8 POTENTIAL PROJECT IMPACTS

8.1 INTRODUCTION

This section provides an assessment of the environmental and socio-economic impacts associated with the Project. Both short-term construction phase impacts and longer-term operational phase impacts have been considered and presented. A description of the methodology used to assess the characteristics and significance of impacts, taking into account impact magnitude and sensitivity of receptors and resources affected is provided in Section 3 of this Draft EIR.

Mitigation measures that Air Products will implement to avoid, reduce, remediate or compensate for impacts (as well as actions that will be taken to enhance Project benefits) are provided in this section and also in the EMPr (Annex F). The impacts that remain following implementation of mitigation measures are assessed and presented as residual impacts in this section.

This section describes the various impacts in the following structure:

- biophysical impacts;
- socio-economic impacts;
- unplanned/accidental events; and
- cumulative impacts.

Impacts are evaluated in the context of the Project and associated activities. Section 4 provides details of planned construction and operation activities while it is expected that the decommissioning of the proposed acetylene plant at the end of its life cycle will involve similar activities to those of construction. It is however anticipated that the decommissioning phase would result in the generation of significant amounts of waste. Unplanned events and cumulative impacts are described in Section 8.4 and Section 8.5 respectively.

Figure 8.1 illustrates the manufacturing process of the proposed acetylene manufacturing facility and depicts the associated emissions and wastes as a result of the manufacturing process, which may have a potential impact on the biophysical and socioeconomic environments.
The Project will utilise water as a purification media to strip ammonia impurities from the acetylene gas. Compression will take place in a water bath, while the adsorbent (ie to remove moisture) which will be used is a molecular sieve with activated alumina beds.

### 8.2 Potential Biophysical Impacts

Impacts are described in the context of the effect of the Project or the Project’s activity on a biophysical resource or receptor. Through the EIA process the following biophysical resources or receptors were identified as having the potential to be affected:

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**Figure 8.1 Potential Environmental Emissions of a Typical Acetylene Plant**

Source: Environmental Impacts of Acetylene Plants (EIGA, 2011)
soils;
air quality;
ambient noise;
flora; and
fauna.

8.2.1 Potential Impacts on Soil Resources

Impact Description

Impacts on soils will occur primarily during soil disturbance at Project construction. The initial stage of construction will involve site clearing and grubbing, which will be restricted to the area required for the construction of the proposed acetylene gas production facility and associated infrastructure including roads. Site clearing will begin with the destruction and removal of 2 building structures, located on the northern portion of the site. Clearing and grading will also involve removal of vegetation and debris and the preparation of a level surface for construction equipment/laydown area. Site preparation also involves the mobilisation of equipment, materials and heavy vehicle traffic on the Project site, resulting in soil compaction within the Project site.

The potential impacts to soil resources are:

- **Disturbance and loss of soil resources during construction** - The clearance of vegetation and removal of the existing buildings on site will involve grubbing/excavating to uproot vegetation as well as to remove the building foundations and debris. These activities will result in the disturbance of the site soil profile and loss of topsoil.

- **Increased potential for soil erosion during construction** - The removal of vegetation, buildings and debris on the Project site will result in exposure of bare soils, increasing the risk of erosion by wind or water (ie surface water runoff). This is particularly severe during periods of heavy wind or rain (ie December to January).

Impact Assessment

**Disturbance and loss of soil resources during construction**
Grubbing and site levelling activities have a *direct* and *negative* impact on the soil resources at the Project site. The extent of this impact will be limited to *on-site* only. Approximately 3.5ha of the 4ha site will be disturbed by the construction activities. This impact is *temporary* as it is only likely to occur during the construction phase (ie period of one year, however the Project site may be exposed for a period of four to six months). Furthermore, the disturbance and loss of soil will be a once-off occurrence at certain locations on the Project site during construction. The magnitude of this impact is considered to be *small*.
The soils of the Project site are considered well-drained, red, apedal (ie structureless) soils which are dystrophic to mesotrophic loam (ie low to moderate inherent fertility and a strongly to moderately weathered profile). Whilst the soil resource may have some agricultural potential, the area of soil resource lost is small (ie 3.5 ha), therefore the sensitivity of the soil resource is therefore low.

The pre-mitigation significance of this impact prior to mitigation is therefore rated as negligible.

**Increased potential for soil erosion during construction**

Soil erosion is expected to be limited to areas where vegetation has been cleared and no construction has yet taken place. Approximately 3.5ha of the 4ha site will be disturbed by the construction activities. The extent of this impact will be limited to the local area. Areas of bare soil will be temporarily exposed during the construction phase (ie one year, however the Project site may be exposed for a period of four to six months). During this period, the occurrence of soil erosion would be dependent on the activity being undertaken and the machinery being used as well as the weather conditions on site. Construction activities are not considered to be intensive (ie large excavations, deep trenches or stockpiling of significant quantities of topsoil due to the limited area of the Project site and the existing infrastructure that is planned to be used). The magnitude of this impact is therefore considered to be small.

Whilst the Project site is situated within the Klip River catchment, there are no tributaries or drainage systems on or near the site; therefore the risk of erosion by water is reduced. The study area is however dominated by north westerly to north easterly winds, while day time conditions are characterised by moderate winds, with an average wind speed of 5m/s, decreasing during night-time. The sensitivity is therefore low.

The pre-mitigation significance of this impact prior to mitigation is rated as negligible.

**Mitigation Measures**

The following mitigation measures will be implemented to reduce the impact on soils resources on the Project site.

- A stormwater management plan shall be developed to ensure that all surface-water run-off is collected into the 2 water catchment pits, to be located along the eastern boundary of the Project site.

- Suitable topsoils shall be removed and stockpiled for reuse (ie to a height of less than 2m) during site rehabilitation and landscaping. Stockpiles shall be covered with adequate sheeting to reduce soil erosion.

- All trees around the farmhouse will remain on site and be maintained.
- Areas of the site not used for buildings and infrastructure and not covered with hard-standing surface shall be revegetated or landscaped as soon as possible after disturbance.

- Construction zones shall be demarcated so as to minimise the site work footprint.

- Heavy vehicles shall be confined to designated working areas and access roads.

- Erosion shall be avoided during operations by the establishment of hardstanding on and around the facility as well as the construction of the stormwater management infrastructure around the Project site.

**Residual Impact**

With strict implementation of the above mentioned mitigation measures, the magnitude of the above impacts will be reduced, thus reducing the impact significance. *Table 8.1* provides a summary of the impact assessment on soil resources.

**Table 8.1 Impact Summary: Soil Resources**

<table>
<thead>
<tr>
<th>Potential Impact</th>
<th>Magnitude</th>
<th>Receptor Sensitivity</th>
<th>Pre-Mitigation Significance</th>
<th>Post-Mitigation Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disturbance and loss of soil resources during construction</td>
<td>Small</td>
<td>Low</td>
<td>Negligible</td>
<td>Negligible</td>
</tr>
<tr>
<td>Increased potential for soil erosion during construction</td>
<td>Small</td>
<td>Low</td>
<td>Negligible</td>
<td>Negligible</td>
</tr>
</tbody>
</table>

**8.2.2 Potential Impacts on Air Quality**

**Impact Description**

The construction, operation and decommissioning of the Project may result in atmospheric emissions. These emissions have the potential to adversely affect human health or result in nuisance to sensitive receptors. The emission sources of the pollutants likely to occur as a result of the Project activities have been listed in *Table 8.2*.

**Table 8.2 Potential Air Emission Sources**

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Emission Source (Construction and Operation)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pollutant</td>
<td>Emission Source (Construction and Operation)</td>
</tr>
<tr>
<td>--------------------</td>
<td>----------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>NO₂</td>
<td>• Vehicle tailpipe exhaust from forklifts as well as product and raw material trucks.</td>
</tr>
<tr>
<td></td>
<td>• Backup generator exhaust.</td>
</tr>
<tr>
<td>SO₂</td>
<td>• Vehicle tailpipe exhaust from forklifts as well as product and raw material trucks.</td>
</tr>
<tr>
<td></td>
<td>• Backup generator exhaust.</td>
</tr>
<tr>
<td>Benzene* (Volatile Organic Compounds)</td>
<td>• Fugitive emissions from plant operations.</td>
</tr>
<tr>
<td>PM₁₀</td>
<td>• Construction activities including vehicles travelling on dirt roads, site levelling, earth moving and vegetation clearing.</td>
</tr>
<tr>
<td></td>
<td>• Vehicle entrainment from product and raw material trucks on the paved on-site ring road.</td>
</tr>
<tr>
<td>Phosphine (PH₃)</td>
<td>• Fugitive emissions from the charging of the generator.</td>
</tr>
<tr>
<td>Acetone</td>
<td>• Working and standing losses from the acetone storage tank.</td>
</tr>
<tr>
<td></td>
<td>• Fugitive acetone emissions from cylinder cleaning and filling operations.</td>
</tr>
</tbody>
</table>

*Notes: A SA NAAQS has also not been established for VOCs. It was therefore decided to calculate cumulative VOC impacts with baseline benzene concentrations.

The potential impacts to air quality are:

- potential PM₁₀ emissions during construction;
- potential PM₁₀ emissions during operation;
- potential NO₂ emissions during operation;
- potential SO₂ emissions during operation;
- potential Acetone emissions during operation;
- potential Phosphine (PH₃) emissions during operation; and
- potential VOC emissions during operation.

**Impact Assessment**

**Potential PM₁₀ emissions during construction**

The PM₁₀ emissions likely to be generated during the construction period are considered to be a *direct* and *negative* impact. Construction activities will be limited to a period of 1 year; therefore the duration of this impact is *temporary*. Due to the transportation of construction materials and equipment on and off the Project site along the local gravel roads (ie Tilliet Road) PM₁₀ emissions will be generated, the extent of this impact is therefore *local*. Due to the nature of these activities; the impact is expected to be *intermittent*.

As a result of the prevailing wind direction and expected wind speeds, PM₁₀ emissions are likely to travel less than 200m from the source area and areas that are predicted to be worst affected are those to the south and south-east of the Project site. The annual average PM₁₀ concentrations during the construction phase (*Figure 8.2*) are predicted to increase by up to 40μg/m³ on the Project site and immediately to the south and south-east. This represents a
100 percent increase from the current baseline concentration, which is estimated to be between 50μg/m³ and 73μg/m³). The magnitude of this impact is therefore expected to be high.

The location of the Project site within the Vaal Triangle Airshed Priority Area means that at present the air quality is generally poor as evidenced by the baseline concentrations of PM$_{10}$ (50μg/m³ to 73μg/m³) which exceeds the National Ambient Air Quality Standards (40μg/m³). The sensitivity is therefore considered to be high.

The pre-mitigation significance of this impact is therefore rated as major.

**Figure 8.2** Predicted Incremental Annual Average PM$_{10}$ Concentrations during Construction

Source: Atmospheric Impact Report for the Proposed Acetylene Plant, Airshed Planning Professionals (May 2014)

**Potential PM$_{10}$ emissions during operation**

The PM$_{10}$ emissions likely to be generated during the Project operations are considered to be a direct and negative impact. The facility is planned to be operational for a period of 40 to 50 years; therefore the duration of this impact is long-term. Vehicle entrainment from product and raw material trucks travelling on the on-site ring road and along Tilliet Road which would both be tarred will result in limited PM$_{10}$ emissions; the extent of this impact is therefore local. It is expected that there would be approximately 13 vehicles generated daily from the operation of the facility, this includes the delivery of raw materials, distribution of the final product, worker travelling and collection of lime. Furthermore operational activities such as the use of forklifts are expected to be intermittent.
As a result of the prevailing wind direction, \( \text{PM}_{10} \) emissions would travel less than 200m from the source area and areas that are predicted to be worst affected are those to the south and south-east of the Project site. The incremental annual average \( \text{PM}_{10} \) concentrations during the operational phase (Figure 8.3) are predicted to be less than 4\( \mu g/m^3 \) just outside the Project site which is below the NAAQS (40\( \mu g/m^3 \)). The possibility exists for the daily average \( \text{PM}_{10} \) concentration stipulated in the NAAQS (120\( \mu g/m^3 \)) to be exceeded directly outside the Project site should the backup generators be used continuously (more than 24 hours) for more than four days per year. The magnitude of this impact is therefore expected to be negligible due to the minimal increment of \( \text{PM}_{10} \) emissions and it is also unlikely that Air Products would use the backup generators to this extent.

The current baseline concentrations at the four monitoring stations of \( \text{PM}_{10} \) (50\( \mu g/m^3 \) to 73\( \mu g/m^3 \)) exceeds the National Ambient Air Quality Standards (40\( \mu g/m^3 \)). The sensitivity is therefore considered to be high.

The pre-mitigation significance of this impact is therefore rated as negligible.

Figure 8.3  
Predicted Incremental Annual Average \( \text{PM}_{10} \) Concentrations during Operation

Source: Atmospheric Impact Report for the Proposed Acetylene Plant, Airshed Planning Professionals (May 2014)

Potential \( \text{NO}_2 \) emissions during operation
\( \text{NO}_2 \) emissions are likely to be emitted from vehicle and machinery exhausts such as forklifts, backup generators and product and raw material trucks. These emissions are considered to be a direct and negative impact for the duration of the Project operations (ie 40 to 50 years); which is considered to be long-term. The extent of this impact is considered to be local as machinery will
be used on site, however vehicles will be travelling to and from site for the delivery of raw materials and for the distribution of the gas product. It is expected that two trucks will be travelling to and from site per day distributing the gas product and an additional three trucks will be on site per day for deliveries of raw materials and collection of the lime.

As a result of the prevailing wind direction, NO\textsubscript{2} emissions would travel from the source area to the south and south-east of the Project site for most of the time. The incremental annual average of NO\textsubscript{2} concentrations during the operational phase (Figure 8.4) are predicted to be less than 5\(\mu\text{g/m}^3\) just outside the Project site boundary. The predicted highest hourly NO\textsubscript{2} concentration (80\(\mu\text{g/m}^3\) to 100\(\mu\text{g/m}^3\)) generated from the operational phase complies with the NAAQS (200\(\mu\text{g/m}^3\)), however this hourly concentration could possibly exceed the NAAQS outside the Project site, if the backup generators are utilised for more than 88 hours per year (Figure 8.5). The magnitude of this impact is therefore expected to be negligible due to the minimal increment of NO\textsubscript{2} emissions and it is also unlikely that Air Products would use the backup generators to this extent.

**Figure 8.4** Predicted Incremental Annual Average NO\textsubscript{2} Concentrations during Operation

The baseline NO\textsubscript{2} concentrations at the Project site were assumed to be represented by an average of the four monitoring stations which ranged between 23\(\mu\text{g/m}^3\) to 34\(\mu\text{g/m}^3\), the average annual baseline NO\textsubscript{2} concentration at the Project site is therefore estimated to be 25\(\mu\text{g/m}^3\). The current annual baseline concentration of NO\textsubscript{2} falls below the NAAQS (40\(\mu\text{g/m}^3\)). The sensitivity is therefore considered to be low.
The pre-mitigation significance is therefore rated as **negligible**.

**Figure 8.5**  Predicted Incremental Highest Hourly NO₂ Concentrations during Operation

Potential SO₂ emissions during operation
SO₂ emissions are likely to be emitted from vehicle and machinery exhausts such as forklifts, backup generators and product and raw material trucks. These emissions are considered to be a **direct and negative** impact for the duration of the Project operations (ie 40 to 50 years); which is considered to be **long-term**. The extent of this impact is considered to be **local** as machinery will be used on site, however vehicles will be travelling to and from site for the delivery of raw materials and for the distribution of the gas product. It is expected that two trucks will be travelling to and from site per day distributing the gas product and an additional three trucks will be on site per day for deliveries of raw materials and collection of the lime.

As a result of the prevailing wind direction, SO₂ emissions would travel from the source area to the south and south-east of the Project site. The incremental annual average SO₂ concentration during the operational phase is expected to increase by 0.1 percent. The magnitude of this impact is therefore considered to be **negligible**.

The measured annual average SO₂ concentrations range from 11μg/m³ to 18μg/m³. The 1 year SO₂ average concentration stipulated in the NAAQS is 50μg/m³. The annual average SO₂ concentrations measured is therefore below and in compliance with the NAAQS. The sensitivity is therefore considered to be **low**.
The pre-mitigation significance of this impact is therefore rated as **negligible**.

**Potential Acetone emissions during operation**

Acetone emissions are likely to be emitted from the acetone storage tank and from cylinder cleaning and filling operations. These emissions are considered to be a **direct** and **negative** impact for the duration of the Project operations (ie 40 to 50 years); which is considered to be **long-term**. The impact will be restricted to the **site**. The frequency of these emissions is considered to be **intermittent**.

The annual average acetone concentrations were predicted to be 12μg/m³ as the maximum concentration resulting from the Project activities. Acetone is considered non-toxic at normal ambient concentrations; the most stringent health guideline identified for acetone is the United States Agency for Toxic Substance and Disease Registry (US ATSDR) acute inhalation reference concentration (RfC) of 30 900μg/m³. The Project will result in emissions that are 0.1 percent of this reference concentration. The magnitude of this impact is therefore considered to be **negligible**.

The ambient concentration of acetone in the study area does not exceed this reference concentration of 30 900μg/m³. The sensitivity of the site is therefore considered to be **low**.

The pre-mitigation significance of this impact is therefore rated as **negligible**.

**Potential Phosphine (PH₃) emissions during operation**

Acetylene gas is considered to be non-toxic at normal ambient concentrations, but some acetylene impurities (especially phosphine) could have a significant impact to human health if sufficient quantities of acetylene are emitted, this would only occur in an emergency situation. PH₃ emissions are likely to be emitted in the form of fugitive emissions from the charging of the generator, lime sludge tanks and acetylene tank filling operations. These emissions are considered to be a **direct** and **negative** impact for the duration of the Project operations (ie 40 to 50 years); which is considered to be **long-term**. The extent of this impact is expected to be restricted to the **site**.

The United States Environmental Protection Agency’s Integrated Risk Information System (US EPA IRIS) provides a chronic inhalation reference concentration (RfC) of 0.3μg/m³ for phosphine. The predicted annual average PH₃ concentration resulting from the Project activities is estimated to be 0.05μg/m³, which is a factor below the reference concentration (Figure 8.6).

For short term averages, PH₃ concentrations were evaluated against the US EPA Health Effects Assessment Summary Tables (HEAST), which stipulate a reference concentration of 3μg/m³. The highest daily PH₃ concentrations are estimated to be 0.5μg/m³ which falls below the reference condition (Figure 8.7). The magnitude of this impact is therefore considered to be **small**.
The ambient concentration of acetylene gas in the study area does not exceed either US EPA reference concentrations for PH$_3$. The sensitivity of the site is therefore considered to be low.

The pre-mitigation significance of this impact is therefore rated as *negligible*. 
Potential VOC emissions during operation
VOC emissions are likely to be emitted from vehicle and machinery exhausts such as forklifts, backup generators and product and raw material trucks. These emissions are considered to be a direct and negative impact for the duration of the Project operations (ie 40 to 50 years); which is considered to be long-term. The extent of this impact is considered to be local as machinery will be used on site, however vehicles will be travelling to and from site for the delivery of raw materials and for the distribution of the gas product. It is expected that two trucks will be travelling to and from site per day distributing the gas product and an additional three trucks will be on site per day for deliveries of raw materials and collection of the lime.

The incremental annual average VOC concentration during the operational phase is estimated to be below 1μg/m³, which is less than the 1 year average stipulated in the NAAQS (5μg/m³). VOC concentrations were predicted to increase by approximately 40 percent from the baseline conditions within the Project site. The magnitude of this impact is therefore expected to be small (Figure 8.8).

Figure 8.8 Predicted Incremental Annual Average VOC Concentrations during Operation

Source: Atmospheric Impact Report for the Proposed Acetylene Plant, Airshed Planning Professionals (May 2014)

An annual average benzene concentration of 2.8μg/m³ has been recorded at the four monitoring stations, closest to the Project site. This concentration falls below the one year average stipulated in the NAAQS (5μg/m³). The sensitivity of the regional air quality is therefore considered to be low due to the current baseline concentrations being below the NAAQS.
The pre-mitigation significance of this impact is therefore rated as negligible.

Mitigation Measures

Various goals have been set for industrial emissions as part of the Vaal Triangle Airshed Priority Area Air Quality Management Plan (VTAPA AQMP). The goals that are applicable to the Project, along with recommended measures to achieve these goals are outlined below.

- Spray roads with water and other dust-generating surfaces to reduce dust emissions.
- Cover all materials with the potential to lead to dust emissions, during transport.
- Regularly clear and remove excess dirt or mud on access roads as a result of project activities.
- Enforce speed limits of 15kph on unhardened roads and surfaces.
- Minimise the drop heights for transfer of materials that could emit dust.
- Provide and enforce use of appropriate PPE to minimise dust exposure, if required.
- The emissions inventory compiled as part of this EIA shall be updated to include any changes in the process or emissions from the Project, once operational. All point and diffuse sources for all significant pollutants shall be included in the emissions inventory.
- Establish and implement a maintenance plan for the Project operations which shall include a schedule for repairs and equipment changes to coincide with plant offline times.
- Develop a fugitive dust emissions management plan, which shall include:
  - paving of all on-site roads to minimize entrained dust emissions;
  - regular sweeping of on-site roads to minimize silt loading, thereby minimizing entrained dust emissions; and
  - total enclosure of material storage.
- Develop a gaseous emissions management plan, which shall include:
  - regular maintenance and repair of vehicle fleet;
  - minimize vehicle idling times; and
- minimize the use of the backup generator usage (it is recommended that generator usage be restricted to less than 88 hours per year, to ensure off-site compliance with the NAAQS).

- Conduct ambient air quality monitoring in accordance with the AEL requirements. In particular, passive sampling of VOCs shall be conducted at the south-eastern boundary of the Project site, as well as at the closest sensitive receptors (ie Henley on Klip).

- Conduct quarterly consultative community meetings and establish a site complaints register.

**Residual Impact**

With strict implementation of the above mentioned mitigation measures, the magnitude of the above impacts will be reduced, thus reducing the impact significance, except for PM$_{10}$ emissions during the construction period. *Table 8.3* provides a summary of the impact assessment on air quality.

### Table 8.3 Impact Summary: Air Quality

<table>
<thead>
<tr>
<th>Potential Impact</th>
<th>Magnitude</th>
<th>Receptor Sensitivity</th>
<th>Pre-Mitigation Significance</th>
<th>Post-Mitigation Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Potential PM$_{10}$ emissions during construction</td>
<td>Medium</td>
<td>High</td>
<td>Major</td>
<td>Moderate</td>
</tr>
<tr>
<td>Potential PM$_{10}$ emissions during operation</td>
<td>Small</td>
<td>Low</td>
<td>Negligible</td>
<td>Negligible</td>
</tr>
<tr>
<td>Potential NO$_2$ emissions during operation</td>
<td>Small</td>
<td>Low</td>
<td>Negligible</td>
<td>Negligible</td>
</tr>
<tr>
<td>Potential SO$_2$ emissions during operation</td>
<td>Negligible</td>
<td>Low</td>
<td>Negligible</td>
<td>Negligible</td>
</tr>
<tr>
<td>Potential Acetone emissions during operation</td>
<td>Negligible</td>
<td>Low</td>
<td>Negligible</td>
<td>Negligible</td>
</tr>
<tr>
<td>Potential Phosphine (PH$_3$) emissions during operation</td>
<td>Small</td>
<td>Low</td>
<td>Negligible</td>
<td>Negligible</td>
</tr>
<tr>
<td>Potential VOC emissions during operation</td>
<td>Small</td>
<td>Low</td>
<td>Negligible</td>
<td>Negligible</td>
</tr>
</tbody>
</table>

### 8.2.3 Potential Noise Impacts

Noise is described in terms of changes in ambient noise on receptors. Project construction activities will generate noise from the operation of heavy equipment and construction of the Project facility. The main sources of noise during the Project operations include manual handling, use of vehicles, compressors and pumps. The nearest human sensitive receptors would be the surrounding neighbours, which include some residences, located between 150
to 200m from the southern, western and northern boundaries of the Project site.

Noise impacts assessed include:

- potential increase in noise emissions during construction; and
- potential increase in noise emissions during operation.

Impact Description

**Potential increase in noise emissions during construction**
During construction the main sources of noise will be the movement of heavy earthmoving vehicles for site clearance activities. Furthermore, noise will be generated from construction equipment used for concrete mixing, sheet piling and steel works. Other noise sources include the use of generators and construction workers on site as well as construction vehicles travelling to and from the Project site. Construction noise is likely to be audible only intermittently, and for much of the time not at levels to create a disturbance. Noise from Project activities will therefore not be at levels that would affect human health but could cause disturbance to normal activities.

**Potential increase in noise emissions during operation**
The main noise sources that are likely to be generated from the operation of the facility are the high pressure filling manifolds (ie pipes) used to fill acetylene gas into cylinders and metal-on-metal contact during handling of the cylinders in the cylinder storage area. Furthermore, generator tanks operated in the generator room may also contribute an additional noise source as well as the electrical generators used in the compressor room. The pump houses which will be used to pump water from the two water catchment pits is also likely to result in minimal noise emissions as the use of these pumps will be intermittent. Vehicle traffic noise will also be generated during operations.

Impact Assessment

**Potential increase in noise emissions during construction**
Noise emissions are considered to be a direct and negative Project impact. Ambient noise levels will be elevated to varying degrees at various times in various places on the Project site. It is likely that there will be periods of intermittent noise disturbance, at the nearest receptors, whilst much of the local community will not notice the elevated noise levels. The extent is therefore local and would occur in the short-term. The magnitude is therefore considered to be small.

In terms of sensitivity, the area surrounding the Project site is characterised by small industries (ie manufacturing, transport) and mining activities (ie Gen Douglas Mine). Furthermore, the noise generated from the transport along the R59 highway and metro railway line located to the west and east respectively also contribute to the background noise levels. The resulting ambient noise is
therefore typical of an urban district. However, it is recognised that there are residences in close proximity to the site; in particular, residences are located between 150m and 200m from the southern, western and northern boundaries of the Project site. These residences are considered to be the closest sensitive receptors to noise emissions generated during construction activities. The sensitivity of the receiving environment is therefore medium.

The pre-mitigation significance is therefore rated as minor.

**Potential increase in noise emissions during operation**

This assessment was based on existing noise measurements of noise generating activities and equipment at the existing Kempton Park facility. Noise associated with operations will generally be lower in intensity than construction noise and much of it will be intermittent. These noise emissions are still however considered to be a direct and negative Project impact. The duration of the impact will be long-term with a local extent.

The average rating noise level generated from the acetylene plant is approximately 86 dB (A), from the generator and compressor facilities. Furthermore, the average noise level generated from the filling hall, cylinder storage area and pump houses is approximately 64 dB (A). As per the South African National Standard 10103 - The measurement and rating of environmental noise with respect to annoyance and to speech communication (2008), there are typical rating levels for noise in certain districts (ie areas of a specific land-use eg residential, industrial). Based on the existing land uses around the Project site, the area would be classified as an urban district with one or more of the following: workshops; business premises; and main roads. As stipulated by this guideline, the day time equivalent continuous rating level for noise typical for this district is 60dB(A) and night time at 50dB(A). The noise levels likely to be generated by the acetylene process generator and compressor does exceed the specified limit for the day and night. However, these facilities would be located in an enclosed generator and compressor room which would reduce the resulting noise level at the boundaries of the Project site to within the guideline value. Furthermore, the filling hall, cylinder storage area and pump houses are likely to result in a minor exceedance of the day time limit, with these activities being intermittent. The overall magnitude of this impact is medium.

In terms of sensitivity, the area surrounding the Project site is characterised by small industries (ie manufacturing, transport) and mining activities (ie Glen Douglas Mine). Furthermore, the noise generated from the transport along the R59 highway and metro railway line located to the west and east respectively also contribute to the background noise levels. However, it is recognised that there are residences in close proximity to the site; in particular, residences are located between 150m and 200m from the southern, western and northern boundaries of the Project site. These residences are considered to be the closest sensitive receptors to noise emissions generated. The sensitivity of the receiving environment is therefore medium.
The pre-mitigation significance is therefore rated as *moderate.*

**Mitigation Measures**

**Potential increase in noise emissions during construction**

- Ensure that all equipment is operated and maintained in accordance with original specifications in terms of noise rating.

- Construction activities, including vehicle movements to/from the Project site, shall be normally scheduled for local daylight hours. Activities that are associated with high levels of noise shall not be conducted at night.

- Air Products shall consult with the local communities and communicate work schedules.

- Identify areas where hearing protection must be worn and erect sign-posting at these noisy areas according to good health and safety practice.

**Potential increase in noise emissions during operation**

- Areas where double hearing protection is required (ie the compressor room, generator room and use of power tools) should be clearly demarcated and labelled as such.

- Provide quiet areas for food and rest breaks to reduce employee exposure to noise from production activities.

- Maintain machines and plant equipment and include modifications or additions to noise mufflers, gas and compressed air outlets or duct silencers.

- Use ‘low noise’ equipment, and methods of work where feasible.

- Use alternatives to diesel/petrol engines and pneumatic units, such as hydraulic or electric-controlled units, where feasible.

- Reduce throttle settings and turn off equipment and plant when not used.

- Limit activities associated with high levels of noise to daylight hours only.

- Plan vehicle/ equipment movements to avoid travel through residential areas.

- Avoid clustering of machinery and other large operational vehicles near residences and other sensitive land uses.

- A maintenance schedule shall be compiled and be well documented as proof of maintenance and inspections.
- Where practical, add noise barriers (i.e., between production area and offices) and boundaries of the site.

- Conduct representative noise measurements at intervals not exceeding 24 months, and/or when changes or additions to plant structures or machinery are made that would significantly change the noise exposure.

**Residual Impact**

With strict implementation of the above mentioned mitigation measures, the magnitude of the above impacts will be reduced, thus reducing the impact significance during the construction and operation phases. Table 8.4 provides a summary of the impact assessment on air quality.

**Table 8.4 Impact Summary: Noise**

<table>
<thead>
<tr>
<th>Potential Impact</th>
<th>Magnitude</th>
<th>Receptor Sensitivity</th>
<th>Pre-Mitigation Significance</th>
<th>Post-Mitigation Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Potential increase in noise emissions during construction</td>
<td>Small</td>
<td>Medium</td>
<td>Minor</td>
<td>Minor</td>
</tr>
<tr>
<td>Potential increase in noise emissions during operation</td>
<td>Medium</td>
<td>Medium</td>
<td>Moderate</td>
<td>Minor</td>
</tr>
</tbody>
</table>

**8.2.4 Potential Impacts on Flora (Vegetation)**

Approximately 42 percent of the Project site has been transformed due to the development of infrastructure, landscaping, dumping of wastes and the establishment of alien invasive plant species. The remaining ‘natural’ habitat contains a diverse array of Highveld grassland species, with 93 species recorded during the site ecological site survey. However, the vegetation structure and floristic diversity of the Project site has been impacted by the activities mentioned above as well as other current activities, including a sewage leak on the southern section of the property and possible frequent fires surrounding the property further altering vegetation structure.

**Impact Description**

The development of the Project will result in the loss of grassland and floral habitat due to disturbance and displacement. The disturbance associated with construction activities can also result in the rapid colonisation of alien invasive species. The potential impacts to vegetation on the Project site are described below.

**Loss of grassland and floral habitat during construction**
The Project site contains over 50 percent of semi-natural grassland despite the area being largely transformed by residential and small business development. The diversity of floral species is relatively high and provides for an important resource to terrestrial fauna on the Project site (ie habitat). The construction phase of the Project will involve the removal of topsoil and vegetation within the site footprint and immediate surroundings resulting in the removal of the grassland areas and ultimately a loss of floral habitat. Approximately half of the Ziziphus-Hillardia (Vernonia) grassland patch, however, will remain untouched (south-western corner).

**Potential impact of alien invasive species on remaining grassland during construction and operation**

Project construction activities will involve the removal of topsoil and vegetation within the site footprint. Once topsoil has been disturbed and stockpiles established, an increase in alien species is eminent through increased activities to and from the Project site, introducing contaminated soil, disturbing existing problem areas with alien invasive plants on the Project site and planting of alien invasive species during landscaping. Two Category 1 species and one Category 1 species have already been recorded on site in the disturbed areas.

*Impact Assessment*

**Loss of grassland and floral habitat during construction**

The loss of grassland and floral habitat is a negative and direct Project impact which will be restricted to the Project site (on-site), as construction activities will be confined to the boundaries of the Project site. The grassland habitat once removed will be considered a permanent loss unless the Project site is rehabilitated to its original state during the decommissioning of the facility. Approximately half of the Ziziphus-Hillardia (Vernonia) grassland patch, however, will remain untouched (south-western corner). Furthermore, with approximately 42 percent of the Project site having being transformed and the remaining natural vegetation already impacted by other anthropogenic activities on the Project site, the loss of grassland is considered to have a small magnitude.

The sensitive receptors to this impact include the floral species that make up the vegetation communities. Based on the extent of habitat to be lost and the number of CI species detected on the Project site (ie the Declining Boophone disticha), the sensitivity of the Project site is considered to be medium.

The pre-mitigation significance of this impact is there rated as moderate-minor.

**Potential impact of alien invasive species on remaining grassland during construction and operation**

The spread of alien invasive plant species is a negative and indirect impact of Project activities. The extent of this impact is local as the impact may occur within the Project site, however seed dispersal of the alien invasive plant
species may extend to the surrounding areas. The impact on the remaining natural habitat will be long term beyond the construction and operations phase and possibly after decommissioning, depending on the use of the Project site after Project decommissioning. The extent of the Project site is approximately 4ha; however 3ha of the Project site is expected to be covered by hardstanding/concrete surfaces to allow for the collection of surface-water run-off. The impact will therefore be limited to the grassland and landscaped areas in the southern portion of the Project site, which will likely be impacted during the growing seasons (i.e., December/January and August/September). The magnitude of this impact is considered to be medium.

Due to the limited size of the Project site, the natural remaining habitat is more sensitive to change and therefore prone to encroachment of alien invasive plant species. In addition, the Declining Boophane disticha is also located within the Project site and will need to be translocated in this area (south-western portion). The sensitivity of the Project site to this impact is considered to be medium.

The pre-mitigation significance of this impact is there rated as moderate.

Mitigation Measures

Due to the current disturbance as well as the extent of the Project site, there are limited mitigation measures that Air Products can implement.

Loss of grassland and floral habitat during construction

- During the planning phase of the Project, permits to remove the CI species (Declining Boophane disticha) shall be applied for. These shall be relocated to the south-western portion of the Project site, where no development shall take place.

- No dumping is to occur outside of the Project site including any stockpiles or construction equipment.

- A designated area for the construction equipment and materials shall be placed on existing disturbed areas, as indicated in green on the site sensitivity map (Figure 6.22). The south western section of the site shall be avoided.

- Habitat destruction shall be restricted to the footprint of Project which does not exceed 3ha.

- If at all possible a section of grassland shall remain as a buffer between properties.

Potential impact of alien invasive species on remaining grassland during construction and operation
• Category 1 alien invasive plant species were located on and surrounding the Project site. These shall be removed immediately and disposed of by an approved horticulturalist.

• All Melia trees and associated seedlings shall be removed from the Project site, prior to construction activities.

• A qualified and experienced horticultural specialist shall be appointed to redesign the current landscaping to indigenous Highveld species only and to maintain the *Searsia lancea* and *S pyroides* individuals.

• A long-term monitoring plan shall be developed for the Project site with a focus on each growing season.

• Any emerging alien seedlings shall be removed prior to construction and during the Project operations.

*Residual Impact*

The implementation of the above measures would ensure that the construction and operation impacts are minimized. A summary of the impacts to flora has been provided in *Table 8.5* with the expected post-mitigation impact significance.

**Table 8.5 Impact Summary: Flora**

<table>
<thead>
<tr>
<th>Potential Impact</th>
<th>Magnitude</th>
<th>Receptor Sensitivity</th>
<th>Pre-Mitigation Significance</th>
<th>Post-Mitigation Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loss of grassland and floral habitat during construction</td>
<td>Small</td>
<td>Medium</td>
<td>Moderate-Minor</td>
<td>Minor</td>
</tr>
<tr>
<td>Potential impact of alien invasive species on remaining grassland during construction and operation</td>
<td>Medium</td>
<td>Medium</td>
<td>Moderate</td>
<td>Minor</td>
</tr>
</tbody>
</table>

*8.2.5 Potential Impacts to Fauna*

The Project site is predisposed to a low diversity of faunal species that are likely to occur given the small area and high degree of land transformation. A total of three mammal, 22 bird, two reptile, three frog and 12 terrestrial macro-invertebrate species were detected during the ecological site survey. Although the abundance of terrestrial macro-invertebrates on site is high the overall species richness is low. The highly transformed and fragmented habitat on site in addition to the lack of any natural rocky ridges, wetlands or open water habitats means that the likelihood of the presence of CI faunal species is low.
Impact Description

**Loss of faunal habitat during construction**
The Project site contains over 50 percent of semi-natural grassland despite the area being largely transformed by residential and small business development. The diversity of floral species is relatively high and provides for an important resource to terrestrial fauna on the Project site (i.e., habitat). The construction phase of the Project will involve the removal of topsoil and vegetation within the site footprint resulting in the removal of the grassland areas and ultimately a loss of faunal habitat. Approximately half of the *Ziziphus-Hillardia (Vernonia)* grassland patch, however, will remain untouched (south-western corner).

**Potential sensory disturbance to fauna during construction and operation**
Sensory disturbance to fauna may be caused by machinery, vehicles, workforce as well as light pollution from security and operational lights during the construction and operation of the Project. The majority of faunal species tend to inhabit areas away from such disturbances. Faunal species are likely to return after the decommissioning of the facility or once construction is complete and during Project operations. These species would be more habituated to noise and may potentially benefit from the increase in lighting. This is often a slow process that may not see a return of the full spectrum of species.

**Potential loss of faunal species due to spills during construction and operation**
Surface water run-off from the Project site or accidental spills during the construction and operation of the facility pose a risk to faunal species. It is expected that a number of chemicals and products will be stored on site in storage facilities above ground. Faunal species that come into contact with accidental spills from these tanks could be poisoned which may be fatal. Faunal species will be particularly drawn to the two catchment pits proposed to collect the surface water run-off, should these remain open.

Impact Assessment

**Loss of faunal habitat during construction**
The loss of grassland and faunal habitat is a negative and indirect Project impact with an on-site extent, as construction activities will be confined to the boundaries of the Project site. The grassland habitat once removed will be considered a permanent loss unless the Project site is rehabilitated to its original state during the decommissioning of the facility. Approximately half of the *Ziziphus-Hillardia (Vernonia)* grassland patch, however, will remain untouched (south-western corner). Furthermore, with approximately 42 percent of the Project site having being transformed and the remaining natural vegetation impacted by other anthropogenic activities on the Project site, the loss of grassland is considered to have a small magnitude.
Based on the extent of habitat to be lost and the number of potentially occurring CI species including the Near-threatened Hedgehog (Atelerix frontalis) and Giant Bullfrog (Pyxicephalus adspersus). These species may potentially occur on the Project site based on the feeding and breeding habitat available. However, these species were not observed during the site survey in November 2013. The sensitivity of the Project site is considered to be medium.

The pre-mitigation significance of this impact is there rated as moderate-minor.

**Potential sensory disturbance to fauna during construction and operation**

Sensory disturbance to fauna is considered to be a negative and direct Project impact. Noise and light disturbances can be experienced from a distance of approximately 200m from the Project site, therefore the extent of the impact is considered to be local. The duration of the impact is considered to last through the Project operations and is therefore long term. Based on the nature and the size of the plant together with its positioning within a semi-industrial area, it is not expected that the plant will generate excessive noise above background levels nor make a significant difference in terms of light pollution especially considering that operations will take place during daylight hours. The magnitude of this impact is considered to be small.

The Project site is predisposed to a low diversity of faunal species that are likely to occur given the small area and high degree of land transformation. Sensory disturbance may only slightly decrease this faunal diversity beyond the proposed Project footprint. The sensitivity of is therefore low.

The pre-mitigation significance of this impact is there rated as negligible.

**Potential loss of faunal species due to spills during construction and operation**

The loss of faunal species due to spills is considered to be a negative and indirect Project impact. The loss of faunal species through this activity is widely dependant on the extent of spill and the substance involved. The extent of the impact is therefore considered to be local with a long-term duration (ie Project operations). The frequency of the impact is dependent on extreme rainfall events as the surface water or ponding thereof is likely to attract fauna to the Project site. The magnitude of this impact is considered to be small.

The highly transformed and fragmented habitat on site in addition to the lack of any natural rocky ridges, wetlands or open water habitats means that the likelihood of the presence of CI faunal species is low. The vulnerability/importance of the species utilising the Project site is considered medium to low.

The pre-mitigation significance of this impact is there rated as minor-negligible.
Mitigation Measures

Loss of faunal habitat during construction

- No dumping shall occur outside of the Project site including any stockpiles or construction equipment.

- A designated area for the construction equipment and materials shall be placed on existing disturbed areas, as indicated in green on the site sensitivity map (Figure 6.22). The south western section of the site shall be avoided.

- Habitat destruction shall be restricted to the footprint of the Project which does not exceed 3ha.

- If at all possible a section of grassland shall remain as a buffer between properties and shall be protected from disturbance during construction activities.

Potential sensory disturbance to fauna during construction and operation

- Noise reduction measures relating to all construction and operational activity shall be implemented to reduce noise wherever possible. In particular, regular maintenance of machinery and equipment shall be undertaken.

- Lighting shall be kept to a minimum and where possible directed downwards. Lights shall also be fitted with hoods so as to minimise the amount of light emitted from the Project site.

Potential loss of faunal species due to spills during construction and operation

- Strict operational protocols shall be enforced to prevent and/or contain any accidental spillages.

- Ensure that all storage containers are water tight and inspected regularly for leaks.

- In cases where accidental releases of such contaminants do occur, effective clean-up measures shall be implemented immediately.

- Prohibit any snaring or harvesting in / outside of the Project site.

- Cover the two water catchment pits.

- Small culverts shall be included at the base of the site perimeter wall to allow movement of small mammals between the Project site and the surrounding areas. fauna.
Residual Impact

The implementation of the above measures would ensure that the construction and operation impacts to fauna are minimized. A summary of the impacts to fauna has been provided in Table 8.6 with the expected post-mitigation impact significance.

**Table 8.6 Impact Summary: Fauna**

<table>
<thead>
<tr>
<th>Potential Impact</th>
<th>Magnitude</th>
<th>Receptor Sensitivity</th>
<th>Pre-Mitigation Significance</th>
<th>Post-Mitigation Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loss of faunal habitat during construction</td>
<td>Small</td>
<td>Medium</td>
<td>Moderate-Minor</td>
<td>Minor</td>
</tr>
<tr>
<td>Potential sensory disturbance to fauna during construction and operation</td>
<td>Small</td>
<td>Low</td>
<td>Negligible</td>
<td>Negligible</td>
</tr>
<tr>
<td>Potential loss of faunal species due to spills during construction and operation</td>
<td>Small</td>
<td>Medium-Low</td>
<td>Minor-Negligible</td>
<td>Negligible</td>
</tr>
</tbody>
</table>

8.3 **POTENTIAL SOCIO-ECONOMIC IMPACTS**

The focus of this section is on the impacts that the Project will have on the socio-economic environment described in the Section 7 of the Draft EIR and on ways in which these impacts can be prevented and mitigated where negative or maximised where positive.

The development of the Project is not expected to have a significant impact on the socio-economic environment, due to its highly specialised nature. The main socioeconomic impacts associated with the Project relate to the benefits for the local economy through the creation of employment; procurement of goods and services; and community benefits through Social Corporate Investment (SCI) programmes. Furthermore the impacts on traffic and heritage resources have also been assessed in this section. These impacts are discussed in detail and assessed below.

8.3.1 **Potential Impacts on the Local Economy**

Impact Description

Creation of employment opportunities during construction and operation
Employment has been of significant interest to local stakeholders to date, and is likely to continue as a core focus. The Project is expected to result in approximately ten employment opportunities for construction and 20 employment opportunities for operations. All ten construction jobs will be temporary; while the operational jobs will be permanent; see Table 8.7 below. The limited number of employment opportunities is due to the highly specialised construction requirements and limited scale of the Project (ie the project is being undertaken in phases).

### Table 8.7 Employment Opportunities

<table>
<thead>
<tr>
<th>Phase</th>
<th>Status</th>
<th>Skilled</th>
<th>Semi-Skilled</th>
<th>Unskilled</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction</td>
<td>Temporary</td>
<td>5</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Operation</td>
<td>Permanent</td>
<td>10</td>
<td>5</td>
<td>5</td>
</tr>
</tbody>
</table>

The skills required for the operational phase include plant managers, engineers and plant operators with a limited number of unskilled workers including cleaners, gardeners and security personnel (Refer to Section 4.7 for the Project organogram). Only ten new employment opportunities will be created for the operational phase of the Project, as the other ten employees will be brought in from the existing Air Products facilities in Kempton Park and Pinetown. Skilled workers are being brought in from the existing facilities, as it is planned to close down the acetylene plants at these facilities, as such it is Air Products intention to retain its existing staff. Overall the Project is not going to generate a significant number of direct employment opportunities during the construction or operations phase, and it is expected that only a limited number of local people (five to ten) will get jobs.

**Training and skills development during construction and operation**

During construction, the provision of training will be dependent on the appointed Contractor. Air Products will provide training by offering multi-skilling through the operational aspects of the facility. All employees are encouraged to complete their secondary education with tertiary level education being offered to plant operators and/or supervisors. Furthermore, Air Products has a Code 400 Skills Development Plan in place in which over 90 percent of the overall funds are allocated to historically disadvantaged people who require academic and skills advancement.

**Procurement of goods and services during construction and operation**

The procurement of goods and services will occur during the construction phase of the Project. The total budget for procurement of goods and services for construction is estimated to be R45 million; however, a significant amount of this budget will be used for the procurement of the key components of the facility, which will be imported. These include the generator, ammonia scrubber, cooler condensers, compressors and minor operational equipment. Based on this, local procurement will benefit the civil and construction industry, transport, vehicle servicing and cleaning and security services only. Operational procurement requirements are expected to be limited to routine maintenance of the facility and its equipment.
Community health and safety during construction and operation
Throughout the consultation process for the Project, stakeholders have raised two major concerns namely: decrease in air quality and the potential risk of an explosion or fire. These concerns have been assessed in Sections 8.22 and 8.6 respectively.

Impact Assessment

Creation of employment opportunities during construction and operation
Project employment is considered to be a positive and direct impact. Employment during construction will be temporary (approximately one year) whilst employment during operations will be long-term based on how long those who are employed on a permanent basis are willing to stay employed by the facility. The extent of the impact is considered to be local as the local communities will be approached with possible employment opportunities. The number of personnel required for both construction and operations is limited to approximately five to ten people including unskilled workers. The impact magnitude will be positive for both those employed by or because of the Project activities.

The sensitivity of the receptor will be low as people will be able to adapt and continue with their day-to-day lives regardless of whether they have secured employment with the Project or not.

The pre-mitigation impact significance will be minor positive due to the limited number of people that will be employed.

Training and skills development during construction and operation
Project employment is considered to be a positive and indirect Project impact. Training and skills development received during both construction and operations will be permanent as those trained can always use the skills acquired. The impact extent is likely to be local based on the type of skills required and training to be offered during both construction and operations. The scale of the impact will be small due to the limited number of opportunities. The frequency of training will be occasional depending on the skills required at each stage of construction or Project operations. The impact magnitude will be positive.

The sensitivity of the receptor will be low as people will be able to adapt and continue with their employment regardless of whether they have been presented with an opportunity for training or skills development.

The pre-mitigation significance will be minor positive due to the extent of the skills development activities that will be provided to those employed.

Procurement of goods and services during construction and operation
The procurement of goods and services will be a positive and direct Project impact for goods and services procured during construction and operational
activities. Construction related procurement will be temporary, while operational procurement will be long-term, however it will based on the Project needs. The impact will extend internationally as there are machinery and equipment requirements that are sourced from outside the country. The scale of the impact will be small for both construction and operation due to the size of the facility and limited Project requirements (ie use of existing on-site buildings for administrative offices and change facilities). The frequency of the impact during construction will be once-off especially with materials for the construction of the facility; while operational procurement is likely to be occasional based on the operational needs of the facility. The impact magnitude will be positive.

The sensitivity of the receptor is likely to be low as procurement companies or suppliers will not be dependent on the Project proceeding.

The pre-mitigation significance of the impact is predicted to be minor positive.

Enhancement and Mitigation Measures

The following enhancement and mitigation measures should be implemented during the construction, operation and decommissioning of the Project.

- Air Products shall employ the Project workforce in compliance with the Air Products Recruitment Policy. Air Products shall ensure that this policy makes provision for the employment of local residents and suppliers (originating from the local municipality) and employment of women as a means of ensuring that gender equality is attained.

- Air Products shall work closely with the relevant local Ward Councillor to ensure that the use of local labour and procurement is maximised. This may include:
  - sourcing available databases on skills/employment-seekers that local authorities may have; and
  - advertising employment opportunities and criteria for skills and experience needed through local and provincial media.

- Air Products shall ensure that the appointed Contractors and suppliers have access to Health, Safety, Environmental and Quality (SHEQ) training as required by the Project.

- All goods and services shall be procured in accordance with the Air Products Procurement Policy.

- Air Products shall conduct an assessment of capacity within the Local Municipality and Gauteng province to supply goods and services over the operational lifetime of the facility.
• Ensure multiskilling and skills development activities through the Air Products 400 Skills Development Plan to ensure ongoing capacity building of the Project workforce.

• Air Products shall consider working closely with the Ward Councillor to get an understanding of the communities’ most urgent needs. This will allow Air Products to align its future CSI programmes with the existing/or planned municipal community development projects.

Residual Impact

The implementation of the above measures would ensure that the construction and operation impacts remain of minor positive significance relating to the local economic benefits of the Project. The impact summary is provided in Table 8.8.

Table 8.8 Impact Summary: Local Economy

<table>
<thead>
<tr>
<th>Potential Impact</th>
<th>Magnitude</th>
<th>Receptor Sensitivity</th>
<th>Pre-Mitigation Significance</th>
<th>Post-Mitigation Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Creation of employment opportunities during construction and operation</td>
<td>Positive</td>
<td>Low</td>
<td>Minor (Positive)</td>
<td>Minor (Positive)</td>
</tr>
<tr>
<td>Training and skills development during construction and operation</td>
<td>Positive</td>
<td>Low</td>
<td>Minor (Positive)</td>
<td>Minor (Positive)</td>
</tr>
<tr>
<td>Procurement of goods and services during construction and operation</td>
<td>Positive</td>
<td>Low</td>
<td>Minor (Positive)</td>
<td>Minor (Positive)</td>
</tr>
</tbody>
</table>

8.3.2 Potential Impact on Heritage, Archaeological and Paleontological Resources

Impact Description

Excavations required for the installation of the Project facility as well as land clearing activities may disturb or destroy features of cultural heritage, archaeological and paleontological value, should they exist on the Project site. As the Project area and surrounding areas have been disturbed by previous agricultural, industrial and commercial activities, it is likely that these activities would have destroyed most archaeological resources that may have been present. There are no outcrops of fossil-bearing rocks of the Malmani
Dolomite Subgroup on the Project site; therefore the construction of the Project will not affect any paleontological heritage. In addition, it is unlikely that there will be any Quaternary sinkhole or cave deposits in the study area.

**Impact Assessment**

Construction activities may potentially have a direct and negative impact on heritage, archaeological and paleontological resources, should they occur on the Project site. The extent of the impact is local, as these resources are of local importance and the extent of their disturbance would be on-site and limited to the footprint of the Project infrastructure (ie 3ha). The duration would be permanent; as any of these resources are irreplaceable and would be a once-off should a resource be encountered during construction. The magnitude of this impact is considered to be small due to the limited area of the Project site as well as the limited extent of the Project activities on the site (ie excavations would be restricted to a few areas on the Project site for the water catchment pits.

The sensitivity of the Project site is considered to be low as no heritage resources, inclusive of burial sites, surface archaeological artefacts or historical remains were identified within the Project site.

The pre-mitigation significance of this impact is therefore rated as negligible.

**Mitigation Measures**

- Should bedrock be impacted by the Project, a paleontological field assessment and protocol for chance finds shall be conducted and submitted to the SAHRA for comments prior to undertaking the activity.

- If any new evidence of archaeological sites or artefacts, paleontological fossils, graves or other heritage resources are found during construction or operation, the SAHRA and an archaeologist and/or palaeontologist, depending on the nature of the finds, shall be alerted immediately.

- Develop a Chance Find Procedure, in the event that any heritage resources are identified prior to or during construction.

**Residual Impact**

The implementation of the above measures would ensure that the construction and operation impacts remain negligible. The impact summary is provided in Table 8.9.

<table>
<thead>
<tr>
<th>Table 8.9</th>
<th>Impact Summary: Heritage, Archaeological and Paleontological Resources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Potential Impact</td>
<td>Magnitude</td>
</tr>
<tr>
<td>-------------</td>
<td>-----------</td>
</tr>
</tbody>
</table>

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ENVIRONMENTAL RESOURCES MANAGEMENT

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8-31
### 8.3.3 Potential Traffic Impact

**Impact Description**

Traffic volumes will increase during the construction phase of the Project in areas surrounding the Project site as well as those in the vicinity of existing major transport routes. During operations, transportation trucks will be required for transportation of:

- raw material from suppliers to the facility;
- final product;
- by-product (lime);
- goods (deliveries) to and from the facility; and
- commuter trips.

The increase in traffic levels on roads will increase the rate of road wear and could degrade and eventually damage road surfaces. The result could be breaks in the paved surface (e.g., potholes, damage at the road shoulders) which would also increase the risks of road accidents (see Section 8.4.5). Furthermore, urban areas and major intersections located along the major transport routes in the regions surrounding the Project site may experience increased congestion, especially at intersections, densely populated areas, and near business centres.

The assessment of the Project traffic related activities was based on the evaluation of the poorest traffic scenario during the construction, operation, closure and decommissioning phases. These scenarios have been described below.

- Baseline morning and afternoon peak hour traffic volumes of the existing traffic on the surrounding road network (2013).
- Construction phase, projected traffic demand during the construction phase of the Project.
- Operational phase, projected morning peak hour traffic demand. This scenario refers to the year in which the Project operations will commence (2018). A growth rate of 3 percent per annum was applied to the baseline traffic.

<table>
<thead>
<tr>
<th>Potential Impact</th>
<th>Magnitude</th>
<th>Receptor Sensitivity</th>
<th>Pre-Mitigation Significance</th>
<th>Post-Mitigation Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Potential Impact on Heritage, Archaeological and Paleontological Resources</td>
<td>Small</td>
<td>Low</td>
<td>Negligible</td>
<td>Negligible</td>
</tr>
</tbody>
</table>
• 2018 projected morning peak hour traffic demand without development traffic.

• 2018 projected morning peak hour traffic demand with development traffic.

• Decommissioning phase, projected traffic demand during the decommissioning phase of the Project.

The impacts assessed therefore include:

• potential increase in traffic volumes during construction; and
• potential increase in traffic volumes during operation.

**Impact Assessment**

**Potential increase in traffic volumes during construction**
Heavy vehicle trips are expected to be generated to transport construction material to and from the Project site. Commuter trips (private and public transport) are expected to be generated daily by skilled construction workers with approximately 90 percent assumed to be using private transport. Approximately 90 percent of semi and unskilled works are assumed to travel by public transport.

This is considered a *negative* and *direct* Project impact. The duration of the impact will be *short term* and will occur for a period of approximately one year. The extent of the impact is *local* as only local roads such as Tilliet Road, Kalksteen Road and the M61 are likely to be impacted by construction traffic. It is expected that approximately 13 vehicles will be generated during the morning (07:30 – 08:30) and afternoon (17:00 – 18:00) peak hours respectively.

Capacity analysis of the intersections on the surrounding road network was conducted using *aaSIDRA* analytical software. The performance characteristics and expected traffic demand of every intersection were determined for the different traffic scenarios described above. The Tilliet Road/Access Road, Tilliet/Kalksteen and Kalksteen/M61 Road intersections were found to operate at an acceptable Level of Service (LOS) with a delay of 1.2 to 1.7 second delay (morning peak hour) and 1.1 to 1.9 second delay (morning peak hour). LOS is a measure of intersection or roadway performance, determined on the delay for un-signalised intersections. According to the Department of Transport, a delay which is less than 14.5 seconds is considered to be acceptable. The magnitude of the impact is considered to be *small*.

Furthermore, it is evident that the M61 Road and Kalksteen Road is expected to accommodate the existing and future traffic demand without requiring additional road upgrades. The M61 Road and Kalksteen Roads have an average of 91 percent spare capacity per lane to accommodate the future demand during the critical peak hours. The sensitivity is there *low*. 
The pre-mitigation significance of the increased traffic volumes during construction is therefore rated as *negligible*.

**Potential increase in traffic volumes during operation**

It is expected that Project traffic will increase during the operation phase from the delivery raw materials: final product; by-product (lime); goods (deliveries) and commuter trips. This increase in traffic volume is considered a *negative* and *direct* Project impact. The duration of the impact will be *long term* and will occur for a period of 40 years. The extent of the impact is *local* as only local roads such as Tilliet Road, Kalksteen Road and the M61 are likely to experience the increase in traffic volumes. It is expected that approximately 13 vehicles will be generated during the morning (07:30 – 08:30) and afternoon (17:00 – 18:00) peak hours respectively.

The Tilliet Road/Access Road, Tilliet/Kalksteen and Kalksteen/M61 Road intersections were found to operate at an acceptable Level of Service (LOS) with an delay of 1.2 to 1.7 second delay (amorning peak hour) and 1.1 to 1.9 second delay (afternoon peak hour). Future traffic volumes including the Project traffic was found to have a LOS between 2.8 and 11.9 second delay (morning peak hour) and 4.7 to 11.6 second delay (afternoon peak hour). According to the Department of Transport, a delay which is less than 14.5 seconds is considered to be acceptable. The magnitude of the impact is considered to be *small*.

Furthermore, it is evident that the M61 Road and Kalksteen Road will be expected to accommodate the existing and future traffic demand without requiring additional road upgrades. The M61 Road and Kalksteen Roads have an average of 91 percent spare capacity per lane to accommodate the future demand during the critical peak hours. The sensitivity is there *low*.

The pre-mitigation significance of the increased traffic volumes during construction is therefore rated as *negligible*.

**Mitigation Measures**

- Surfacing of Tilliet Road between Kalksteen Road / Tilliet Road intersection and the access to the Project site (approximately 450m).

- Upgrade of the existing M61 Road / Kalksteen Road and Kalksteen Road / Tilliet Road intersections by providing road sign and road markings according to the SARTSM requirements.

- Provision of lighting at the intersections of the Kalksteen Road / Tilliet Road in accordance with the requirements of the Midvaal Local Municipality.

- No on-street pick up/drop offs at the intersections of the Tilliet Road and the access to the Project site shall be allowed, these shall be done on the Project site.
Residual Impact

The implementation of the above measures would ensure that the construction and operation impacts remain negligible. The impact summary is provided in Table 8.10.

<table>
<thead>
<tr>
<th>Potential Impact</th>
<th>Magnitude</th>
<th>Receptor Sensitivity</th>
<th>Pre-Mitigation Significance</th>
<th>Post-Mitigation Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Potential increase in traffic volumes during construction</td>
<td>Small</td>
<td>Low</td>
<td>Negligible</td>
<td>Negligible</td>
</tr>
<tr>
<td>Potential increase in traffic volumes during operation</td>
<td>Small</td>
<td>Low</td>
<td>Negligible</td>
<td>Negligible</td>
</tr>
</tbody>
</table>

8.4 UNPLANNED EVENTS

The following section presents the assessment of impacts resulting from unplanned or non-routine events and those which are as a result of incidents or accidents. The evaluation of impacts for unplanned and accidental events takes into account the likelihood of the event occurring in the impact magnitude. Given the nature of the construction and operation of the Project facility, unplanned and accidental events may include:

- accidental release of equipment fuels, oils and waste materials during construction and operation;
- potential risk of fire and explosions as a result of hazardous materials stored on site; and
- potential risk of vehicle traffic accidents.

If the above unplanned and accidental events did occur, there would be a resulting impact on biophysical and socio-economic environment. The risk of unplanned and accidental events and an assessment of the potential impacts are described in this section.

8.4.1 Risk of Fires and Explosions

There are a number of hazards that will be present at the Project site that may result in injury to people or a fatality in more serious cases in the unlikely event of an incident. Some hazards may even give rise to multiple fatalities, which are also considered unlikely. This assessment is only concerned with ‘major hazards’ that could affect receptors beyond the boundary of the site, these hazards include:
• hydrocarbon fires associated with a loss of containment of acetone;
• vapour cloud explosions involving a loss of containment of acetylene gas or acetone;
• flash fires involving a loss of containment of acetylene gas or acetone; and
• release of asphyxiant nitrogen due to loss of containment.

Societal risk is calculated from these hazards is calculated using FN curves. These curves illustrate the relationship between an incident which causes N or more fatalities and the cumulative frequency (F) of such an event for the surrounding population. The calculated societal risk results for off-site populations (i.e., excluding known on-site populations) as a result of risks posed by the Project are so low that an FN curve is not generated.

The Rate of Harm (also known as the Potential Loss of Life, PLL, or Expectation Value, EV) is the sum of the number of people harmed multiplied by the frequency with which this happens. The Rate of Harm breakdown indicates those scenarios which are the largest contributors to the risk. The Rate of Harm breakdown for the Project is presented below. The Rate of Harm indicates that approximately 99.99 percent of the largest total risks are as a result of vapour cloud explosions resulting from the rupture of the acetylene generators (inclusive of Phase 1 and 2 of the Project).

**Table 8.11 Rate of Harm Contributing Greater than 1%**

<table>
<thead>
<tr>
<th>Location</th>
<th>Description</th>
<th>Rate of Harm (people·cpm)</th>
<th>Rate of Harm (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Generator Room</td>
<td>VCE after rupture of Generator in Phase No. 2</td>
<td>6.52E-01</td>
<td>90.16</td>
</tr>
<tr>
<td>Generator Room</td>
<td>VCE after rupture of Generator in Phase No. 1</td>
<td>7.11E-02</td>
<td>9.83</td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td>1.50E-04</td>
<td>0.01</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>7.23E-01</td>
<td>100.00</td>
</tr>
</tbody>
</table>

**Impact Description**

**Acetylene generator rupture/failure**
There is a risk of an on-site fire or explosion associated with the manufacture, handling, and storage of acetylene gas on site. The potential scenarios considered as potential for acetylene releases to the atmosphere included releases from the generator system, the compressors as well as from piping and pigtails in the cylinder filling halls. There is also the potential for failures of acetylene cylinders or valve failures of the cylinders. A loss of containment could result in jet fires or vapour cloud explosions.

**Risk of acetone pool fires**
There is a risk of an on-site fire associated with the storage and handling of acetone on site. This could result from a loss of containment of the acetone from the delivery road tanker, or its associated off-loading equipment, from the acetone storage vessel or the equipment used to fill acetone into the
acetylene cylinders. The thermal radiation from an acetone pool fire could potentially impact employees on-site only. Factors that have been identified as having an effect on the integrity of acetone storage vessels are related to design, inspection, maintenance, and corrosion. There are various scenarios that may result in a loss of containment, the worst case being a catastrophic failure with release of the entire storage content of the vessel. In addition, acetone road tankers will be on-site to re-fill the acetone storage tank. The acetone road tankers are also associated with a potential risk of a rupture. Spillage of acetone resulting from the catastrophic failure of a road tanker is assumed to be unconfined and also the “worst case” scenario.

Impact Assessment

**Acetylene generator rupture/failure**

This assessment estimates the overpressure effects of explosions due to the loss of containment from the acetylene generators during Phase 2 (indicating use of both generators). It can be seen from Figure 8.9 that an overpressure of 0.05 bar extends 82m beyond the Project site boundaries to the west, 70m beyond the Project site boundary to the north, 28m beyond the site boundary to the east and only a few metres beyond the site boundary to the south for the complete Phase 2 of the Project.

The effects of various overpressure levels from explosions are presented in the following table, taken from Lees.

**Table 8.12**  
*Direct Effects of Blast on Structures (Lees)*

<table>
<thead>
<tr>
<th>Blast Overpressure (kPa)</th>
<th>Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.2</td>
<td>Occasional breakage of large glass windows already under strain</td>
</tr>
<tr>
<td>0.7</td>
<td>Breakage of windows, small, under strain</td>
</tr>
<tr>
<td>1.0</td>
<td>Typical pressure for glass failure</td>
</tr>
<tr>
<td>4.8</td>
<td>Minor structural damage to house structures</td>
</tr>
<tr>
<td>6.9</td>
<td>Partial demolition of houses, made uninhabitable</td>
</tr>
<tr>
<td>17.3</td>
<td>50% destruction of brickwork of house</td>
</tr>
<tr>
<td>20.7 - 27.6</td>
<td>Steel frame building distorted and pulled away from foundations. Frameless, self-framing steel panel building demolished</td>
</tr>
<tr>
<td>34.5 - 48.3</td>
<td>Nearly complete destruction of houses</td>
</tr>
</tbody>
</table>

It can be seen from this table that the overpressure levels experienced beyond the site boundaries would be well below the overpressure required to result in “occasional breakage of large glass windows already under strain”.

The extent of any potential impact to on-site and off-site receptors would be *direct* and *negative* and would remain close to the source of the loss of containment. The duration of the effects would range from *short-term* to *permanent* depending on the consequence. Based on the calculations presented in the MHI, the effects of an acetylene explosion could extend beyond the Air Products site boundaries. Although the likelihood of an explosion is extremely low (but *possible*), if one did occur the potential consequences could be serious on-site and in the immediate area of the release. Due to the distance from the potential explosion source the receptors where infrastructure exists
could suffer some degree of minor damage. The magnitude of a potential impact would therefore be medium.

The nearest human sensitive receptors would be the surrounding neighbours, which include some residences, located between 150 to 200m from the southern, western and northern boundaries of the Project site. The sensitivity of receptors is considered to be medium due to the distance of these residences.

The pre-mitigation significance is considered to be moderate to surrounding landowners.

**Risk of acetone pool fires**

This assessment estimates the effects of thermal radiation from fires on human beings. Table 8.13 indicates the maximum pool fire radiation levels reached on the site for the acetone releases and resulting pool fires from a rupture/failure of the acetone storage vessel or a rupture from an acetone road tanker. The thermal radiation from these fires is shown as a measure of thermal flux. The pool diameter refers to the extent of the spill/leak from the vessel/tank. The highest thermal flux measurement (6.3 kW/m²) does not extend beyond the Project site boundaries for pool fire incidents (Figure 8.10).

The extent of this impact is on-site. The duration of the effects would range from short-term to permanent depending on the consequence. The likely frequency of a vessel failure used in the MHI risk analysis was calculated to be $5 \times 10^{-6}$ per vessel per year. The likelihood of this risk occurring is unlikely should Air Products strictly adhere to their Standard Operating Procedures on vessel and tank inspections. The magnitude of an acetone pool fire is considered to be small due to the consequences being restricted to the Project site.

The nearest human sensitive receptors would be the surrounding neighbours, which include some residences, located between 150 to 200m from the southern, western and northern boundaries of the Project site. The sensitivity of receptors is considered to be medium due to the distance of these residences.

The pre-mitigation significance is considered to be moderate to surrounding landowners.

**Table 8.13** Maximum Acetone Pool Fire Consequence Distances

<table>
<thead>
<tr>
<th>Scenario ID</th>
<th>Description</th>
<th>Pool Diameter (m)</th>
<th>Thermal Flux (kW/m²)</th>
<th>Maximum Downwind distance (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Catastrophic Failure (D8)</td>
<td>11</td>
<td>6.3</td>
<td>40</td>
</tr>
<tr>
<td>Road Tanker</td>
<td>Rupture</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Catastrophic Failure (D8)</td>
<td>8</td>
<td>6.3</td>
<td>30</td>
</tr>
<tr>
<td>Storage Vessel</td>
<td>Rupture</td>
<td></td>
<td>12.5</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td>Rupture</td>
<td></td>
<td>37.5</td>
<td>17</td>
</tr>
</tbody>
</table>
Figure 8.9  Area Enveloped by the Largest Explosion Scenario for the Final Phase Double Generator Rupture
Figure 8.10  Area Enveloped by the Largest Acetone Pool Fire
**Mitigation Measures**

- To ensure that the Project is compliant with the requirements of the MHI Regulations, the MHI Risk Assessment must be submitted to the Local Provincial Director of the Department of Labour, the Chief Inspector of the Department of Labour and the local authorities.

- Equip the facility with an emergency shut-down system to stop all electrical machinery.

- The acetylene plant will be designed, constructed, operated and maintained to Air Products Acetylene Plant Design Standard.

- An emergency water deluge system shall also be provided to cover the cylinder filling and indoor storage areas.

- Employees and contractors shall be made aware of the site emergency plans and trained on all emergency requirements.

- Air Products shall determine which municipality has the appropriate emergency response skills and equipment (readiness) to assist in the case of an emergency. At least once a year, that municipality emergency response departments (fire, medical and criminal response) should visit the Project site to familiarise themselves with the site and its activities. The site emergency plan should be shared with these authorities.

- Neighbouring businesses, residents and authorities shall be actively engaged regarding the emergency evacuation procedures in case of an explosion or any major event. This may include:
  - familiarising neighbours with the emergency alarm sounds;
  - undertaking shared (including the neighbours) emergency-drills once every six months or at agreed intervals; and
  - develop procedures for notification/ informing neighbours and authorities of any hazardous installations of new machinery on site.

Section 6 of the MHI Regulations requires the development of an On-Site Emergency Plan as follows, which Air Products shall comply to:

- establish an on-site emergency plan to be followed inside the premises of the installation or part of the installation classified as a major hazard installation in consultation with the relevant health and safety representative or the relevant health and safety committee;

- discuss the emergency plan with the relevant local government, taking into consideration any comment on the risk related to the health and safety of the public;
• review the on-site emergency plan and where necessary, update the plan, in consultation with the relevant local government service at least once every three years;

• sign a copy of the on-site emergency plan in the presence of two witnesses, who shall attest the signature;

• ensure that the on-site emergency plan is readily available at all times for implementation and use;

• ensure that all employees are conversant with the on-site emergency plan; and

• cause the on-site emergency plan to be tested in practice at least once a year and keep a record of such a test.

Residual Impact

The implementation of the mitigation measures and the likelihood of this impact mean the residual impact will remain as major.

Table 8.14 Impact Summary: Risk of Fire and Explosion

<table>
<thead>
<tr>
<th>Potential Impact</th>
<th>Magnitude</th>
<th>Receptor Sensitivity</th>
<th>Pre-Mitigation Significance</th>
<th>Post-Mitigation Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetylene generator rupture/failure</td>
<td>Medium</td>
<td>Medium</td>
<td>Moderate</td>
<td>Moderate</td>
</tr>
<tr>
<td>Risk from acetone pool fires</td>
<td>Small</td>
<td>Medium</td>
<td>Minor</td>
<td>Minor</td>
</tr>
</tbody>
</table>

8.4.2 Accidental Spills to Soil and Groundwater Resources

Various hazardous substances will be used in the plant process and undertaking Project activities, as such the potential for an accidental release of these hazardous materials exists. In particular, an accidental spill or release is possible during the handling and storage of these substances.

Impact Description

During construction there is the potential for accidental spills of fuel and oil during fuelling and use of machinery and vehicles. This is likely to occur around the Project site, including areas used for maintenance, material and equipment laydown, parking and fuel storage. Spills could also occur along the roads adjacent to the Project site and along the route for construction traffic. These spills have the potential to contaminate soil and groundwater resources. With the Klip River situated approximately 2km east of the Project site, the potential for surface water contamination is unlikely, also due to the
fact that there are no drainage channels are located on or around the Project site.

Activities that may result in an accidental spill during the operational phase of the Project include the handling and storage of chemicals as well as maintenance activities. These activities are unlikely to impact on soil, groundwater due to the concrete surface and surface water drainage that is planned for the Project site. Furthermore, significant releases of hazardous materials from storage vessels are rare because storage containers are designed and built specifically to prevent release.

Impact Assessment

Accidental spills are considered a direct and negative impact resulting from Project activities. Spills have the potential to impact the groundwater resources, if the hazardous material moved through the soil and reached the groundwater table. If hazardous materials such as fuel were to be spilled onto the ground, the extent would be limited to the Project site. The duration would be short-term and limited to the construction period. Incidental spills of fuels and chemicals are infrequent but do occur, most frequently due to malfunction of handling systems and poor handling practices. These fuels and chemicals are however used in small quantities during construction. The overall magnitude of the impact is considered to be medium.

The susceptibility rating of the regional aquifer is medium, which indicates that groundwater in the region is at risk of pollution, particularly from the existing mining, commercial and agricultural activities in the surrounding area. Furthermore, the soils of the Project site are not considered to be impacted by any contaminants due to the limited development and use of the Project site. The sensitivity is therefore medium.

The pre-mitigation significance is therefore rated as moderate.

Mitigation Measures

Mitigation for accidental spills is designed to provide proper prevention and to ensure capability for response and clean-up in the event of an accident.

- Hazardous material storage facilities (calcium carbide, fuel stores) shall be designed and built to Air Products Procedure on the Storage and Containment of Environmentally Hazardous Substances (October 2008).

- Hazardous material storage shall be on hardstanding and an impermeable surface with all storage facilities bunded.

- Refuelling of equipment and vehicles shall be carried out in designated areas on hard standing ground to prevent seepage of any spillages to the ground. Drip trays shall be used during construction when refuelling and servicing vehicles or equipment, where it is not on a hardstanding
Air Products shall develop a detailed hazardous material spill response plan. All spills shall be immediately contained and cleaned up and contaminated areas shall be remediated and post remediation verification carried out.

Residual Impact

With the implementation of control and containment systems, the chance of a spill occurring is maintained as unlikely. The potential impact residual significance will be reduced.

Table 8.15 Impact Summary: Accidental Spills to Soil and Groundwater Resources

<table>
<thead>
<tr>
<th>Potential Impact</th>
<th>Magnitude</th>
<th>Receptor Sensitivity</th>
<th>Pre-Mitigation Significance</th>
<th>Post-Mitigation Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Potential contamination of soil and groundwater resources during construction</td>
<td>Medium</td>
<td>Medium</td>
<td>Moderate</td>
<td>Minor</td>
</tr>
</tbody>
</table>

8.4.3 Waste

A variety of wastes will be created during the course of Project activities during construction and operations. These include:

- hazardous and non-hazardous solid waste;
- sewage and grey water from living facilities; and
- hazardous liquid wastes such as used oils and spent chemicals.

The Project will have systems for handling, storing, treating and ultimately disposing of Project waste. If systems are implemented and used properly, impacts from waste would be minimal. However, if waste management systems are not properly designed and/or operated there is the potential for impacts on people and the environment.

Impact Description

Incorrect disposal/storage of wastes could result in leaching and the contamination of soil and groundwater resources. This potential contamination of soils and ground groundwater resources could also have negative impacts on ecosystem functioning and also on human health for those using these resources. The use of existing dumpsites could exacerbate existing environmental problems at these sites, namely windblown litter, vermin and other disease vectors as well as potential health impacts from the direct contact of scavengers with the waste. In addition, there are nuisance impacts related to the dust creation and impacts from the transport of rubble to disposal sites.
Wastes generated during the construction and operation phase are provided in the table below.

Table 8.16  Wastes generated

<table>
<thead>
<tr>
<th>Waste Classification</th>
<th>Construction Phase</th>
<th>Operation Phase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-Hazardous Solid Waste</td>
<td>Plastic, paper, and cardboard from the delivery of the equipment and machinery</td>
<td>Paper, plastic, wood, glass</td>
</tr>
<tr>
<td>Hazardous Waste</td>
<td>Excess cement, paints and contaminated containers (e.g. empty paint tins), used</td>
<td>Empty chemical containers, used lubricating oils from machinery and vehicles</td>
</tr>
<tr>
<td></td>
<td>lubricating and hydraulic oils (from vehicles and machinery)</td>
<td>Scrape metals, fluorescent tubes, refrigerants.</td>
</tr>
<tr>
<td>Liquid Waste</td>
<td>Washout water from concrete mixing plant maintenance and other washing operations</td>
<td>Sewage and other wastewater will be generated by the sanitation facilities provided for the workforce</td>
</tr>
<tr>
<td></td>
<td>such as cleaning of vehicles and washdown from equipment.</td>
<td></td>
</tr>
<tr>
<td>General Refuse</td>
<td>Food residues, paper and used bottles and cans generated by the workforce.</td>
<td>Organic and food wastes, office waste from the administrative facilities.</td>
</tr>
</tbody>
</table>

Impact Assessment

The incorrect management and disposal of Project wastes is considered a direct and negative Project impact. The extent of this impact during construction and operations is regional, as the impacts of disposal would extend beyond the Project site and to the local landfill sites, located in the Sedibeng District Municipality. The impacts are deemed to be long-term as the impacts will be felt during the operational phase. Significant wastes are expected to be generated during the construction phase; however, the operational phase will be limited to domestic wastes and on-going maintenance wastes. The likelihood of the improper waste management and disposal of wastes occurring is unlikely. The magnitude is therefore considered to be medium.

In terms of disposal, there are various existing waste disposal facilities still being licenced within the municipality which still are to confirm types of wastes and the volumes of waste that can be accommodated the Project. The sensitivity is therefore medium.

The pre-mitigation significance is therefore rated as moderate.
Mitigation Measures

- Air Products shall manage the site clearance and construction wastes in accordance with Section 5.8.10 of their Waste Management Procedure (October 2008).

- An Air Products approved contractor shall be used to transport wastes off site. The Municipal Waste Services will be notified, prior to construction to ensure this material is disposed in an appropriate manner at a licence landfill site with the capacity to receive such wastes.

- Air Products shall prepare a comprehensive waste management plan for all phases of the Project. The plan will consider the types and volumes of waste that will be generated and will specify measures for handling, treatment and disposal of all wastes. Principles of reduction, recycling and re-use shall be incorporated into this plan.

- Storage of waste products on the Project site shall only be permitted within designated areas with hard standing so as to limit contamination of soils and groundwater. Wastes shall not be stored on-site for more than 90 days.

- Solid wastes shall be segregated to facilitate reuse and recycling of specific materials. All wastes that cannot be reused or recycled shall be collected by approved waste contractors and transferred to an appropriately licensed waste management facility for treatment and disposal.

- All hazardous and liquid waste materials eg fuel for generators, including any contaminated soils will be stored in a bunded area of 110 percent of the stored material’s capacity and disposed of by a licensed contractor.

- All concrete mixing be undertaken on impermeable plastic lining to prevent contamination of the soils and surrounding areas.

- Air Products shall consider donating the unsold lime by-product from the operational activities to emerging farmers found in the Municipal area. This can be done in partnership with the relevant Municipal authorities.

Residual Impacts

With the implementation of the mitigation measures, the likelihood of the impact occurring and therefore impact significance would be reduced. The residual impact is therefore considered to be reduced to minor.

Table 8.17  Impact Summary: Improper Waste Management and Disposal

<table>
<thead>
<tr>
<th>Potential Impact</th>
<th>Magnitude</th>
<th>Receptor Sensitivity</th>
<th>Pre-Mitigation Significance</th>
<th>Post-Mitigation Significance</th>
</tr>
</thead>
</table>

ENVIRONMENTAL RESOURCES MANAGEMENT

ACETYLENE GAS FACILITY: DRAFT EIA REPORT
### Vehicle Accidents

**Impact Description**

The presence of Project vehicles during construction and operations could increase the risk of accidents along the roads outside the Project site. Degradation and damage to regional and local roads from Project vehicles also has the potential to increase the risk of accidents. There are a number of sensitive receptors located along these traffic routes, with houses, businesses, schools, footpaths situated close and adjacent to the roads. The number of these sensitive receptors close to the roads results in risks of vehicle accidents, which could be compounded by the damaged roads such as potholes. The vehicle accidents could be caused by collisions with other vehicles, as well as collisions between vehicles and people.

**Impact Assessment**

Vehicle accidents are an *indirect* and *negative* Project impact. The extent of the increase in traffic vehicle accidents is considered to be *regional* as the impacts are experienced beyond the Project site and along the distribution routes. The duration of this impact is *long-term* as it will be experienced throughout the operation of the Project. The existing traffic in the area is comprised of light truck and passenger vehicles, pedestrians and few heavy vehicles. It is expected that approximately 13 additional vehicles will be generated during each phase of the Project, namely construction and operational phase. Given the increase in traffic around the site and the large numbers of sensitive receptors close to the roads, traffic accidents are considered to be as *possible*. The magnitude of this impact is therefore considered to be *medium*.

The local and regional roads are tarred and considered to be in adequate condition, except for Tilliet Road, which is planned to be upgraded. Furthermore, there is approximately 91 percent spare capacity on the local road network for additional vehicles. The sensitivity of impact is considered to be *low*.

The significance of vehicle accident risks in the region prior to mitigation is therefore considered to be *minor*.

**Mitigation Measures**

In addition to the general mitigation measures identified for traffic impacts (*Section 8.3.3*) the following mitigation is suggested.
• Speed limits shall be enforced for all Project vehicles.

• Air Products shall work with the relevant local and regional government to ensure the roads used by Project vehicles are well maintained, and that potential problems or hazards are communicated to the relevant authority timeously. Project planning and operations will be done in consultation with the government.

• Design a journey management schedule that avoids peak hour travelling times during the day.

• Drivers to adhere to the roads and avoid driving on road shoulders.

• Require competency training (including defensive driving), and identification of road signs and traffic codes for vehicle drivers and conductors before mobilisation is allowed.

• Use road signs at strategic points to warn people of oncoming heavy vehicles.

• Certify all vehicles for roadworthiness (and renew as required).

• Avoid night trips.

Residual Impact

The implementation of mitigation measures will assist to decrease the magnitude of the impacts, but the residual significance of this negative impact is therefore considered to remain as minor.

Table 8.18 Impact Summary: Vehicle Accidents

<table>
<thead>
<tr>
<th>Potential Impact</th>
<th>Magnitude</th>
<th>Receptor Sensitivity</th>
<th>Pre-Mitigation Significance</th>
<th>Post-Mitigation Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vehicle accidents during the construction and operational phase of the Project</td>
<td>Medium</td>
<td>Low</td>
<td>Minor</td>
<td>Minor</td>
</tr>
</tbody>
</table>

8.5 Potential Cumulative Impacts

Cumulative impacts are assessed with the combination effects of the Project with current and future development in the immediate area of the Project site. The cumulative impacts assessed depend on the status of other projects and the level of data available to characterise the magnitude of the impacts.

Relevant developments were identified through consultations with the local ward councillor. The main developments identified were the proposed Glen
Douglas dolomite burning plant, proposed Oil Skip's oil recycling facility and the proposed tyre pyrolysis plant, as described in Section 7.7. The Glen Douglas Mine is a current mining operation which has largely characterises the biophysical landscape near the Project site. The oil-recycling facility is not likely to have any cumulative effects due the nature of the facility and distance from the Project site. The proposed tyre pyrolysis plant and Glen Douglas dolomite burning plant however would contribute significantly to the release of air emissions, if these developments had to go ahead.

8.5.1 Air Quality

While current developments may be singly compliant with regulatory limits or standards in terms of air quality, the combined effects of emissions and atmospheric pollutants of several industrial developments could result in an elevation of ground level concentrations of pollutants and have an impact on the health of local communities and habitats. The combination of these developments would likely result in an increase in traffic and vehicles movements during construction and operations and thus vehicle-related emissions such as NO₂ and VOC.

Cumulative NO₂ emissions during operation

NO₂ emissions are likely to be emitted from vehicle and machinery exhausts such as forklifts, backup generators and product and raw material trucks. These emissions are considered to be a direct and negative impact for the duration of the Project operations (ie 40 to 50 years); which is considered to be long-term. The extent of this impact is considered to be local as machinery will be used on site, however vehicles will be travelling to and from site for the delivery of raw materials and for the distribution of the gas product. It is expected that two trucks will be travelling to and from site per day distributing the gas product and an additional three trucks will be on site per day for deliveries of raw materials and collection of the lime.

As a result of the prevailing wind direction, NO₂ emissions would travel from the source area to the south and south-east of the Project site. The cumulative incremental annual average NO₂ concentrations during the operational phase (Figure 8.11) are less than 10 percent and likely to remain within compliance of the NAAQS, however operation of the stand-by generators could result in non-compliance if used more than 88 hours per year. The magnitude of this impact is therefore expected to be small.
The baseline NO\textsubscript{2} concentrations at the Project site were assumed to be represented by an average of the four monitoring stations which ranged between 23\(\mu\)g/m\(^3\) to 34\(\mu\)g/m\(^3\), the average baseline NO\textsubscript{2} concentration at the Project site is therefore estimated to be 25\(\mu\)g/m\(^3\). The current baseline concentration of NO\textsubscript{2} falls below the NAAQS (40\(\mu\)g/m\(^3\)). The sensitivity is therefore considered to be low.

The pre-mitigation significance is therefore rated as negligible.

Assuming mitigation measures as per Section 8.2.2. are adhered to, the post-mitigation significance would remain as negligible.

**Potential VOC emissions during operation**

VOC emissions are likely to be emitted from vehicle and machinery exhausts such as forklifts, backup generators and product and raw material trucks. These emissions are considered to be a direct and negative impact for the duration of the Project operations (ie 40 to 50 years); which is considered to be long-term. The extent of this impact is considered to be local as machinery will be used on site, however vehicles will be travelling to and from site for the delivery of raw materials and for the distribution of the gas product. It is expected that two trucks will be travelling to and from site per day distributing the gas product and an additional three trucks will be on site per day for deliveries of raw materials and collection of the lime.

VOC concentrations were predicted to increase by approximately 40 percent from the baseline conditions within the Project site and up to 10 percent south-
east of Project site. The magnitude of this impact is therefore expected to be small (Figure 8.12).

Figure 8.12  Predicted Cumulative Annual Average VOC Concentrations during Operation

An annual average benzene concentration of 2.8μg/m³ has been recorded at the four monitoring stations, closest to the Project site. This concentration falls below the 1 year average stipulated in the NAAQS (5μg/m³). The sensitivity is therefore considered to be low.

The pre-mitigation significance of this impact is therefore rated as negligible.

Assuming mitigation measures as per Section 8.2.2 are adhered to, the post-mitigation significance would remain as negligible.

8.5.2  Terrestrial Ecology

The construction of the Project will involve the removal of grassland habitat and will reduce the amount of open space present in the study area. The Project site still contains over 50 percent semi-natural grassland and is linked to a number of other agricultural holdings in the region. The majority of these areas have bonox fencing (livestock and game fencing) allowing for small animal movements to occur. The diversity of floral species on the Project site and in the surrounding grassland (westwards) is relatively high and the communities still provide resources such as food and cover to terrestrial fauna. The floral species that make up the vegetation communities as well as the indigenous faunal species that utilise these habitats for feeding, breeding and dispersal include the Near threatened Hedgehog (*Atelerix frontalis*) and
possibly the Giant Bullfrog (*Pyxicephalus adspersus*) which will be negatively affected by this loss of open space.

This loss of open space and reduction in corridor movement is considered to be a *direct* and *negative* impact, which will be restricted to the *local* area and the surrounding agricultural holdings (north, west and south) while the duration is *long-term* as a large portion of the habitat will remain lost until closure of the Project facility. Approximately 3ha of the 4ha Project site will be lost. The magnitude of the impact is considered to be *medium*.

Faunal and floral species require corridors for dispersal therefore the sensitivity of the species utilising the area is considered *moderate* to *low*.

Based on the extent of habitat to be lost, the pre-mitigation significance is rated as *moderate*.

Assuming mitigation measures as per Section 8.2.4. are adhered to, the post-mitigation significance would remain as *negligible*. 