent is released from site outside of accepted specifications.	*SHERQ Administrator*	Ongoing	Monitoring records.		

3.10. WASTE MANAGEMENT

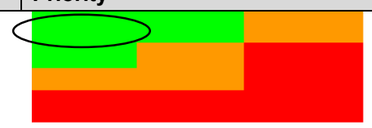
Ref.	Activity	Requirements / specifications	Responsibility	Scheduling	Compliance indicator(s)	Priority	Status / Ref.
3.10.1	**General**	Sasol shall define an overall waste management strategy for the project that defines, but shall not be restricted to, the following: ○ Waste minimisation strategy; ○ Waste collection strategy; ○ Waste separation strategy; ○ Waste transport strategy; ○ Waste disposal strategy.	***SHERQ Administrator***	October 2004	Documented waste management strategy.		
3.10.2		Where markets exist (or could be created) for the re-use or recycling of waste materials these materials should be separated from the waste stream at their point of generation and stored separately for collection by the recycling agent. No material may be released to communities where the material could present a health or safety risk to the community. Old chemical drums may only be released for recycling if crushed prior to release to prevent the containers being used as water vessels.	***Field Operations Manager***	October 2004 +	Disposal records.		
3.10.3	**Waste storage and transport – general**	A clear distinction should be made between the hazardous and non-hazardous components of the waste stream with separation occurring at source. Wastes should be placed in separate containers and transported to their disposal facilities separately.	***SHERQ Administrator***	October 2004 +	Documented and implemented waste management strategy. Provision of separate containers for non-hazardous and hazardous waste.		
3.10.4		In all cases, waste must be contained. Storage and disposal areas shall be contained / controlled to prevent scavenging by persons and / or animals. Wind-blown litter shall not be permitted.	***SHERQ Administrator***	October 2004 +	As per requirement.		
3.10.5		Waste containers shall bear labels that identify the contents. Where applicable this labelling should meet the UN requirements for the labelling of hazardous substances. Containers shall be lined or constructed of materials that are compatible with the wastes to be stored. Containers should be in good condition, free from corrosion, leaks or ruptures.	***Maintenance Manager***	Ongoing	As per requirements.		
3.10.6		Waste containers shall be stored above ground, over an impermeable surface and under covering.	*SHERQ Administrator*	Ongoing	As per requirement.		
3.10.7	**Waste disposal**	All combustible waste shall be disposed of by incineration in the on-site incinerator, except in cases where the incineration of any material may result in the possibility of safety or health risks to operators or public.	***SHERQ Administrator***	Ongoing	Documented and implemented waste management strategy. Waste disposal records.		

Ref.	Activity	Requirements / specifications	Responsibility	Scheduling	Compliance indicator(s)	Priority	Status / Ref.
3.10.8		In summary, waste will be handled as follows: ○ All combustible waste shall be disposed of by incineration at the on-site incinerator. ○ Ash from the incinerator shall be disposed of in the on-site landfill. ○ Medical waste from site shall be disposed of by incineration in the on-site incinerator. ○ Sewage sludge shall be disposed of in the on-site incinerator. ○ Hydrocarbon spills should be immediately cleaned up (including any contaminated soil) and combustible materials should be incinerated. Non-combustible contaminated material should be disposed of to the landfill subject to meeting the conditions specified in the Bergman Ingerop operating manual; should this not be possible, off site disposal or remediation may be required. ○ Non-hazardous waste that is not combustible shall be recycled, reused or if not possible disposed of to the on-site landfill. ○ Hazardous waste that is not combustible shall be disposed of to the on-site landfill SUBJECT to it meeting the specification and pre-treatment specified in the landfill operating manual. ○ Hazardous waste that is not combustible and not permissible in the on-site landfill shall be transported off-site to a licensed hazardous waste site. (note: the transport of hazardous wastes shall meet the requirements of all local, national and international laws, including the proper signage on vehicles and containers as per UN and / or other applicable codes).	***SHERQ Administrator***	Ongoing	Documented and implemented waste management strategy. Waste disposal records. Incident reporting records. Monitoring and inspection records. Audit records.		

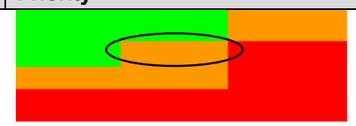
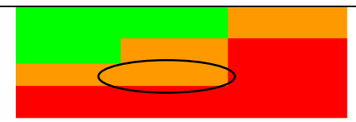
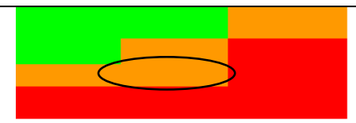
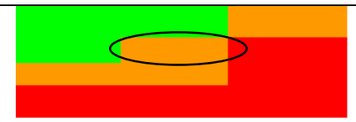
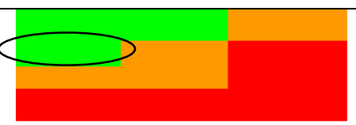
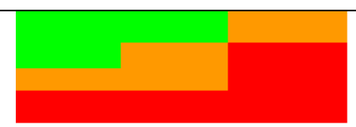
Ref.	Activity	Requirements / specifications	Responsibility	Scheduling	Compliance indicator(s)	Priority	Status / Ref.
3.10.9		Where off-site disposal is the only remaining option (i.e. only for non-combustible hazardous waste not permissible in the on-site landfill), then this must be done in such a manner that it does not create risks of non-compliance with legislation or company policy. This is particularly important in the context of the environment in which the project exists, which is characterised by lack of both waste disposal facilities and the capacity for transportation of waste (especially hazardous waste). The following requirements will therefore apply to the off-site disposal of waste: ○ Transportation would have to be undertaken by Sasol or by a recognised contractor familiar with the requirements for the transportation of hazardous wastes. ○ Sasol / the transportation contractor must have in place the means to respond appropriately to spillages of waste anywhere along the transport route within a time limit acceptable to Sasol. ○ The frequency of waste collection and the interim measures for the storage of waste on site must be appropriate to one another and would have to he such that the system as a whole does not pose an unacceptable risk to either the environment or health and safety. ○ Waste may not be stored on site for a period longer than three months. ○ Storage of waste must be on a contained area underlain by an impermeable substratum, and covered to protect from water ingress. ○ Certificates of safe disposal must be provided for all waste removed from site. Such certificates can only be issued by a recognised waste disposal operation. ○ The site at which waste is disposed must comply with the requirements of Sasol and its shareholders. As such it must be audited on at least a six-monthly basis. ○ No waste is to be disposed of off-site, except with the written approval of the SHERQ Manager who shall ensure that all necessary approvals have been obtained and all risks identified and managed. Where possible suppliers shall be encouraged to take back waste products.	***SHERQ Administrator***	Ongoing	Documented waste management strategy and procedures. Waste disposal records. Audit findings. Inspection records. Written approvals.		
3.10.10		Suppliers of potentially hazardous substances (chemicals, batteries, etc.) shall be required to remove used products and their containers when making their next deliveries of these substances. Certificates of safe disposal of the wastes must be provided by the supplier.	***Commercial Officer***	Ongoing	Disposal records.		

Ref.	Activity	Requirements / specifications	Responsibility	Scheduling	Compliance indicator(s)	Priority	Status / Ref.
3.10.11		Records shall be kept of all waste disposed to the incinerator, landfill and any off-site disposal if applicable (including sales to scrap dealers). These records should reflect date of disposal, type of waste disposed, quantity of waste, responsible party for the waste being disposed and responsible party for the waste receiving facility.	***Commercial Officer***	Ongoing	Disposal records.		
3.10.12		No waste shall be disposed of on open fires.	***Field Operations Manager***	Ongoing	As per requirement.		
3.10.13	**Landfill management**	The on-site landfill shall be managed as per the operations manual prepared by the landfill design engineers, Bergman Ingerop. The site shall be fenced with access control. No ad hoc dumping or scavenging shall be permitted.	***Field Operations Manager***	Ongoing. October 2003	Inspection records. Waste disposal records. Fenced site.		
3.10.14	**Incinerator operation**	The incinerator shall only be operated by trained personnel. The incinerator shall not be operated so as to result in the emission of black smoke from the stack. The secondary incinerator and / or scrubbing stage of the incinerator process may not be bypassed except in an emergency. The waste holding area at the incinerator shall be suitably sized so as to accommodate the volume of waste to be stored prior to incineration and shall meet the requirements of xx.	***Field Operations Manager***	Ongoing	Training records. Inspection records. Records of incinerator efficiency. Waste holding area as per requirement.		

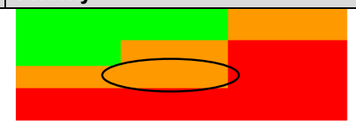
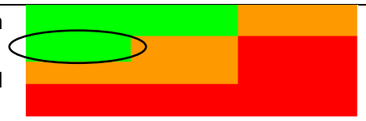
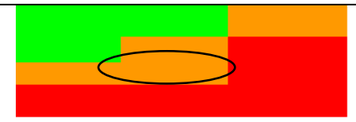
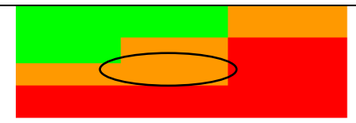
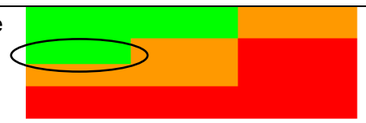
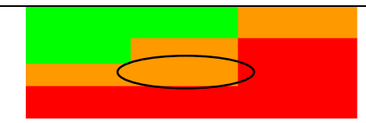
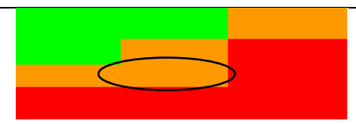
3.11. BUSINESS SERVICES

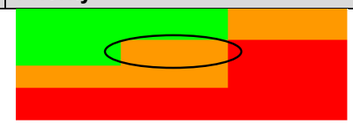
Ref.	Activity	Requirements / specifications	Responsibility	Scheduling	Compliance indicator(s)	Priority	Status / Ref.
3.11.1	**Environmental expenditure**	SPI shall track and record all expenditure on environmental or environmentally related items.	*Business Support Manager*	Ongoing	Expenditure records.		

3.12. PRODUCTION

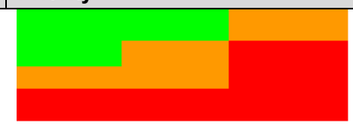
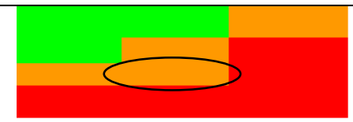
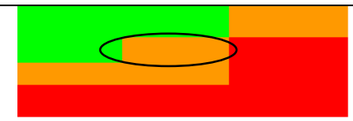
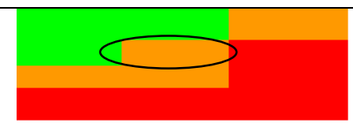
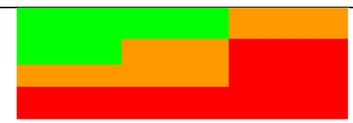
Ref.	Activity	Requirements / specifications	Responsibility	Scheduling	Compliance indicator(s)	Priority	Status / Ref.
3.12.1	**Fire prevention**	Specific measures must be taken to prevent the occurrence and / or spread of bush fires caused by activities at wellheads and flowlines. Measures may include the appropriate instruction of employees concerning fire risks and the construction of firebreaks around perimeters as required. Fire fighting swales, fire extinguishers and protective clothing should be readily available at well-heads and to teams working on flowlines.	***SHERQ Administrator***	Ongoing	Records of employee education. Fire control measures in place.		
3.12.2	**Well-head management**	The Temane 3 well site is situated in very close proximity to the permanent wetland areas of the Govuro River floodplain. This must be remembered when working in and around the area, no pollutants shall be stored in this area. The risk of water contamination must be avoided and no impediments to natural water flow shall be permitted.	*SHERQ Administrator*	Ongoing	Inspection records.		
3.12.3	**Access to well-heads**	Access to well-heads shall only be gained along existing routes. No new route development shall be permitted. Every effort should be made to avoid disturbance to local inhabitants and where possible movement at night should be avoided.	***Field Operations Manager***	Ongoing	Aerial photography / LandSat imagery where available.		
3.12.4	**Revegetation of old well-head sites (or sites no longer needed)**	Well head sites that are not needed shall be rehabilitated. Compacted soils shall be tilled and broken to encourage revegetation. Revegetation of well sites will be conducted through the encouragement of natural processes of secondary succession. Stockpiled topsoil and subsoil shall be reintroduced in the correct order, and the original surface contours of the sites shall be re-established. Soil fertilisation of the soils may be required as per the recommendations of the soils specialist study. In order to encourage the establishment of indigenous plant communities, any areas on the periphery of the site, where the topsoil was not removed and has become compacted, must be tilled.	*SHERQ Administrator*	Prior to decommissioning / closure of any well-head site	Photographic records.		
3.12.5	**Use of compressors and generators at well-heads**	Use of compressors and generators at well-head sites shall be restricted to between the hours from 0700 to 1800, except in emergencies.	***Wells Supervisor***	Ongoing	As per requirement.		
3.12.6	**Radioactivity from wells**	Sasol will confirm radiation levels in gas extracted from wells and any silt / sand produced. Should radiation be detected Sasol shall immediately prepare a plan describing the management thereof as necessary.	***SHERQ Administrator***	Immediate once monitoring results received.	Analysis results. Monitoring records. Management plan.		

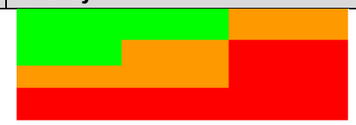
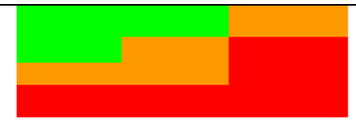
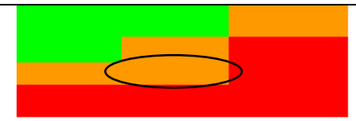
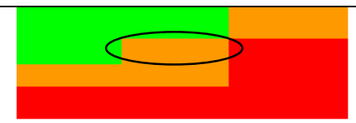
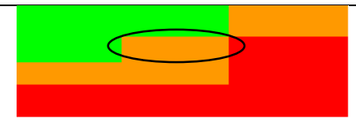
3.13. MAINTENANCE

Ref.	Activity	Requirements / specifications	Responsibility	Scheduling	Compliance indicator(s)	Priority	Status / Ref.
3.13.1	**General**	All storage, refuelling, maintenance and other such facilities shall comply with the requirements of Sections 3.9, 3.10, 3.13 and 3.14.	***SHERQ Administrator***	October 2003 and ongoing	See Sections 3.9, 3.10, 3.13 and 3.14.		
3.13.2	**Topsoil management**	Topsoil stockpiles prepared and remaining after the construction phase shall be maintained for later use in rehabilitation. These should be clearly marked on a site layout plan. Erosion protection (wind and rain) for these stockpiles must be maintained.	***SHERQ Administrator***	Ongoing	Topsoil stockpiles marked on the site layout plan. Topsoil stockpiles maintained to protect from erosion.		
3.13.3	**Excavations**	Should any excavations of flowlines or other be required, soil management shall be as specified in Section 3.10.2 of the construction EMP.	***SHERQ Administrator***	For any excavation	As per requirements.		
3.13.4	**Refuelling and maintenance**	Refuelling and maintenance of vehicles should occur within specified depots only. Working / fuel transfer areas within these depots should be underlain by an impermeable surface and should have a drainage and collective sump system (with oil/water separator) to ensure that no spillage of greases / oils or fuels occurs into local soil and / or water resources. No hydrocarbon contaminated water may be voided to the environment. Operations personnel shall monitor refuelling operations in order to prevent overfilling.	*Maintenance Manager*	Ongoing October 2003 and ongoing Ongoing	Existence of refuelling and maintenance depots. As per requirements.		
3.13.5	**Vehicle and equipment maintenance**	All equipment and machinery is to be maintained in good working order so as to prevent oil, fuel or other such leaks as well as elevated emission levels.	***Maintenance Manager***	Ongoing	Maintenance and service records.		
3.13.6		All vehicles must be equipped with temporary sheeting in case of emergency repairs outside of the CPF site.	***Maintenance Manager***	Ongoing	As per requirement.		
3.13.7		All reasonable precautions must be taken to prevent fuel and lubricant spills. The following must be ensured: ○ No overfilling of diesel bowsers and equipments tanks; ○ Regular inspections to verify that no leaking or defective equipment is brought onto site. ○ Any oils or lubricants discharged during routine vehicle servicing on site are captured using drip trays, containers or other appropriate containment measures.	***Maintenance Manager*** ***SHERQ Administrator***	Ongoing	Inspection records.		

Ref.	Activity	Requirements / specifications	Responsibility	Scheduling	Compliance indicator(s)	Priority	Status / Ref.
3.13.8	**Vehicle washing**	A wash bay(s) shall be designed and constructed at which all vehicle washing will take place. The washbay will be constructed so as to capture all runoff after passing through an oil / water separator (or the industrial effluent treatment plant). No hydrocarbon contaminated water shall be voided to the environment. No vehicle or equipment washing shall occur outside of the washbay(s).	***Maintenance Manager***	October 2003	Washbay(s) constructed as per requirement. Vehicle and equipment washing procedure.		

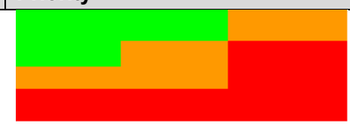
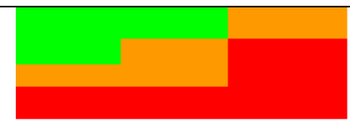
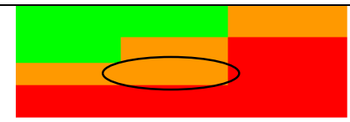
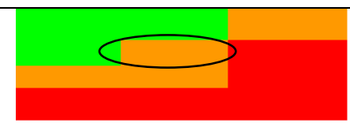
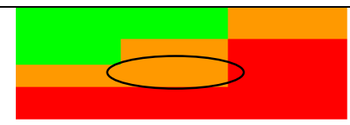
3.14. SUPPORT SERVICES

Ref.	Activity	Requirements / specifications	Responsibility	Scheduling	Compliance indicator(s)	Priority	Status / Ref.
3.14.1	**General**	Sasol shall comply with all applicable laws, regulations, permit and approval conditions and requirements relevant to the storage, use and proper disposal of materials.	*SHERQ Administrator*	Ongoing	Audit findings.		
3.14.2		The necessary tools, materials and expertise must be readily available to deal with spills of oils, fuels, lubricants and other hazardous materials. Spill clean-up kits should be available on site. Capacity and number for each area should be based on the risk associated with a spill (volume / quantity and severity).	*SHERQ Administrator*	October 2003	Register of tools available for handling spills.		
3.14.3	**Establishment of temporary work areas outside of the CPF**	No work areas shall be sited in the vicinity of sensitive sites, e.g. periods of periodic waterlogging, drainage lines and areas of extensive animals habitation. The establishment of temporary work areas should be minimised. Work areas shall be sited in areas of existing disturbance wherever possible. No work area shall be sited so as to cause a nuisance or safety hazard to surrounding landowners, inhabitants or the general public.	***SHERQ Administrator***	Ongoing	SHERQ Administrator to approve, in writing, the establishment of any temporary work area.		
3.14.4	**Storage and handling of hazardous materials on site**	A comprehensive inventory of all hazardous materials and volumes / quantities on site must be kept and maintained per each activity / area.	***Warehouseman***	October 2003 and ongoing	Inventory.		
3.14.5		MSDS contents shall be used as a guide to the appropriate storage and handling of all materials. MSDS's shall be available for all hazardous materials on site and shall be immediately available in areas where such materials are stored or used.	***Commercial Officer***	Ongoing	MSDS's available for all hazardous materials on site.		

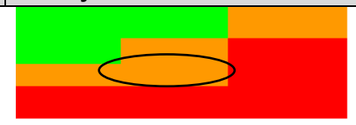
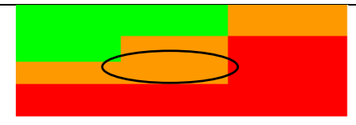
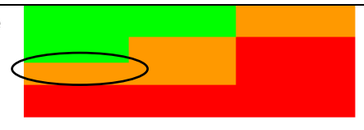
Ref.	Activity	Requirements / specifications	Responsibility	Scheduling	Compliance indicator(s)	Priority	Status / Ref.
3.14.6		Proper storage facilities should be provided for the storage of oils, grease, fuels, chemicals and any other hazardous materials to be used during construction. These storage facilities (including any tanks) consist of an impermeable surface and should be surrounded by a bund wall in order to ensure that accidental spillage does not pollute local soil or water resources.	***SHERQ Administrator***	October 2003 and ongoing	Storage areas as per requirement.		
3.14.7		No fuel or any other chemical storage will be below ground (either partially or completely).	***Operations Manager***	Ongoing	As per requirement.		
3.14.8		Workers shall be made aware of the health and environmental risks associated with any hazardous substances used and should be provided with appropriate protective clothing (PPE) / equipment in case of spillages or accidents.	***SHERQ Administrator***	Ongoing	Training records.		
3.14.9	**Purchasing**	No non-stock items may be purchased and brought to site except through the Commercial Officer. The Commercial Officer shall determine the hazardous / non-hazardous nature of any non-stock item requested and ensure that an MSDS is provided as required. The Commercial Officer shall consult with the SHERQ Administrator when required.	***Commercial Officer***	Ongoing	MSDS for non-stock items. Approval of commercial officer for purchase of all non-stock items.		
3.14.10		Material Safety Data Sheets will be used in all cases for assisting in making an assessment of the possible risk associated with any materials. Where necessary the SHERQ Administrator shall be consulted as to the environmental risk associated with any material.	***Commercial Officer***	Ongoing	As per requirement.		

3.15. COMMISSIONING AND INITIAL STARTUP

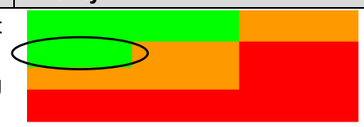
Ref.	Activity	Requirements / specifications	Responsibility	Scheduling	Compliance indicator(s)	Priority	Status / Ref.
3.15.1	**Internal cleaning of piping**	No pipe cleaning will occur during commissioning. This will have been completed prior to commissioning. In the event that new piping is required, e.g. for a plant expansion, a new EIA and new EMP (or addendum to the current EMP) must be prepared.	SHERQ Administrator Operations Manager	Ongoing	EIA / EMP for new piping developments.		

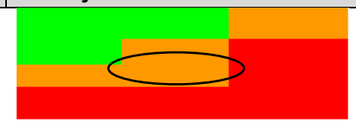
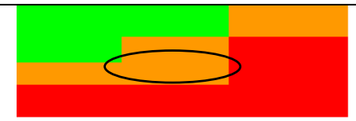
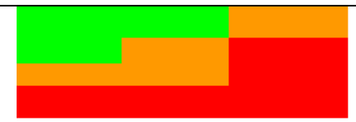
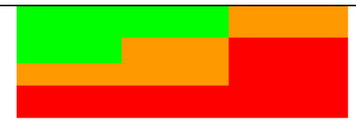
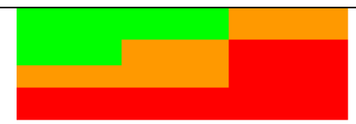
Ref.	Activity	Requirements / specifications	Responsibility	Scheduling	Compliance indicator(s)	Priority	Status / Ref.
3.15.2	**Pigging**	Any effluent produced from pigging shall be diverted into the condensate stream from the plant. Note: Should glycol or methanol be used as corrosion inhibitors in the flowlines, the industrial effluent treatment plant has not been designed for the treatment of glycol contaminated water and glycol contaminated effluent may not be released into the site effluent holding pond or be released from site. Similarly, glycol contaminated water should not be reinjected in the produced water stream. Furthermore there shall not be mixing between site effluent and the produced water streams. Should glycol corrosion inhibitors be used the need for an upgrade to the industrial effluent treatment facility and / or the development of a new treatment facility shall be evaluated and designed and constructed as indicated by the evaluation.	*Field Operations Manager* *SHERQ Administrator*	Ongoing	As per requirement. Record of evaluation of treatment options should glycol inhibitors be used.		
3.15.3	**Water flushing of lines** **Pump testing using water**	Water volumes used for flushing should be minimised. Water flushing shall not be used during normal operations. No additives shall be added to water used for flushing of lines. Effluent shall be routed to the industrial effluent treatment plant. Should any additives be used, the ability of the treatment plant to remove / treat these additives to ensure no environmental risk shall be determined prior to the use of the additives. If necessary the available treatment facilities shall be upgraded.	*Field Operations Manager* *SHERQ Administrator*	Ongoing	As per requirement. Record of evaluation of proposed additives and required treatment options.		
3.15.4	**Accumulation of hydrocarbons in the plant – potential for re-injection into the re-injection well**	Initial products produced from wells shall not be reinjected due to possible contamination risks (construction debris, silt, sand etc.). Sasol shall negotiate with condensate buyers to also take initial accumulation of hydrocarbons as part of the condensate purchase contract.	*SHERQ Manager*	September 2003	Negotiated contract as per requirement.		
3.15.5	**Initial 'loading' of machinery and equipment with fuel, lubricants, chemicals**	Care shall be taken during the initial loading (filling) of machinery and equipment to prevent spills / accidents etc. due to the relatively higher volumes / quantities of materials involved. An action plan shall be prepared detailing approach to intial loading and precautions / safety measures to be put in place.	*SHERQ Administrator*	July 2003	Document specifying approach to initial loading and indicating precautionary measures, safety measures and responses plans to be initiated in the even of an accident.		
3.15.6	**Reduced labour requirements**	SPI shall make every effort to inform construction employees of the duration of their contracts and ensure that no expectation of ongoing employment exists beyond the contract end date.	*SHERQ Manager*	July 2003	Communication records.		

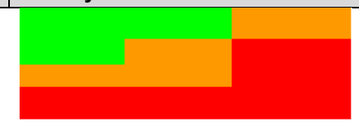
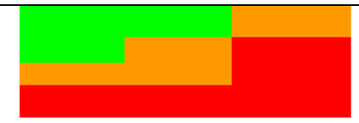
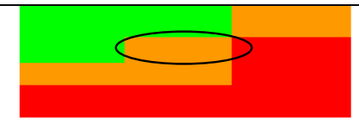
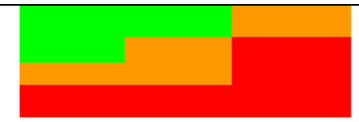
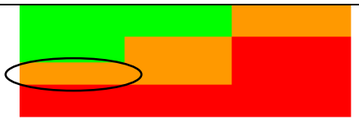
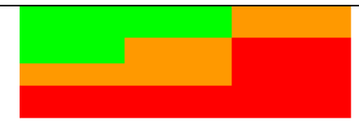
3.16. NORMAL STARTUP (REQUIREMENTS OF 3.15 INCLUDED WHERE APPLICABLE)

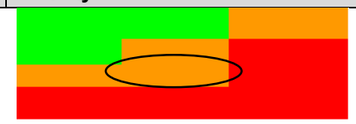
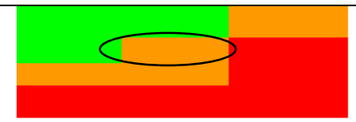
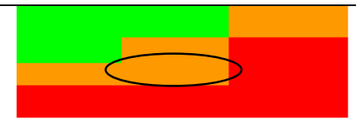
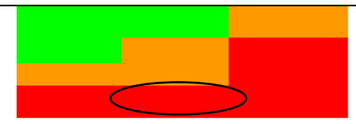
Ref.	Activity	Requirements / specifications	Responsibility	Scheduling	Compliance indicator(s)	Priority	Status / Ref.
3.16.1	**Accumulation of hydrocarbons in the plant – potential for re-injection into the re-injection well**	Initial products produced from wells shall not be reinjected due to possible contamination risks (construction debris, silt, sand etc.). Sasol shall negotiate with condensate buyers to also take initial accumulation of hydrocarbons as part of condensate purchase contract.	*SHERQ Manager*	September 2003	Negotiated contract as per requirement.		
3.16.2	**Pump out process service sections to the re-injection wells, vented and nitrogen purged to flare, water washed and ventilated with fresh air. All hydrocarbon process pipes purged with nitrogen before start-up, including flowline to reinjection well**	No water flushing of lines shall occur during (or prior to) normal startup.	*Operations Manager*	Ongoing	As per requirement. Inspection records.		
3.16.3	**Flushing POC drains with firewater**	Drains shall only be cleaned with water where 'dry' cleaning would not be effective and where cleaning is required to ensure the efficient operation of the drains system. Any water used to clean drains shall be minimised. Drains should be subjected to a regular maintenance programme. Any water used to clean drains shall be routed to the industrial effluent treatment plant.	***Maintenance Manager***	Ongoing	Drains maintenance programme.		

3.17. OPERATION

Ref.	Activity	Requirements / specifications	Responsibility	Scheduling	Compliance indicator(s)	Priority	Status / Ref.
3.17.1	**Use of unsurfaced access roads**	Dust shall be controlled to ensure no detrimental effect to landowners, occupants, employees or the general public. Measures may include dust suppression using water spray and surface binding using 'environmentally friendly' products. The results of dust monitoring and the frequency and severity of complaints received shall guide the level of dust control required (if any).	*SHERQ Administrator*	Ongoing	Number and severity of dust related complaints Results of dust monitoring programme Records of management measures implemented.		

Ref.	Activity	Requirements / specifications	Responsibility	Scheduling	Compliance indicator(s)	Priority	Status / Ref.
3.17.2	**(External) cleaning / painting of piping and equipment**	Products used for cleaning shall be 'environmentally friendly' products as determined by MSDS specifications. All effluent shall be routed to the industrial treatment facility. Note however that depending on the chemicals used, the industrial treatment facility may not be designed to remove pollutants. In all cases decisions regarding the use of chemicals on site that may reach the effluent stream shall be made in terms of the constraints of the industrial effluent treatment facility. If uncertain as to treatment capabilities, the precautionary principle shall be applied and either the chemical shall not be added to the effluent stream or the effluent shall be tested to ensure appropriate quality (specifically for the pollutant / contaminant) of concern, prior to release. Contaminated cleaning materials and effluent shall be disposed of as per Section 3.10.	*Commercial Officer* *SHERQ Administrator*	Ongoing Ongoing	MSDS for products used. Effluent monitoring records.		
3.17.3	**Chemical disposal from laboratory / other**	Chemicals shall be disposed of into containers (incompatible chemicals separated as appropriate) for either: ○ Disposal by incineration (if acceptable per MSDS disposal requirements); or ○ Disposal by landfill (if acceptable as per Bergman Ingerop landfill operating manual); or ○ Disposal off-site to a registered disposal facility for the type of waste being disposed. No laboratory chemical / reagent waste shall be disposed of into drain systems as the industrial effluent treatment plant is not designed to treat this waste.	*Field Operations Manager*	Ongoing	Disposal records. Lab waste disposal procedure.		
3.17.4	**Condensate sales and transport**	Sasol shall ensure that a transport risk assessment is completed for the transport of condensate off-site.	*SHERQ Manager*	Prior to transport of condensate off-site	Documented transport risk assessment.		
3.17.5		Sasol shall prepare and implement a condensate loading and transport procedure that shall address, but not necessarily be limited to: ○ Minimum vehicle requirements / specifications. ○ Detailed instructions on loading of condensate. ○ Route specifications both on and off-site, including pre-defined stopping areas. ○ Instructions in terms of spills / both on and off-site, including a spill management plan. ○ Emergency contact details. The document shall be in both English and Portuguese.	***SHERQ Administrator***	Prior to loading / transport of condensate	Condensate loading and transport procedure. Spill management plan.		
3.17.6		Sasol shall clearly define performance requirements and responsibilities with the condensate transport contractor / purchaser. These requirements must be agreed between all parties involved in writing.	**SHERQ Manager**	Prior to finalising contract(s)	Contractor / Sasol performance requirements and responsibilities in terms of condensate clarified in writing.		

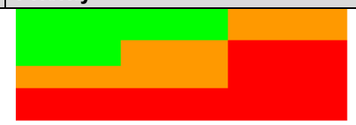
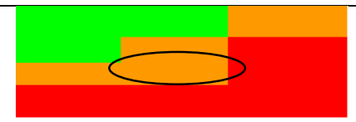
Ref.	Activity	Requirements / specifications	Responsibility	Scheduling	Compliance indicator(s)	Priority	Status / Ref.
3.17.7		Sasol shall audit the environmental performance of the condensate purchaser / contractor on at least a quarterly basis to ensure that all performance requirements are met. This shall include inspections of vehicles to ensure requirements are met and also inspections of the transport route to ensure that no spill/leaks etc. have occurred. Should any spills be evident on the transport route, SPI shall require the contractor to clean such prior to undertaking any further work.	***SHERQ Manager***	Quarterly audits	Audit reports and findings.		
3.17.8		Condensate shall not be transported by sea, without first completing an environmental impact assessment, preparing an environmental management plan and obtaining the relevant governmental approvals. (Due to the sensitive nature of the Vilankulos coastal area the transport of condensate by sea from this area should be avoided.)	***SHERQ Manager*** ***Operations Manager***	Prior to undertaking sea movement of condensate	EIA report. EMP. Government approvals.		
3.17.9	**Condensate loading**	Any spills of condensate at the loading bay must be immediately cleaned and waste material disposed of as per Section 3.10. Any runoff from the condensate loading bay shall be routed to the industrial effluent treatment plant.	***SHERQ Administrator***	Ongoing	Spill cleanup procedure. Non-conformance / incident reports.		
3.17.10	**TEG storage and handling**	TEG contamination of site effluent streams shall not be permitted. In all areas where TEG is stored, transported or handled, Sasol shall ensure that any spill or leak can be contained and does not contaminate soil or water.	*SHERQ Administrator*	Prior to commissioning and ongoing	Plant design as per requirement. TEG storage, handling and use procedure. TEG spill cleanup procedure.		
3.17.11	**Washing down of paved areas with utility water** **Bund cleaning**	The use of clean water (from boreholes) for cleaning of the plant area should be minimised and in principle should only be done where cleaning is required to ensure a safe and healthy work area. Should water be required for cleaning, preference shall be given to using treated (and in-spec) industrial or sewage effluent.	***Maintenance Manager***	Ongoing	As per requirement.		
3.17.12	**Emergency situations**	Sasol shall prepare an emergency preparedness and response plan that shall address, but not be limited to the handling of the following environmental emergencies: ○ Condensate spills; ○ Chemical spills; ○ High rainfall / flood combined with effluent in holding pond outside of specification; ○ Bush fire; ○ Air emissions beyond guidelines and / or release of emissions that may cause health or safety issues for surrounding communities and / or employees; and ○ Release of untreated effluent or effluent outside of specification.	*Field Operations Manager*	October 2003	Documented and implemented emergency preparedness and response plan.		
3.17.13	**Effluent management**	See Section 3.9.					

Ref.	Activity	Requirements / specifications	Responsibility	Scheduling	Compliance indicator(s)	Priority	Status / Ref.
3.17.14	**Emissions management**	Sasol shall ensure adequate measures to protect both employees and the public from any adverse effects related to emissions from the project. Monitoring shall be undertaken as specified in Section xx and corrective action implemented as required.	*SHERQ Administrator*	Ongoing	Monitoring records Non-conformance reports and corrective action plans		
3.17.15	**Re-injection of produced water**	Sasol shall ensure that there is no contamination / pollution (organic or inorganic) of produced water prior to reinjection.	*SHERQ Administrator*	Ongoing	As per requirement – monitoring may be required.		
3.17.16	**Condensate storage tank – penstock valve on tank bunds**	Contents of bund walls shall only be released from the bund under the control of the responsible party. Bund contents may not be released to clean stormwater drains and may only be released to the industrial effluent treatment facility or to the incinerator (if applicable). A tap (to ensure control of release) must be installed on the penstock system.	*SHERQ Administrator*	October 2003 and ongoing	As per requirement.		
3.17.17	**General plant operations**	Noise emissions from the CPF have the potential to exceed project standards (i.e. greater than 45dbA at night and 55dBA during the day; WHO) at a distance further than the partial protection zone. Should ambient noise monitoring and / or community complaints indicate that noise levels from the plant need to be reduced, SPI shall initiate immediate action to achieve the required reduction in noise levels to meet project standards.	*SHERQ Administrator*	Ongoing	Monitoring records. Records of action taken as necessary.		
3.17.18	**Sand / silt production from wells**	Sand / silt produced from wells will be incorporated into the condensate sold to third parties. See xx.					

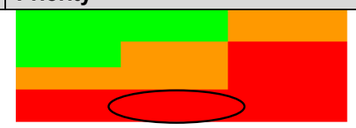
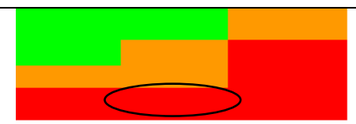
3.18. NORMAL SHUTDOWN

Ref.	Activity	Requirements / specifications	Responsibility	Scheduling	Compliance indicator(s)	Priority	Status / Ref.
3.18.1	**Disposal of liquid hydrocarbon from the closed drain sump**	As per 3.15.3.					
3.18.2	**Flushing of hydrocarbon piping and equipment with utility water**	As per 3.15.2 and 3.15.3.					

3.19. EMERGENCY SHUTDOWN (SECTION 3.18 APPLICABLE)

Ref.	Activity	Requirements / specifications	Responsibility	Scheduling	Compliance indicator(s)	Priority	Status / Ref.
3.19.1	**Effluent management**	No untreated effluent (or effluent outside of specification) may be released from site and shall be held on site in existing facilities until such time as treatment may be possible.	*Operations Manager*	Ongoing	Monitoring records.		
3.19.2	**Incinerator management**	The incinerator may not be operated in the event that the secondary combustion chamber and / or scrubbing phase are inoperable.	*Operations Manager*	Ongoing	Record of incinerator efficiency.		

3.20. LAND USE CONTROLS

Ref.	Activity	Requirements / specifications	Responsibility	Scheduling	Compliance indicator(s)	Priority	Status / Ref.
3.20.1	**General**	As a result of the development of the CPF and associated activities the local area will be changed from what was previously a rural area to an industrialised area. Without proper management this could lead to conflict between the rural and industrial ways of life. SPI shall ensure liaison with the Government to ensure suitable planning of land use and land zoning around the CPF, well-heads, access roads and flowlines.	*Environmental Planner*	Immediate and ongoing	Records of meetings / communication with the Government.		
3.20.2	**Road usage**	The high volume truck flow for the transport of condensate from the CPF site has the potential to result in degradation of the road network to and from the CPF. SPI shall liase with the Government to ensure that the road is maintained to a suitable standard and shall participate with the Government to facilitate this maintenance (and upgrading) as necessary.	*Environmental Planner*	Immediate and ongoing	Records of meeting / communication with the Government.		

Note: Any additional development activities for the project must be conducted in terms of the construction and operations EMP for the project. These documents will need to be updated as necessary to reflect the additional project activities and associated management requirements.

4. PERFORMANCE ASSESSMENT, REVIEW & CORRECTIVE ACTION

The assessment of performance has three key aims:

i) Confirmation of compliance to the requirements as set out in the EMP;

ii) Measurement of environmental performance (degree of success of the EMP and its specifications); and

iii) Ensuring that any deficiencies in the EMP are identified and remedied.

These aims shall be met by making use of four important tools: monitoring, auditing / inspections, non-conformance / incident identification and close-out, and management review. Corrective action will be critical in ensuring that any identified problem areas are effectively addressed. Specifications for monitoring, non-conformance identification, auditing and review are provided in the sections that follow. SPT shall produce procedures for monitoring, auditing and inspections, management review, non-conformance / incident reporting and corrective action that will address the requirements of this section.

4.1. ENVIRONMENTAL MONITORING STRATEGY

A monitoring[2] strategy must be defined to ensure that the effectiveness of management and mitigation measures can be tracked and corrective action (see 4.4) identified as necessary. Note that monitoring shall be intended to evaluate the effectiveness of environmental management, independent of whether the specifications in the EMP have been complied with. Proper monitoring will enable any impacts of the project on the environment to be detected as early as possible and corrective action implemented as required.

Table 3 defines the monitoring requirements necessary during the operational phase of the project. Where monitoring is specified as a requirement, the responsible party will develop a monitoring, measurement and reporting procedure that will outline:

- The monitoring objectives;

[2] Monitoring is a process of surveillance, based on specified approaches and schedules, used to detect whether any changes have occurred in the predefined, quantifiable properties of the particular environment under consideration.

- A detailed description of the required monitoring measures, including responsibilities, parameters to be measured, methods to be used, sampling locations, frequency of measurement, detection limits and the definition of thresholds that will signal the need for corrective actions (see 4.4);

- The approach to the analysis of results and the identification of activities and impacts requiring corrective action; and

- Reporting requirements, with defined responsibilities, to ensure early detection of conditions that require corrective action and approach to initiating corrective action.

TABLE 3. MONITORING REQUIREMENTS. (IN SOME CASES PERFORMANCE INDICATORS HAVE BEEN INDICATED IN THE EMP STANDARD AND THUS ADDITIONAL MONITORING MAY BE REQUIRED TO THAT PRESENTED IN THE TABLE)

Parameters to be monitored	Monitoring location	Frequency of monitoring	Threshold limits per parameter[3, 4]	Reporting	Responsibility
Water related monitoring (surface)					
Sewage plant effluent volume - *m^3*	Outlet from sewage plant	For every release (online)	None – must be within stated capacity of plant.	Operations Manager Field Operations Manager SHERQ Manager SHERQ Administrator	*Field Operations Manager*
Sewage plant effluent quality - *Ammonia nitrogen* - *Nitrate nitrogen* - *Soluble ortho-phosphate (as P)* - *Residual chlorine (as Cl)* - *Coliform count*	Outlet from sewage plant	Initially weekly to determine effectiveness of the treatment plant; thereafter bi-weekly and in the event of any upset event.	- 3.0 mg/L - 15 mg/L - 1.0 mg/L - 0.1 mg/L - 0 /100ml	Operations Manager Field Operations Manager SHERQ Manager	*SHERQ Administrator*

[3] World Bank Discharge Requirements as presented in the Industry Guideline; World Health Organisation drinking water quality guidelines; Department of Water Affairs and Forestry (RSA), Waste Discharge Standards were used in setting threshold limits

[4] Note that in addition, the amplitude and frequency of natural cycles in parameters should not be altered, i.e. SPI shall ensure that it is aware of the amplitude and frequency of such cycles through the results of appropriate baselines studies.

Parameters to be monitored	Monitoring location	Frequency of monitoring	Threshold limits per parameter[3, 4]	Reporting	Responsibility
Industrial effluent volume - m^3	Outlet from industrial effluent treatment plant	For every release (online)	None	Operations Manager Field Operations Manager SHERQ Manager SHERQ Administrator	*Field Operations Manager*
Industrial effluent quality - *COD* - *TSS* - *Oil and grease* - *Ammonia nitrogen* - *Nitrate nitrogen* - *Soluble ortho-phosphate (as P)* - *Sum of selected metals (*antimony, arsenic, beryllium, cadmium, chromium, copper, lead, mercury, nickel, selenium, silver, thallium, vanadium, zinc)	Outlet from industrial effluent treatment plant	Initially weekly to determine effectiveness of the treatment plant; thereafter bi-weekly and in the event of any upset event.	 - 65 mg/L - 18 mg/L - 0 mg/L - 3.0 mg/L - 15 mg/L - 1.0 mg/L - 1 mg/L	Operations Manager Field Operations Manager SHERQ Manager	*SHERQ Administrator*
Site effluent - *pH* - *BOD* - *COD* - *TSS* - *O&G* - *Phenol* - *Nitrogen (total)* - *Ammonia nitrogen*	Effluent holding pond	Prior to release from site	 6-9 50 mg/L 250 mg/L 18 mg/L 0 mg /L 0.5 mg /L 10 mg /L 3.0 mg /L	Operations Manager Field Operations Manager SHERQ Manager	*SHERQ Administrator*

Parameters to be monitored	Monitoring location	Frequency of monitoring	Threshold limits per parameter[3, 4]	Reporting	Responsibility
- *Nitrate nitrogen*			15 mg/L		
- *Phosphorus*			1 mg /L		
- *Chlorine*			0.1 mg /L		
- *Total coliforms*			0 /100ml		
- *Temperature*			<2^{0}C from receiving body		
- *Sum of selected metals* (antimony, arsenic, beryllium, cadmium, chromium, copper, lead, mercury, nickel, selenium, silver, thallium, vanadium, zinc)			1 mg/L		
Water quality: Govuro floodplain - *pH* - *TSS* - *O&G* - *Ammonia nitrogen*[5] - *Nitrate nitrogen* - *Dissolved oxygen*[6] - *Chlorine*[7] - *Phenol*[8]	Adjacent to effluent outfall (approx. 15m radius) and at distances of at least 200m and 700m in the direction of the Govuro River.	Seasonal baseline data to be established as a matter of priority. Bi-weekly monitoring.	+/- 0.5 from baseline +/- 10% from baseline 0 mg/L +/- 2.5% from baseline +/- 2.5% from baseline +/- 5% from baseline +/- 2.5% from baseline +/- 2.5% from baseline	Operations Manager Field Operations Manager SHERQ Manager	*SHERQ Administrator*

[5] Target Water Quality Range is ≤ 7 µgN/L

[6] Target Water Quality Range is 80% - 120% of saturation (typical concentrations at sea level, and at TDS values below 3000mg/L are: 10.08 mg/L at 15^{0}C and 9.09mg/L at 20^{0}C).

[7] Target Water Quality Range is ≤ 0.2 µg/L

Parameters to be monitored	Monitoring location	Frequency of monitoring	Threshold limits per parameter[3, 4]	Reporting	Responsibility
- *Inorganic Phosphorus*			+/- 10% from baseline		
- *Inorganic Nitrogen*			+/- 10% from baseline		
- *TDS*			+/- 10% from baseline		
- *Temperature*			+/- 2^0C or 5%[9] from baseline		
Water quality: Govuro River	Upstream (at least 150m) and downstream (at least 50m) of the flowline crossing and the effluent outfall.	Seasonal baseline data to be established as a matter of priority. Bi-weekly monitoring.		Operations Manager Field Operations Manager SHERQ Manager	*SHERQ Administrator*
- *pH*			+/- 0.5 from baseline		
- *TSS*			+/- 10% from baseline		
- *O&G*			0 mg/L		
- *Ammonia nitrogen*[6]			+/- 2.5% from baseline		
- *Nitrate nitrogen*			+/- 2.5% from baseline		
- *Dissolved oxygen*[7]			+/- 5% from baseline		
- *Chlorine*[8]			+/- 2.5% from baseline		
- *Phenol*[9]			+/- 2.5% from baseline		
- *Inorganic Phosphorus*			+/- 10% from baseline		
- *Inorganic Nitrogen*			+/- 10% from baseline		
- *TDS*			+/- 10% from baseline		
- *Temperature*			+/- 2^0C or 5%[10] from baseline		

[8] Target Water Quality Range is ≤ 30 µg/L

[9] Whichever is more conservative

Parameters to be monitored	Monitoring location	Frequency of monitoring	Threshold limits per parameter[3, 4]	Reporting	Responsibility
Leachate quality from waste site(s) *- pH* *- COD* *- O&G* *- Phenol* *- Ammonia nitrogen* *- Nitrate nitrogen* *- Chlorine* *- Total coliforms*	Waste site leachate pit.		 6-9 250 mg/L 0 mg /L 0.5 mg /L 3.0 mg /L 15 mg /L 0.1 mg /L 0 /100ml	Operations Manager Field Operations Manager SHERQ Manager	*SHERQ Administrator*
Leachate volume from waste site(s) - m^3	Waste site leachate pit.	Every leachate collection.	None.	Operations Manager Field Operations Manager SHERQ Manager	*SHERQ Administrator*
Water related monitoring (groundwater)					
Groundwater extraction volumes *- m^3*	At each supply borehole.	Online.	None. (there must be no impact on existing groundwater users)	Operations Manager SHERQ Manager SHERQ Administrator	*Field Operations Manager*
Atmospheric related monitoring					
Environmental dust		Baseline obtained prior to the initiation of construction. During operation there are no foreseen ongoing activities resulting in the generation	PM10 (inhalable particulates): Max. 24 hr – 180 µg/m^3 Annual avg. – 60 µg/m^3	Operations Manager Field Operations Manager SHERQ Manager	*SHERQ Administrator*

Parameters to be monitored	Monitoring location	Frequency of monitoring	Threshold limits per parameter[3, 4]	Reporting	Responsibility
		of dust emissions. Should dirt road usage become frequent, complaints be received and / or significant dust generation be observed from the CPF, an appropriate monitoring programme for PM10 and Total Suspended Particulates shall be implemented.			
NO_x concentrations	See Appendix A of Air Quality Specialist Study for a discussion.	Online monitoring stations	Units=µg/m^3 Annual avg. 283 Max. 1 month avg. 403 Max. 24 hr avg. 566 Max. 1 hour avg. 1132 Instantaneous peak. 2080	Operations Manager Field Operations Manager SHERQ Manager	*SHERQ Administrator*
VOC concentrations	See Appendix A of Air Quality Specialist Study for a discussion.	Online monitoring stations	20 000 µg/m^3	Operations Manager Field Operations Manager SHERQ Manager	*SHERQ Administrator*
Stack monitoring (incinerator) *- Sulphur dioxide* *- Carbon monoxide* *- Oxides of nitrogen* *- Particulate matter*	Stack outlet of incinerator	Biannually at a time representative of normal operations. (conducted by professional contractor).	As per advice of supplier / contractor)	Operations Manager Field Operations Manager SHERQ Manager	*SHERQ Administrator*

Parameters to be monitored	Monitoring location	Frequency of monitoring	Threshold limits per parameter[3, 4]	Reporting	Responsibility
- Hydrochloric acid *- Dioxins and furans* *- Total hydrocarbon compounds*					
Odours	Receptor locations.	Ad-hoc inspections and in response to complaints received.	Odours not offensive at receptor end (H_2S at the property boundary should be less then 5ug/m^3).	Operations Manager Field Operations Manager SHERQ Manager	*SHERQ Administrator*
Meteorological parameters *- Hourly average wind speed and direction* *- Hourly ambient temperature* *- Hourly precipitation* *- Relative humidity* *- Barometric pressure*	Weather station location on top of control room complex.	Online monitoring station.	None.	None.	*SHERQ Administrator*
Acoustic related monitoring					
Ambient noise levels *- dBA* Every measurement sample must be representative of the ambient noise level at the time, and have a minimum duration of 15 minutes Samples shall reflect typical operational conditions at the plant. The subjective impression of the ambient noise at the measurement	500m from site boundary at four points, North, South, East and West of the plant.	Bi-annually, once during the winter and once during the summer months. Samples taken during representative periods of the day (0600 to 1800) and night (2200 to 0600).	< 55 dBA during the day. < 45 dBA during the night.	Operations Manager Field Operations Manager SHERQ Manager	*SHERQ Administrator*

Parameters to be monitored	Monitoring location	Frequency of monitoring	Threshold limits per parameter[3, 4]	Reporting	Responsibility
points shall be noted, with specific reference on the audibility of plant and other significant noise sources in the area.					
Ecology related monitoring					
Vegetation in floodplain *- photographic point monitoring of vegetation composition*	Reference photographic points shall be located adjacent to the monitoring points used for water sampling in the Govuro floodplain and shall be selected to reflect the vegetation types general of the area.	Quarterly.	Observable change to extent of vegetation type or nature of vegetation in terms of dominant species composition.	Operations Manager Field Operations Manager SHERQ Manager	*SHERQ Administrator*
Vegetation along flowlines and access roads *- surface cover* *- degree of weed infestation* *- erosion*	All flowlines	Quaterly inspections	Estimate of percentage cover along disturbed flowline areas. Notes on degree of weed infestation alongside and in disturbed areas. Notes on any erosion observed.	Based on the results of inspection, identify any action necessary to ensure ecological functioning, successful flowline rehabilitation and remediation of any impacts. Report to SHERQ Manager and Field Operations Manager	*SHERQ Administrator*

4.2. SITE INSPECTION AND AUDITS

Inspections and audits will be conducted to evaluate compliance to the requirements of the EMP. Section 4.2.1 defines the site inspection requirements and associated responsibilities for the operations phase of the project. Section 4.2.2 defines the auditing requirements for the operations phase of the project.

4.2.1. SITE INSPECTIONS

The SHERQ Administrator will undertake regular inspections of all works so as to identify any project activities or components that are causing, or may cause, a potential environmental impact. Inspections will be ongoing and will form part of the day-to-day function of the SHERQ Administrator. The SHERQ Administrator will immediately bring any identified non-conformances to the attention of the responsible party for rectification. Any potential problem areas will be logged and managed as per the requirements of Section 4.4 (non-conformance and preventative action).

4.2.2. AUDITS

The main goals of an EMP audit are to evaluate compliance with stipulated EMP requirements, to identify any non-conformance and to assess whether objectives and targets have been achieved. An audit programme and procedure shall be developed by Sasol to ensure that the audits are sufficiently comprehensive and scheduled.

Auditing must consider the results obtained from monitoring to assess whether objects and targets have been met, and whether there is any non-conformance with stipulated EMP and legal requirements. The audit must also assess whether EMP implementation has been undertaken according to planned arrangements and that the EMP itself is being appropriately updated based on project requirements and impacts identified. The audit shall confirm that any identified corrective action has been undertaken and assess the effectiveness of that action.

Sasol shall develop a procedure for conducting EMP audits that shall incorporate details of:

- Audit approach;
- Scheduling;
- Reporting; and
- Responsibilities.

Table 4 defines the minimum requirements in terms of audit types and frequency that will be conducted during the operational phase of the project.

TABLE 4. MINIMUM AUDITING REQUIREMENTS FOR THE OPERATIONAL PHASE OF THE TEMANE GAS FIELDS PROJECT.

Nature and scope of audit	Conducted by	Reported to	Frequency of audit
Internal EMP compliance audit – all project components	SHERQ Administrator SHERQ Manager as necessary	Operations Manager SHERQ Manager	Entire project to be covered at least bi-annually.
External EMP compliance audit - all project components	Independent consultant – appointed by Sasol	SHERQ Administrator SHERQ Manager Operations Manager MICOA	Annually.
Government audit As per the requirements of Government.	MICOA	SHERQ Administrator SHERQ Manager Operations Manager	As requested by Government

Note:

1. It is in the nature of environmental auditing to be conservative. Wherever latitude exists in interpretation, the auditor will take the most conservative (worse-case) stance. Credit will only be given for management actions that demonstrably comply with the project standard. Records should be kept of all actions taken to meet the requirements of the EMP. Similarly records and motivations must be kept of all changes / modifications to the EMP.

4.3. REVIEWS

Site management shall establish an environmental committee that will include as a minimum the SHERQ Administrator, Public Relations Officer, Field Operations Manager and Operations Manager. This committee shall meet on at least a monthly basis to review environmental performance, including incidents/non-conformances reported, corrective actions implemented, monitoring results and EMP compliance. Management actions and planning shall be specified based on the results of the review. The meeting shall be documented.

In addition, a management review meeting shall be held on at least a bi-annual basis to review the status of Environmental Management and EMP implementation and to ensure the continued effectiveness of the EMP as well as its appropriateness. The review meeting will be attended by the environmental committee, the Environmental Planner and the SHERQ Manager. The meeting shall be documented.

The management review should:

- Review EMP objectives and evaluate the need for new or revised objectives;
- Set new objectives as appropriate;
- Evaluate environmental performance and the effectiveness of the EMP by reviewing monitoring and audit results;
- Evaluate changing circumstances and how these may influence and be reflected in the EMP. This could include changes to permits, contracts, loan agreements etc; and
- Examine the results of any action items from the previous management review meeting.

4.4. CORRECTIVE AND PREVENTIVE ACTION

The need for setting corrective action will arise from deviations from:

- A predetermined baseline or limit (as detected through monitoring); or
- EMP requirements.

In this regard, Sasol shall establish an incident and non-conformance reporting procedure. The procedure shall include details for:

- Ensuring the recording of incidents / non-conformances;
- Reporting channels for incidents / non-conformances; and
- The identification of corrective and preventative action measures.

Corrective actions shall be identified based on incident / non-conformances reported and on the results of EMP monitoring, EMP audits and/or management review. Corrective action should result in:

- The implementation of a specific action(s) to remedy the identified deficiency(ies); or

- A change to the targets or objectives set in the EMP; and
- Corrective actions implemented shall be documented.

Should it be considered by Government Authorities that operational activities are causing unacceptable environmental damage, the SHERQ Administrator will immediately consult with the Government and agree on the remedial measures to be taken. Such agreed measures shall be undertaken immediately to prevent further damage and to repair any damage that may have occurred.

5. COMPETENCY, TRAINING AND AWARENESS CREATION

Those persons who are involved in activities that could result in an environmental impact(s) must receive appropriate environmental awareness training (and must also possess the necessary skills to successfully and responsible undertake their tasks). All employees must be made aware of Sasol's undertaking to conduct the proposed activities in a manner that is respectful to local people, their land and resources and sensitive biophysical habitats. Training will take the form of, but not be limited to: induction training, use of educational posters and daily environmental discussion topics prior to the start of each shift.

During these training sessions, the following principles should be presented / discussed:

- SPI's environmental, health and safety policies and applicable Mozambican environmental regulations.
- EIS and EMP commitments.
- Restrictions and procedures for operations.
- Restrictions and procedures for collection, treatment and disposal of waste and hazardous substances.
- Statement and clarifications of Sasol's communications policies.
- Fire fighting procedures.
- Procedure for emergency response.
- Procedures for incident reporting and handling.
- Need to refrain from destruction of animals and plants, indiscriminate defecation, waste disposal and/or pollution of local soil and water resources.

6. CONTINGENCY AND DECOMMISSIONING PLANNING

Sasol shall make financial provision for unforeseen potential impacts that may require specific mitigation / management measures. Furthermore, Sasol shall plan for plant and infrastructure decommissioning by:

- Preparing a roll-over five year decommissioning plan (SHERQ Manager);
- Making financial provision for decommissioning requirements (SHERQ Manager); and
- Liasing with communities and government with regard to decommissioning objectives (SHERQ Administrator).

7. EMERGENCY PREPAREDNESS AND RESPONSE

Sasol shall establish and maintain procedures to identify the potential for, and to respond to accidents and emergency situations in accordance with recognised international standards. The procedure(s) shall also address measures to prevent such situations and to mitigate environmental impacts that may be associated with them.

The emergency procedure(s) shall include the establishment of a network of communication between Sasol, employees, contractors, available emergency services including police, traffic police, local medical and ambulance services, fire departments, community associations, specialist services etc., that may be available.

The emergency plan shall be tested on a regular basis through the use of drills and mock emergencies so as to identify and rectify any shortcomings.

8. REPORTING REQUIREMENTS

All reporting will be as per the organogram presented as Figure 2 of this report and as specified elsewhere in the EMP.

In addition to all reporting requirements identified in the EMP, records shall be kept of all monitoring results, monitoring reports, incident records, audit reports and management reviews. Minutes of all environmental project meetings shall be maintained.

All reports will be managed as per the requirements of 9.

9. DOCUMENT CONTROL

The EMP forms the basis for environmental management on site. Based on the results of the performance assessment and review process (Section 4), the EMP may be modified as the project progresses. Modifications will only be permitted by the SHERQ Administrator who shall retain a single master copy of this EMP. All changes to the EMP shall be tracked, including details of the change, date of the change and name of the reviewer. The SHERQ Administrator will ensure that any modifications are communicated, explained to and discussed with all affected parties (i.e. the authorities, contractors, employees, Operations Manager and any affected party who requests this information).

SPT shall prepare a document control procedure to which all parties shall comply. This procedure shall define:

- Document distribution
- Document retention and record keeping
- Management of EMP revisions.

Russell Gillespie

For Metago Environmental Engineers (Pty) Ltd

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For Sasol Petroleum Temane Limitada

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Date of change	Detail of change	Reviewer	Signature

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