EXECUTIVE SUMMARY

Aluminium Pechiney (AP) is planning to develop an aluminium smelter inside the Coega IDZ in Port Elizabeth. The plant will generate 485 000 tons of aluminium per annum for international markets.

This study deals with the transportation-related impact of the expansion and addresses the following issues:

- Impact on traffic conditions
- Impact on the harbours
- Impact on the road infrastructure
- Impact on road safety
- Impact on the biophysical environment due to the transportation of hazardous materials.

The above issues are assessed with regard to the construction and operational phase of the proposed plant.

Apart from minor impacts identified with regards to each of the above issues, two aspects have been identified that can have a significant impact and will subsequently require significant mitigation measures:

Aspect 1: Accommodation of peak hour traffic during the peak 12 months of construction. Some of the existing intersections in the vicinity of the proposed development may not be able to accommodate the traffic generated during the morning and afternoon peak hours of the 12-month peak period of the construction phase. The impact can be limited by means of minor intersection improvements and the construction of critical sections of the proposed Coega road network before the commencement of the peak construction period.

Aspect 2: The introduction of a rail service to transport aluminium ingots from the plant to the harbour should be considered as a future alternative. Aluminium Pechiney (AP) is currently planning to transport aluminium ingots from the plant to the harbour by means of trucks carrying 24-ton payloads. This arrangement will generate 56 daily one-way loaded trips to the harbour plus the 56 unloaded trips back to the plant. The trucks will run 24 hours a day, 7 days a week. This will have negative transport-related impacts on the structural capacity of the road and road safety along Neptune Road and Ranger Road extension.

It appears that a rail service might not be a feasible short-term alternative, but it is recommended that AP should investigate the technical and economic feasibility of rail as an alternative to road for the medium to long term. The feasibility investigation should allow for the introduction of a rail service between the site and the harbour, and appropriate loading and off-loading facilities in future. Such allowance includes a site layout that can accommodate a rail line with minimum interference with day-to-day transport and operations. However, to mitigate the negative impact over the short term, it is recommended that AP also investigate the use of vehicles with a load carrying capacity higher than 24 tons to transport ingots to the harbour in order to reduce the number of heavy vehicles on Neptune and Ranger roads.
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<th>Description</th>
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<tr>
<td>AP</td>
<td>Aluminium Pechiney</td>
</tr>
<tr>
<td>CDC</td>
<td>Coega Development Corporation</td>
</tr>
<tr>
<td>CSIR</td>
<td>Council for Scientific and Industrial Research</td>
</tr>
<tr>
<td>IDZ</td>
<td>Industrial Development Zone</td>
</tr>
<tr>
<td>EIA</td>
<td>Environmental Impact Assessment</td>
</tr>
<tr>
<td>NMMM</td>
<td>Nelson Mandela Metropolitan Municipality</td>
</tr>
<tr>
<td>PE</td>
<td>Port Elizabeth</td>
</tr>
<tr>
<td>SMME</td>
<td>Small, medium and micro enterprises</td>
</tr>
<tr>
<td>SPL</td>
<td>Spent potlining</td>
</tr>
<tr>
<td>t/year</td>
<td>Tons per year</td>
</tr>
</tbody>
</table>
1. INTRODUCTION

1.1 Background

Aluminium Pechiney is proposing to construct and operate a primary aluminium smelter within the Coega Industrial Development Zone (IDZ) near Port Elizabeth, South Africa. The proposed Coega IDZ comprises an area of approximately 12 000 hectares in the Nelson Mandela Metropolitan Municipality (NMMM), which incorporates the former Port Elizabeth, Uitenhage and Despatch municipalities.

The CSIR's Division of Roads and Transport Technology (Transportek) was commissioned to undertake a specialist study on the transport-related impacts. This study is associated with the environmental impact assessment (EIA) conducted by CSIR Environmentek as part of the necessary approval process.

The aim of this report is to elaborate on the impacts that the construction and operation of the plant may have on traffic conditions, the harbours, transport infrastructure, the safety of other road users, and the biophysical, social and economic environments, and to propose measures and procedures to ensure that negative impacts are limited and positive aspects are enhanced. Where applicable, this includes an assessment of feasible alternative modes of transport.

This report also serves to address the issues raised during the public participation process. Annexure A includes direct responses to the issues identified for the specialist study.

1.2 The Coega Industrial Development Zone (IDZ)

Situated 12 km east of the city of Port Elizabeth on South Africa's Eastern Cape coast, the Coega Industrial Development Zone is designed to meet the needs of manufacturers wanting to succeed in global markets (Figure 1.1). Coega is at the centre of the world's main trade routes, being equidistant from the American, European and the Pacific Rim regions. This makes the Coega IDZ the ideal location for any manufacturer adding value to raw materials and components and producing goods bound for world markets.

The long-term plans for the Coega IDZ include an international airport to handle high-value freight as well as passengers. Coega will furthermore offer the following:

- Industrial parks – spread across 12 000 hectares of land - customised for heavy, medium and light industries
- Purpose-built, world-class infrastructure
- Inter-modal transportation linkages
- Integration with South Africa’s newest deepwater port designed to be a world-class gateway to international markets (Port of Ngqura) which will include container, general cargo and bulk terminals.
• Economic clusters centred on backward and forward integration
• One-stop shop investor facilitation with all relevant Government departments and agencies
• Customised employee training programmes
• World-class environmental policies and standards
• Customs-secure areas for the assembly and manufacture of products for export
• A high-tech communications infrastructure
• Commercially competitive electricity
• Adequate industrial-standard water supplies.

The Coega Industrial Development Zone (IDZ), the first IDZ to be established in South Africa, is being developed by the Coega Development Corporation (CDC).

1.3 Approach

A desktop study was carried out after an initial workshop was held with Aluminium Pechiney and project leaders responsible for the other specialist studies in the EIA. The main sources of information were documentation provided by Aluminium Pechiney (AP)\(^{1,2,3}\), documentation on the Coega Development Zone and Port Integration Transportation Study\(^{4,5}\) and discussions with staff from the CDC.

Experience gained from specialist studies in similar projects, as well as issues raised during the AP public participation process (refer to Annexure A), were used to identify key traffic and transportation issues related to the proposed development which would require more detailed investigation. Where useful information was available, an attempt was made to quantify the impact of the proposed development. Where such information was lacking, a more subjective judgement was made on the nature, extent, duration and significance of the impact, as well as the probability of it occurring.

Key issues related to the transportation of personnel, materials and waste during the construction and operational phase of the smelter were assessed. A spreadsheet-based traffic model was developed for this assessment to determine the number of passenger vehicles and heavy vehicles that will be added to the road network in the vicinity of the proposed development.

The decommissioning of the smelter (after operation terminates) is not covered in this assessment, since it will only take place in the distant future (30 to 40 years’ time) and there is little information and a limited basis for assumptions.

It is important to note that this is only one of a number of specialist studies associated with the EIA process for the AP development. Issues related to the handling of waste and materials, such as the transportation of raw materials by conveyer belt, are addressed in the Materials Handling and Waste Management specialist study\(^{6}\).
Chapter 2 of this document provides some background on the extent of the proposed AP development, while Chapter 3 describes the current and future transport infrastructure and traffic conditions that have a bearing on the Aluminium Pechiney development. Chapter 4 addresses the possible impacts and mitigation measures. The areas of impact are each discussed in terms of the context of the area, the impact during the construction and operational phases and the possible mitigation measures to limit the impact. Chapter 5 gives a summary of the impact and mitigation measures in the prescribed summary format. Chapter 6 addresses the issue of rail transport as an alternative to road transport. The conclusions and recommendations are provided in Chapter 7.
2. OVERVIEW OF THE PROPOSED ALUMINIUM PECHINEY SMELTER DEVELOPMENT

2.1 Introduction

Aluminium ingots (bars) will be the primary product produced mainly for shipment from the proposed Port of Ngqura to international markets. Aluminium is produced in a series of large electrolytic cells generally known as "pots". It is intended that the smelter will operate with new-generation smelting technology (AP50) and produce approximately 485 000 tons per annum of aluminium.

The major raw materials required for the smelting process are alumina, petroleum coke, aluminium fluoride and liquid coal tar pitch.

2.2 Project implementation process

Aluminium Pechiney initiated feasibility studies and the approvals process in 2002. Construction is planned to start by early 2003 in order for the smelter to be operational in early 2005, as shown in the proposed project schedule below (Table 2.1).

<table>
<thead>
<tr>
<th>Activity</th>
<th>Schedule</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preferred site confirmed</td>
<td>2002</td>
</tr>
<tr>
<td>Environmental Impact Assessment and Approvals</td>
<td>2002</td>
</tr>
<tr>
<td>Construction</td>
<td>2003 / 2004</td>
</tr>
<tr>
<td>First metal</td>
<td>Early 2005</td>
</tr>
<tr>
<td>Full metal capacity reached</td>
<td>End 2005</td>
</tr>
</tbody>
</table>

It is planned that construction will take 26 months, leading to the first metal production early in 2005 and full capacity production 8 months after first metal production. The duration of the project from the beginning of construction to operation at full capacity is expected to be 34 months. The life of the project is expected to be 30 to 40 years.

2.3 Construction Phase

The construction phase will take approximately 26 months and will involve the transportation of personnel, construction material and equipment to the site, and personnel and waste away from the site.

Approximately 6 000 people will be working at the construction site during the peak period of approximately 12 months, with an average of 4 500 people the rest of the time. The majority of these construction workers will be recruited from the NMMM area. To accommodate construction workers with special skills who are not available from within the NMMM, a new construction village is planned at Wells Estate (south of Motherwell).
General materials such as concrete and steel will be required for construction, and also specialised materials and equipment for plant assembly. A typical breakdown of the construction materials that will be required for the development of the AP plant is listed in Table 2.2.

**Table 2.2 : Breakdown of construction materials**

<table>
<thead>
<tr>
<th>Material</th>
<th>Typical quantities (where available)</th>
<th>Proportion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Civil work</td>
<td>General levelling: 43 000 m³      Drainage/sewerage: 21 000 m³    Piles: 16 000</td>
<td>38%</td>
</tr>
<tr>
<td></td>
<td>Concrete: 150 000 m³</td>
<td></td>
</tr>
<tr>
<td>Structural steel</td>
<td>28 000 tons</td>
<td>10%</td>
</tr>
<tr>
<td>Roofing and siding</td>
<td>335 000 m²</td>
<td>4%</td>
</tr>
<tr>
<td>Refractory and lining</td>
<td>-</td>
<td>8%</td>
</tr>
<tr>
<td>Vessel and piping</td>
<td>-</td>
<td>5%</td>
</tr>
<tr>
<td>Electrical</td>
<td>30 000 tons</td>
<td>11%</td>
</tr>
<tr>
<td>Mechanical</td>
<td>-</td>
<td>18%</td>
</tr>
<tr>
<td>Aluminium conductors</td>
<td>-</td>
<td>6%</td>
</tr>
</tbody>
</table>

The origin of the construction material will depend on the cost at the time of construction, and will be the responsibility of the construction manager. One can expect that general construction material such as steel and concrete will be sourced within the NMMM region. The specialised material and equipment needed for the smelting process would probably be imported via Port Elizabeth Harbour since the Port of Ngqura will not be operational during the construction phase.

The Aluminium Pechiney site will be served by two accesses during the construction phase. The first will be provided from Road 435 and will serve heavy vehicles only. The other access will be from Road 450 (St Georges Road) via Ranger Road extension and will serve passenger traffic such as private cars, taxis and buses. Refer to Figure 4.2 for the relative locations of these accesses.

As part of the construction of the Port of Ngqura, a dedicated temporary “haul road” will be constructed to transport construction materials from Coega Kop to the port. This road will cross the access road provided for construction workers to the AP site (the extension of Ranger Road) as well as Road 435 to the east of Road 450. CDC has developed temporary arrangements to manage the conflict between passenger vehicles, construction vehicles and pedestrians crossing the “haul road” by means of a pedestrian bridge and boom-controlled intersections. Refer to Figure 2.1 for a graphic illustration of the access arrangement during construction.
A dedicated public transport terminal and parking area are provided next to the haul road. Staff can then enter the construction site by means of a pedestrian bridge across the haul road. A boom-controlled intersection is also provided at this location to allow limited vehicle access to the site. Heavy vehicles will be able to cross the haul road at other boom-controlled intersections on Road 435.

2.4 Operational phase

The operational phase will involve the transportation of personnel, raw materials, finished products and waste.

The personnel will include around 550 people who will work in shifts (three shifts per day - 6:00 to 14:00, 14:00 to 22:00, and 22:00 to 6:00), while approximately 450 people (including Aluminium Pechiney staff and subcontractors) will work during normal daytime working hours (07:00 – 17:00)\(^3\). The majority of these people will reside in the Motherwell-KwaZakhele, Port Elizabeth and Uitenhage areas.
The amount of raw materials, product and waste that is likely to be generated by the AP development during the operational phase, together with the modes of transport used to transport it, are shown in Table 2.3.

### Table 2.3 : Extent of materials and modes of transport used

<table>
<thead>
<tr>
<th>Type of material</th>
<th>Material</th>
<th>Quantity (tons per year)</th>
<th>Mode of transport</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raw material</td>
<td>Alumina</td>
<td>931 000</td>
<td>Ship, conveyor</td>
</tr>
<tr>
<td></td>
<td>Petroleum coke</td>
<td>180 000</td>
<td>Ship, conveyor</td>
</tr>
<tr>
<td></td>
<td>Liquid pitch</td>
<td>38 000</td>
<td>Ship, road</td>
</tr>
<tr>
<td></td>
<td>Aluminium fluoride</td>
<td>8 800</td>
<td>Ship, road</td>
</tr>
<tr>
<td></td>
<td>Heavy fuel oil</td>
<td>31 800</td>
<td>Road</td>
</tr>
<tr>
<td>Product</td>
<td>Aluminium ingots</td>
<td>485 000</td>
<td>Road, ship</td>
</tr>
<tr>
<td>Waste</td>
<td>Waste</td>
<td>27 600</td>
<td>Road</td>
</tr>
</tbody>
</table>

The alumina and petroleum coke will be shipped to the Port of Ngqura from where it will be transported to the Aluminium Pechiney site by a conveyor.

The liquid pitch will be shipped to the Port of Ngqura from where it will be transported to the site in heated road tankers with a payload of approximately 24 tons.

Owing to the relatively small quantities of aluminium fluoride required annually, this material will be shipped either to the Port of Ngqura or Port Elizabeth Harbour from where it will be transported by truck to the site (payload approximately 24 tons).

It is envisaged that Aluminium Pechiney will purchase heavy fuel oil from commercial suppliers based in Port Elizabeth (such as Shell), and generally it will be transported with an insulated road tanker truck.

Aluminium ingots will be transported by road to the Port of Ngqura from where they will be shipped to several destinations. AP will use trucks with a payload of 24 tons to transport the ingots to the harbour. Rail was not considered in the design phase owing to the additional handling required in loading and unloading the wagons and due to the fact that rail transport, although part of the medium to long-term planning for the IDZ, does not forms part of the short-term infrastructure planning and provision.

An amount of approximately 6 380 t/year industrial general waste and 4 030 t/year hazardous waste will be transported to the respective permitted waste disposal sites in the Port Elizabeth region. The remaining waste (17 220 t/year) will be transported to various recycling or re-use centres located in Port Elizabeth or other parts of South Africa which also includes approximately 7 000 t/year SPL.

The general waste disposal sites that will be used are the Arlington General Landfill and Koedoeskloof Low Hazardous and General Landfill which are both operated by the
Municipality. It is expected that by the time the smelter starts generating hazardous waste, the current Aloes High Hazardous landfill will no longer be operating. Instead, a regional hazardous waste management facility would be operational to cater for the Nelson Mandela Metropole and the Coega IDZ. The Environmental Impact Assessment (EIA) for this regional hazardous waste management facility has been initiated, and site location is currently being determined.

During the operational phase of the AP plant, access will be gained through Ranger Road extension. Ranger Road extension is still in the design phase but is likely to consist of six lanes (three lanes per direction), of which two lanes will be dedicated to heavy vehicles. The same design is planned for Neptune Road between the proposed harbour and the intersection with Ranger Road\(^7\).

The lay-out of the smelter site includes a large parking area with a public transport terminal. The lay-out further allows for separate four-lane access roads for heavy vehicles and passenger vehicles.

### 2.5 Expected harbour activities

AP expects to ship raw materials and products through the Port of Ngqura and Port Elizabeth Harbour. These materials are normally delivered through dedicated port facilities. Refer to Table 2.4 for the type of load, vessel and loading facility required for each material.

<table>
<thead>
<tr>
<th>Material</th>
<th>Quantity (tons per annum)</th>
<th>Type of load</th>
<th>Type of vessel</th>
<th>Loading facility</th>
<th>Ports</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alumina</td>
<td>931 000</td>
<td>Solid bulk</td>
<td>Panamax bulk carrier</td>
<td>Suction</td>
<td>Ngqura</td>
</tr>
<tr>
<td>Petroleum coke</td>
<td>180 000</td>
<td>Solid bulk</td>
<td>Handysize bulk carrier</td>
<td>Suction</td>
<td>Ngqura</td>
</tr>
<tr>
<td>Liquid pitch</td>
<td>38 000</td>
<td>Hot liquid bulk</td>
<td>Dedicated tanker vessel</td>
<td>Self-unloading vessel</td>
<td>Ngqura</td>
</tr>
<tr>
<td>Aluminium fluoride</td>
<td>8 800</td>
<td>Break bulk</td>
<td>Multi-purpose vessel</td>
<td>General cargo facility</td>
<td>Ngqura or PE</td>
</tr>
<tr>
<td>Aluminium ingots</td>
<td>485 000</td>
<td>Break bulk or container</td>
<td>Multi-purpose vessel</td>
<td>General cargo facility</td>
<td>Ngqura</td>
</tr>
</tbody>
</table>

The alumina and coke will be transported by dedicated vessels that carry loose, dry-bulk material which will then be unloaded by vacuum onto an enclosed conveyor system. Alumina will be delivered in Panamax class vessels approximately every three weeks. The coke will be imported by ship, suction unloaded and also transported to the smelter via the conveyor system\(^8\).
Aluminium fluoride will probably be imported in 1-ton bulk bags or 25-kilogram layer bags and transported by truck to the site. Liquid pitch will be shipped in a dedicated, heated vessel, while the aluminium ingots will be stacked and trucked to the port to be loaded onto general cargo vessels.

3. TRANSPORT INFRASTRUCTURE AND TRAFFIC CONDITIONS

3.1 Introduction

The NMMM has a developed transport system that includes road, sea, air and railway transporting facilities. The rail system, harbour and airport fall under Spoornet, the National Ports Authority and the Airports Company Limited, respectively. The road system falls under the Port Elizabeth municipality, the Eastern Cape Province and the South African National Roads Agency Limited (SANRAL).

3.2 Existing road transport and traffic conditions

The primary road system in the NMMM is well developed with multi-lane freeways, arterial and collector roads. The N2 Freeway bisects the city, providing a good link to industrial and other parts of the city. The arterial road system is in good condition, although it requires upgrading in some rapidly developing areas.

The lower income community is highly dependent on public transport. Minibus taxis are the most commonly used mode of transport, and other modes of transport include private vehicles, commuter rail and buses.

The Algoa Bus Service is the only holder of a permit to operate scheduled bus services in the metropolitan area. The service also extends to adjacent rural areas. The service coverage is such that virtually all residential and industrial areas fall within a maximum 750 m walking distance to the nearest bus stop.

A number of private bus operators primarily offer hire transport, but are not subsidised unless doing contractual work for the Algoa Bus Service. The 16-seater minibus taxis carry an estimated 55% of all commuters with 2 000 taxis licensed to operate. This service competes directly with the bus service and commands a bigger market share because of the flexibility of stops and journey times (despite overcrowding problems and no pre-set timetables).

A Transport Forum is in place with membership from the NMMM, minibus taxi associations, commuter bus operators, South African Police Service, the SA National Defence Force and various other institutions and organisations that use and are reliant on road transport. The Transport Forum is a non-statutory body that meets on a regular basis in an attempt to co-
ordinate transport concerns and address problems regarding road transport, for example minibus taxi operator conflicts.

The Coega area is currently serviced by the N2 Freeway, secondary roads and gravel roads. The N2 Freeway is the major road link along the east coast and is in good condition, serving an important function in the economy of the Eastern Cape region. Via the St Georges Interchange, the N2 Freeway provides access to Road 460 (to Uitenhage) and Road 450 (to Addo and Kirkwood agricultural hinterland). This road also provides access to Motherwell Residential Township and the Markman Industrial Township. Refer to Figure 4.1 for the extent of the existing road network in the Coega area, its capacity and weekday morning peak hour traffic volumes.

As part of the development of the Coega IDZ, the road network within the Coega area will be extended and upgraded. These improvements include the following (refer to Figure 1.1 as well):

- re-surfacing of the N2 Freeway from Port Elizabeth up to the Coega area and the addition of two lanes to it on the eastern side of Coega,
- construction of three new interchanges to the Coega IDZ,
- construction of a major six-lane road (two lanes dedicated to heavy vehicles), known as Neptune Road, linking the Metallurgical Cluster, Road 435, the N2 Freeway and the proposed harbour (refer to Figure 4.3), and
- the extension of Ranger Road across Neptune Road and upgrading it to a six-lane road serving as an access road to the Metallurgical Cluster.

### 3.3 Rail transport

The existing railway network in Port Elizabeth developed over time and was initially not aimed at providing commuter rail services. The existing network and station placement in the Port Elizabeth Metropolitan Area does not provide accessibility to and from the low-income residential areas. Many areas are not adequately served by the existing rail service. The Port Elizabeth CBD area is, however, relatively well served by the rail transport system.

The double railway line between Port Elizabeth Central and Swartkops Stations allows for a uni-directional peak-hour line capacity of 18 trains along this section. From Swartkops Station to Uitenhage Station and to Aloes Station respectively single railway lines exist, which allow for a peak-hour line capacity of 4 trains in one direction.

Grassridge, Aloes and Coega Stations are located within the broader Coega IDZ area. These stations currently provide only for the handling of freight and not for transporting commuters.

Investigations are, however, under way to determine the feasibility of extending the commuter rail network to the Motherwell and Coega areas. The planning allows for road-based public transport services (taxis and buses) to distribute and collect passengers to and from the IDZ.
from the station and to serve the areas where rail is not available. The South African Rail Commuter Corporation is uncertain about when the rail service will be operational.

The planned commuter rail network allows for a circular rail line through the Coega area together with several stations serving it. The planned freight rail network will also be integrated with the existing rail network and will include, inter alia, a line serving the new harbour (Port of Ngqura), a line serving the Metal Industries cluster and a bulk minerals handling facility.

3.4 Sea transport

The existing harbour in Port Elizabeth is located close to the central business district (CBD). The Port Authority Division of Transnet, in association with the Coega Development Corporation, is undertaking the building of the large deepwater harbour (Port of Ngqura) at the mouth of the Coega River, in Algoa Bay. An Marine Risk Assessment on the harbour was carried out by WSP Walmsley as one of the specialist studies commissioned for the Subsequent Port of Ngqura EIA (CES, 2001) for the Coega Development Corporation\(^9\).

4. IMPACT ASSESSMENT

4.1 Introduction

Based on the typical activities of an aluminium smelter and the specific characteristics of the proposed AP development, a number of traffic and transport-related issues were identified as requiring further investigation to assess the impacts of the proposed AP development:

- Impact on current traffic conditions (Section 4.2)
- Impact on the harbours (Section 4.3)
- Impact on the road infrastructure (Section 4.4)
- Impact on the safety of other road users (Section 4.5)
- Impact on the biophysical environment due to transportation of hazardous materials (Section 4.6)

These issues were assessed for the transport of personnel, material (raw materials, finished product and abnormal loads) and waste during both the construction and operational phase of the development along the main transport routes based on existing infrastructure.

The following traffic and transportation-related environmental impacts have been addressed elsewhere and are therefore not included in the scope of this assessment:

- Impacts associated with the general Coega IDZ infrastructure such as the road and rail network have been addressed in the Rezoning EIA commissioned by the Coega Development Corporation\(^10\).
• Impacts associated with the increase in shipping traffic (e.g. risk of oil spills, collision with marine mammals, invasion of alien species via ballast water) have been considered in the Subsequent Port of Ngqura EIA\(^\text{10}\).
• Impacts associated with the noise generated by increased traffic are addressed in a separate noise specialist study as part of the Aluminium Pechiney EIA.
• Impacts associated with the increased opportunities for supporting small, micro and medium sized enterprises (SMMEs) are considered in the socio-economic specialist study for the Aluminium Pechiney EIA.
• The handling of material at the port and smelter as well as dust and spillages from the conveyer belt system are considered in the Materials Handling and Waste Management Specialist Study conducted as part of the Aluminium Pechiney EIA.

### 4.2 Impact on traffic conditions

#### 4.2.1 Context

The proposed AP development will generate additional traffic on the road network described in Section 3 which will consequently have an impact on the traffic conditions in the area. Additional traffic will be generated during construction and operation by the transportation of people, construction materials and equipment, raw materials for production, finished products and waste. Since the South African Rail Commuter Corporation is uncertain about when the extended rail service will be operational, this impact assessment is based on the worst-case scenario in which all the workers will be transported by road-based transport modes.

To determine the impact, the estimated amount of additional traffic on the road network was calculated for both the construction and operational phases. The assessment is based on the busiest time of the day, which is typically the morning and afternoon peak hours, usually between 7:00 and 8:00 in the morning and 16:30 and 17:30 in the afternoon.

A spreadsheet-based model was developed for the assessment using the conventional four-step process, namely trip generation (calculating the number of person trips generated by the development), trip distribution (connecting each trip with an origin and destination), model split (allocating each person trip to a particular mode of transport or vehicle type) and trips assignment (assigning each vehicle trip to a particular route), and focuses on the morning peak hour. It is commonly accepted that the afternoon peak hour is of approximately the same magnitude as the morning peak hour, but in the opposite direction.

The assessment includes the impact that abnormally loaded vehicles will have on traffic conditions. An abnormal load is defined as a material object which, due to its dimensions and/or mass, cannot be transported on a vehicle or vehicles without exceeding the limitations of either dimension or mass contained in the Road Traffic Regulations\(^\text{11}\). It is unlikely that any abnormal loads will be generated during the operational phase.
4.2.2 Assessment of construction phase

It is estimated that approximately 560 private car trips, 110 bus trips, 200 minibus taxi trips and 30 heavy vehicle trips will be generated during a typical peak hour in the peak construction phase (based on 6 000 construction workers) travelling to and from the smelter. Refer to Annexure B for details and assumptions used in these estimates.

Figure 4.2 shows the additional traffic generated during the peak period in the construction phase (approximately 12 months, when 6 000 people will be employed on site), for a typical weekday morning peak hour.

Impact of abnormal loads

Based on experience from the Hillside Aluminium Smelter in Richards Bay, the construction of the proposed AP plant will require the transport of abnormal/over-dimensional loads such as pot shells, transformers and superstructures at a rate of approximately two to four per day during the peak construction period. The majority of the loads will have to be transported from Port Elizabeth harbour.

The abnormal loads will probably be transported to the site via the N2 Freeway and Neptune Road, or Road 450 (St Georges Road) while Neptune Road is under construction. Although the number of trips would be low, the speed and size of the vehicles could have an impact on traffic patterns along these roads. However, the approximately 22 km of N2 Freeway between Port Elizabeth Harbour and the Coega IDZ has more than one lane per direction and therefore other vehicles will be able to pass the abnormal loads. Owing to the short distance that these vehicles will travel on Road 450 (St Georges Road), the delays will be minimal. The significance of the impact due to abnormal loads is consequently regarded as low.

Impact on road sections

It is evident that the AP-related traffic during construction (shown in Figure 4.2), in addition to the current traffic volumes (shown in Figure 4.1), will not exceed the vehicle-carrying capacity (shown in Figure 4.1) of the road sections. The roads that will experience the highest impact are Ranger Road (Aluminium Pechiney contributing to 61% of its capacity within the Markham Industrial area) and Road 435 (Aluminium Pechiney contributing to 9% of its capacity) in the direction of the smelter. The capacities of the road sections are based on the Highway Capacity Manual and assessments done for the Coega Development Corporation. An analysis of Road 435 west of Road 450 indicates that it will operate at level of service D during construction, which means that road users will spend 70 to 80% of their travelling time following other vehicles on the road. It should be emphasised that the assessment is based on the existing road infrastructure accept for the two access roads to the development.
Impact on intersections
Apart from the road sections, the intersections usually act as bottlenecks in the network that can also experience capacity problems. Based on the traffic volumes, the most critical intersections will be the intersection of Road 435 and Road 450 (St Georges Road) and the intersection of Road 450 and Ranger Road extension. Both intersections are currently controlled by stop signs (priority control). There are no short-term (2002 – 2004) plans to upgrade these intersections.

The intersection of Road 450 and Ranger Road is critical in the sense that the majority of construction traffic (consisting of buses, taxis and private vehicles) will have to turn right from Road 450 into Ranger Road in order to gain access to the smelter site through Ranger Road extension during the morning peak hour. In addition to this, heavy vehicles carrying construction materials will also move through these intersections during the day and can also have a negative impact during the off-peak operation of the intersections. The significance of the negative impact on the operation of the two intersections close to the development is medium, and could be aggravated in the presence of pedestrians wanting to cross the intersections.

Cumulative effects
Other construction activities that may take place during the same time as the Aluminium Pechiney (AP) development, and may cause a cumulative effect on traffic conditions, are the port construction and road construction projects as part of the Coega IDZ. The Environmental Impact Assessments for the port do not, however, include traffic volumes that can be used in a cumulative impact assessment. Since Road 435 and its intersection with Road 450 are expected to operate close to capacity due to the construction of the AP plant, the cumulative effect of other IDZ construction activities is likely to cause more serious congestion in the form of slow travelling times (less than 60 km/h) and long queues at the intersections. The significance of the negative impact of the cumulative effects on the intersections within Coega IDZ is medium.

4.2.3 Assessment of the operational phase

It is estimated that approximately 140 private car trips, 40 minibus taxi trips and 10 heavy vehicle trips will be generated during a typical peak hour in the operational phase. Refer to Annexure B for assumptions and details of these estimates.

The additional traffic generated during the peak period of the operational phase on a typical weekday morning peak hour is shown in Figure 4.3. The majority of traffic generated by the development during a typical morning peak hour will approach the site from the N2 Freeway from Port Elizabeth (100 light vehicles and 2 trucks in the peak direction). Smaller numbers of additional traffic will be generated on the other surrounding roads (varying from 5 to 10 light vehicles in the peak direction), but traffic will accumulate as it gets closer to the development, with the highest number on the access road (Ranger Road) of 140 light vehicles and 5 trucks in the peak direction.
It is evident from the assessment that the development will only take up approximately 3% of the road capacity (based on the highest impact on the N2 Freeway of vehicles travelling from PE to the smelter). These volumes are negligible and will not cause a noticeable impact on the level of service. The significance of the negative impact is therefore assessed to be low.

4.2.4 Possible mitigation measures

The Coega Development Corporation, Nelson Mandela Metropolitan Municipality and the South African Rail Commuter Corporation should endeavour to extend the current commuter rail service to the Coega area as soon as possible. Such a service will not only alleviate the impact of the Coega development (AP included) by reducing the need for, and the negative impact of, road-based transport, but will also link the Coega area with economic activities of the Port Elizabeth area.

The following mitigation measures to limit the impact of additional traffic generated during the construction phase should be considered:

- The use of public transport (buses and minibus taxis) should be encouraged. In the event that the NMMM does not provide a public transport service to the Coega area, the construction manager should arrange dedicated bus or minibus taxi services to transport workers.
- Construction of Neptune Road and the interchange with the N2 Freeway should be completed before the peak construction period of AP commences in January 2004. This can alleviate the traffic impact on Road 450 (St Georges Road) and the intersections along it. Based on discussions with the CDC\(^{7,10}\), the design of intersections along Neptune Road will allow for dedicated turning lanes and traffic signals which will be sufficient to accommodate the expected traffic volumes.
- In addition to the above measure, NMMM and CDC should still monitor whether traffic signals are warranted at the intersection of Road 435 and Road 450 (St Georges Road) and the intersection of Ranger Road and Road 450 (St Georges Road) to accommodate traffic during the non-peak period of construction at AP (4,500 construction workers instead of 6,000). Owing to the close proximity of Motherwell and Wells Estate to the Coega IDZ, dedicated pedestrian facilities may also be required at these intersections.
- Appropriate heavy vehicles should be selected in consultation with vehicle manufactures to ensure that they can safely maintain the legal speed limit when loaded.
- Heavy vehicles, and especially heavy vehicles carrying abnormal loads, should be restricted to the N2 Freeway (via Neptune Road/St Georges Road and Ranger Road) and should not be allowed to travel in peak periods (07:00 to 08:00 and 16:30 to 17:30) or on high-volume single-lane commuter roads such as Road 435.
The following mitigation measures should be considered to limit the impact of additional traffic generated during the operational phase:

- The use of public transport (buses and/or minibus taxis) should be encouraged. This can be done by means of, inter alia, an effective public transport system, subsidised public transport fares for all workers and a site-layout that allows better access for public transport users than for private car users. In the event that the NMMM does not provide a public transport service to the Coega area, AP should arrange a service consisting of buses and/or minibus taxis to transport workers to and from the plant. It is important to note that this service should accommodate daytime workers as well as shift workers.

- Appropriate heavy vehicles should be selected in consultation with vehicle manufactures to ensure that they can safely maintain the legal speed limit when loaded. Elements such as the power output of the vehicle, the terrain, the noise specification contained in the noise specialist study, the average trip distances of the vehicles and braking requirements should be taken into account.

- The provision of public transport services for workers and trucking services for raw materials, products and waste are ideal opportunities to involve Small, Medium and Micro Enterprises (SMMEs). These opportunities should be encouraged and are addressed in more detail in the Socio-Economic Specialist Study.

- Heavy vehicles moving between the harbour and smelter should be restricted to the dedicated heavy vehicle lanes provided on Neptune and Ranger roads. Nelson Mandela Metropolitan Municipality, in conjunction with CDC, should develop an enforcement strategy to deal with this restriction.

- AP should investigate the use of vehicles with a load carrying capacity higher than 24 tons to transport ingots to the harbour in order to reduce the number of heavy vehicles on Neptune and Ranger roads.

- Rail was not considered in the design phase owing to the additional handling required in loading and unloading the wagons. The issue is discussed in more detail in Section 6.
Figure 4.1: Existing peak hour traffic volumes and hourly capacity
Figure 4.2: AM peak hour traffic generated by the proposed smelter during construction phase
Figure 4.3: AM peak hour traffic generated by the proposed smelter during operational phase
4.3 Impact on the harbours

4.3.1 Context

Port Elizabeth Harbour is situated close to the proposed development. However, an additional port, known as the Port of Ngqura, will also be constructed in the vicinity of AP as part of the Coega IDZ. The Port of Ngqura will be under construction at the same time as the AP plant. Shipping demands during construction will subsequently be accommodated through the Port Elizabeth Harbour. The Port of Ngqura will, however, be used for the majority of imports and exports during the operational phase.

4.3.2 Construction phase

The majority of imported equipment and material required for the construction of the AP plant will be imported through Port Elizabeth Harbour. This will be shipped as general cargo, and based on experience with similar construction activities, it is unlikely that significant additional shipping will be generated during the construction phase. The proposed expansion will thus have an insignificant impact on the harbour due to construction.

4.3.3 Operation

Based on the experience of the Hillside Aluminium Smelter in Richards Bay, the importing of raw materials and exporting of products can generate up to 70 vessels per year. These 70 ships will not only transport AP’s material but also other materials in demand in the region. The number of vessels is very small compared to the number of vessels typically accommodated by a medium-sized harbour such as Port Elizabeth (1 243 vessels in 2000\(^{14}\)).

Apart from the harbour itself, the development will result in increased demand for loading/unloading and temporary storage. The product-specific loading facilities (suction loading/unloading) will be constructed by AP at the Port of Ngqura, while the demand for general cargo is small in comparison with the capacity of the infrastructure that is planned at the port.

The relatively low amount of “new” traffic generated by AP will have an insignificant impact on the ports, mainly because the Port of Ngqura will be a new port with no existing traffic, and also because of the close proximity of Port Elizabeth Harbour which will share the shipping demand in the region. The significance of the negative impact on the harbours is therefore assessed to be low.
4.4 Impact on road infrastructure

4.4.1 Context

The choice of transporting raw materials and products by road may have a detrimental impact on the structural capacity of the affected road network. The roads that will accommodate the highest volume of heavy vehicles are Neptune Road and Ranger Road extension. Both these roads will be constructed by the same contractor with the same pavement design as shown in Figure 4.4\(^{(10)}\).

The assessment focuses on heavy vehicles since private motor vehicles and light delivery vehicles (LDVs) have a negligible effect on road pavement life. Approximately 100 000 private motor vehicles would do the equivalent road structural damage of one heavy vehicle.

\[
\begin{array}{c}
50 \text{ mm} & \text{Asphalt surfacing} \\
150 \text{ mm G1} & \text{Crushed stone} \\
150 \text{ mm C3} & \text{Stabilised upper sub-base} \\
150 \text{ mm C3} & \text{Stabilised lower sub-base} \\
150 \text{ mm G7} & \text{Upper selected sub-grade} \\
150 \text{ mm G9} & \text{In-situ lower selected sub-grade} \\
150 \text{ mm G10} & \text{In-situ sub-grade}
\end{array}
\]

**Figure 4.4 : Pavement structure of Neptune Road and Ranger Road extension\(^{(10)}\)**

4.4.2 Assessment of construction phase

The construction phase will last 26 months. Since the construction phase is short compared to the lifetime of the road, the effect of construction traffic on the structural life of the road will be insignificant, provided that the roads are correctly maintained and heavy vehicles are not overloaded. The significance of the negative impact is therefore assessed to be low.

4.4.3 Operational phase

During the operational phase, heavy vehicles transporting raw materials and products associated with the AP plant will mainly use Neptune Road and Ranger Road extension.
The typical daily movement of heavy vehicles on Neptune Road (same as Ranger Road extension) is shown in Figure 4.5.

![Aluminium Pechiney](image)

**Aluminium Pechiney**

- **Raw material**
  - 11 loaded vehicles per day
  - 11 unloaded vehicles per day

- **Products and waste**
  - 65 unloaded vehicles per day
  - 65 loaded vehicles per day

**Harbour (and waste destinations)**

**Figure 4.5 : Expected heavy vehicle loading on Neptune Road and Ranger Road extension during operations**

It is apparent from Figure 4.5 that the southbound lane of Neptune Road (from the smelter to the Port of Ngqura) will experience the highest load during the operational phase and will experience the highest structural impact due to the AP development over the 30-40 year lifespan of the smelter.

The impact of the proposed development on the road structure was determined using the South African Mechanistic Design Method\(^{(15)}\). The assessment refers to the cumulative daily E80s. One E80 is the equivalent damage that one standard axle (dual non-steering axle of a typical truck) would do when loaded to 8,2 tons.

Analysis of the proposed road pavement structure of Neptune Road and Ranger Road extension as shown in Figure 4.4 showed that the road should be able to support approximately 11 million E80s per lane over its design life of 25 years.

This traffic analysis consisted of the calculation of the cumulative daily E80s during operations and took no overloading into account. Based on the loading as indicated in Figure 4.5 for the southbound lane and the types of heavy vehicles used, the current cumulative E80s are approximately 137 E80s per day in the south-bound heavy-vehicle lane. This accumulates to approximately 50 000 E80s per year or 1,2 million E80s over the full design life of the roads. The estimated loading (only AP traffic) is equal to only 11% of the structural capacity of Neptune Road and Ranger Road extension. The significance of the negative impact on the road infrastructure is therefore assessed to be low.
Since the majority of structural loading is caused by heavy vehicles transporting ingots from the site to the harbour, the impact on the other roads (other than Ranger Road and Neptune Road) is negligible.

4.4.4 Possible mitigation measures

The most important mitigation measure to limit the impact on the structural capacity of Neptune and Ranger roads is to prevent the overloading of vehicles. Overloaded vehicles will increase the rate of road structure deterioration. The Nelson Mandela Metropolitan Municipality, in conjunction with CDC, should ensure that regular maintenance of Neptune Road and Ranger Road extension is carried out to maintain the structural capacity of the roads, and should also ensure that law enforcement is carried out to prevent overloading. Heavy vehicles should furthermore be weighed before leaving the site.

4.5 Impact on traffic safety

4.5.1 Context

Safety is a problem in road transport. In 1998, 37 584 collisions were reported in the Eastern Cape which caused 1 750 major injuries and 704 fatalities\(^{14}\). As traffic volumes increase, the probability of traffic accidents also increases. Statistics maintained by the Central Statistics Service indicated a rate of 100 casualties and 7.0 fatalities per 100 million kilometres covered per annum (1998) on a national basis\(^{14}\).

4.5.2 Assessment of construction phase

Owing to the increase in vehicles generated by the AP development, there is a potential for increased accident rates. Assuming reasonable travel distances and accumulated annual vehicle trips for light and heavy vehicles that will be generated during the construction phase, it is unlikely that there will be more than 12 million additional vehicle kilometres travelled per annum on the road network. This is likely to cause an additional 12 casualties and one fatality per annum during the construction phase. The significance of the negative impact on road safety is therefore assessed to be low.

4.5.3 Assessment of the operational phase

Assuming reasonable travel distances and accumulated annual vehicle trips for light and heavy vehicles that will be generated during the operational phase, it is unlikely that there will be more than an additional 2 million vehicle kilometres per annum travelled on the road network. This is likely to cause an additional 2 casualties per year and one fatality every seven years during the operational phase. The significance of the negative impact on road safety is therefore assessed to be low.
4.5.4 Possible mitigation measures

In order to mitigate this, only properly trained drivers and well maintained vehicles should be used during the construction and operational phases of the development. Road-based transport should furthermore be limited as far as possible. Mitigation measures mentioned in Sections 4.2.4 and 4.4.4 can also contribute to improved road safety.

4.6 Impact on the biophysical environment due to the transportation of hazardous materials

4.6.1 Context

Hazardous materials will be transported during the construction phase as well as the operational phase. The Minimum Requirements for the Handling, Classification and Disposal of Hazardous Waste, in conjunction with the National Road Traffic Act (Act 93 of 1996), the Hazardous Substances Act (Act 15 of 1973), the Occupational, Health and Safety Act (Act 85 of 1993) and various SABS codes, prescribe measures and guidelines for the transportation of hazardous materials.

The National Road Traffic Regulations (1999), which was made under Section 75 of the National Road Traffic Act, 1996 (Act No. 93 of 1996), extensively regulates:

- multi-loads, small loads, pre-planning and co-ordination of routes for certain types of dangerous goods by relevant authorities, and
- the identification of dangerous goods vehicles, training and responsibilities of operators, consignors and consignees.

The Act also ensures that unintentional incidents are prevented and managed in a responsible way, and it makes persons accountable for their actions. Some of the requirements in the legislation include:

- **Registration of operators:** All dangerous goods operators who are operating vehicles whose gross vehicle mass is in excess of 3500 kilograms are required to register with the Department as dangerous goods operators.
- **Driving licence:** A special category D professional driving licence will be required.
- **Signage on vehicles:** All operators transporting dangerous goods will be required to identify their vehicles accordingly. This will include an orange diamond in front of the vehicle, placards on the sides and rear of the vehicle;
- **Documentation:** The driver of the vehicle will be required to carry at least 3 different documents, including a route plan, a transport emergency card and document known as the dangerous goods declaration. The dangerous goods declaration will contain details of the consignor, consignee the operator, the correct name of the product and the hazards associated with the chemical. The
operator is also required to inform the emergency services situated along the routes which he will travel, what will be transported and the quantities so that appropriate measures will be taken to deal with an emergency;

- **Responsibility of consignors and consignees:** The legislation requires operators, consignors and consignees to take responsibility for their actions within each phase of the transport process. Each Party will be required by law to sign an operational agreement confirming the responsibility attached to them, in this way the responsible person could be held accountable in the event of an incident arising out of negligence.

### 4.6.2 Assessment of construction phase

Some general construction material such as paint and fuels are regarded as hazardous substances. These loads will come from various destinations and will not make use of one particular route. These trips will be of low frequency and therefore the risk of spillage is low. The significance of the negative impact on is therefore assessed to be low.

### 4.6.3 Assessment of the operational phase

During the operational phase, three potentially hazardous materials will have to be transported, namely liquid pitch, spent potlinings (SPLs) and hazardous waste.

#### Liquid pitch

The liquid pitch that is transported by road from the harbour to the AP plant is regarded as a hazardous substance due to its high temperature and volatile organic carbon contents. The proposed plant will require five loaded trucks per day (one every two hours) that will travel from the Port of Ngqura to the smelter on Neptune Road and Ranger Road extension (approximately 5 km).

Based on 1998 traffic statistics, heavy vehicle collisions occur at a rate of 423 collisions per 100 million vehicle kilometres. If this rate is converted to the possible number of collisions involving a truck loaded with liquid pitch, it results in 0.03 collisions per year or one collision every 30 years. The risk of a spillage due to a collision is therefore very low. The liquid pitch will furthermore solidify immediately if it is spilled, causing minimum environmental damage in a localised area.

#### Spent potlinings

The hazardous waste that will be generated by the AP development will mainly consist of spent potlinings (SPLs). The leachate from spent potlinings can pollute the environment due to its cyanide and fluoride content, and is consequently regarded as a hazardous material. It is estimated that approximately 7 000 tons of SPLs will be generated per year by the development.

Alternative external recycling options for SPLs are currently being investigated (see Materials Handling and Waste Management Study) and therefore information regarding the
destination of SPLs is not available. However, it is estimated that approximately 300 trucks (24-ton payloads) will be required per year for the transport of SPLs. Based on the above collision rate, one can expect one collision every 39 years if the average loaded travel distance is 20 kilometres.

Other hazardous waste
It is estimated that a further 4 030 tons per year of hazardous waste will be generated by smelter operations which will require disposal at hazardous waste disposal facilities. It is expected that there will be approximately 2 trucks per day transporting hazardous waste off the AP site, most likely to Port Elizabeth. This represents approximately 630 annual truck trips which accumulate to 31 300 annual vehicle kilometres (average of 50 kilometres per trip). Based on the collision rate given above, one collision every 8 years can be expected.

The significance of the possible negative impact due to the transportation of hazardous substances is therefore assessed to be low.

4.6.4 Possible mitigation measures

AP should use appropriate vehicles, load labelling and driver training programmes as set out in the legislation and codes mentioned in Section 4.6.1 to limit the likelihood and severity of spills during transportation. Further measures to limit the impact of spillage include:

- Limit the transportation of hazardous loads to off-peak periods.
- Continuously review and train staff in preventative measures and incident management plans.
- Facilitate proper driver training regarding measures required in the case of traffic accidents and spills.
- Implement an appropriate emergency action plan.

5. SUMMARY OF IMPACT ASSESSMENT

This section summarises the impacts and mitigation measures as identified in Section 4. These impacts are qualified according to the following categories:

- **Nature of impact** - explains the type of effect that a proposed activity will have on the environment and includes “what will be affected and how?”
- **Extent** - indicates whether the impact will be local and limited to the immediate area of development (the site or the servitude corridor); limited to within 5 km of the development (local); or whether the impact may be realised regionally, nationally or even internationally.
- **Duration** - indicates the lifetime of the impact, as being short term (0 - 5 years), medium term (5 - 15 years), long term (>15 years but where the impacts will cease after the operation of the site), or permanent.
- **Intensity** - indicates whether the impact is destructive or innocuous and is described as low (where no environmental functions and processes are affected), medium (where the environment continues to function but in a modified manner)
or high (where the environmental functions and processes are altered such that they temporarily or permanently cease).

- **Probability** - indicates the likelihood of the impact occurring and is described as improbable (low likelihood), probable (distinct possibility), highly probable (most likely) or definite (impact will occur regardless of prevention measures).

- **Significance** – indicates the potential impact and is described as low (where the impact will not have an influence on the decision or be required to be significantly accommodated in the project design), medium (where it could have an influence on the environment which will require modification of the project design or alternative mitigation) or high (where it could have a “no-go” implication for the project regardless of any possible mitigation).

- **Status of impact** – indicates whether the impact will be positive (a benefit), negative (a cost) or neutral.

- **Degree of confidence** – indicates the degree of confidence in the predictions, based on the availability of information and specialist knowledge, and is described as low, medium or high.

The issues discussed in Section 4 are summarised in Table 5.1. The significance is shown with and without the possible mitigation measure as identified in Section 4.
### Table 5.1: Impacts of AP development without and with the proposed mitigation measures

<table>
<thead>
<tr>
<th>Nature of the impact</th>
<th>Extent</th>
<th>Duration</th>
<th>Intensity</th>
<th>Probability</th>
<th>Significance (without mitigation)</th>
<th>Significance (with mitigation)</th>
<th>Status</th>
<th>Degree of confidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduction in level of service due to presence of abnormally loaded heavy vehicles during construction</td>
<td>Local</td>
<td>Short term</td>
<td>Low</td>
<td>Highly probable</td>
<td>Low</td>
<td>Low (Section 4.2.4)</td>
<td>Negative</td>
<td>Medium</td>
</tr>
<tr>
<td>Reduction in road-based level of service due to increase in traffic volumes during construction</td>
<td>Regional</td>
<td>Short term</td>
<td>Medium</td>
<td>Highly probable</td>
<td>Medium</td>
<td>Low (Section 4.2.4)</td>
<td>Negative</td>
<td>Medium</td>
</tr>
<tr>
<td>Reduction in road-based level of service due to increase in traffic during operations (staff)</td>
<td>Regional</td>
<td>Long term</td>
<td>Low</td>
<td>Highly probable</td>
<td>Low</td>
<td>Low (Section 4.2.4)</td>
<td>Negative</td>
<td>High</td>
</tr>
<tr>
<td>Reduction in level of service due to increased number of heavy vehicles transporting materials and products during operation</td>
<td>Local</td>
<td>Long term</td>
<td>Low</td>
<td>Highly probable</td>
<td>Low</td>
<td>Low (Section 4.2.4)</td>
<td>Negative</td>
<td>High</td>
</tr>
<tr>
<td>Reduction in level of service at the harbour due to construction</td>
<td>Regional</td>
<td>Short term</td>
<td>Low</td>
<td>Probable</td>
<td>Low</td>
<td>Low</td>
<td>Negative</td>
<td>Low</td>
</tr>
<tr>
<td>Reduction in level of service at the harbour due to increased operation</td>
<td>Regional</td>
<td>Long term</td>
<td>Low</td>
<td>Probable</td>
<td>Low</td>
<td>Low</td>
<td>Negative</td>
<td>High</td>
</tr>
<tr>
<td>Accelerated degradation of road structure due to construction traffic</td>
<td>Regional</td>
<td>Short term</td>
<td>Low</td>
<td>Highly probable</td>
<td>Low</td>
<td>Low (Section 4.4.4)</td>
<td>Negative</td>
<td>Low</td>
</tr>
<tr>
<td>Accelerated degradation of road structure due to increase in operational traffic</td>
<td>Local</td>
<td>Long term</td>
<td>Medium</td>
<td>Highly probable</td>
<td>Low</td>
<td>Low (Section 4.4.4)</td>
<td>Negative</td>
<td>High</td>
</tr>
<tr>
<td>Increased number of road accidents due to increased traffic during construction</td>
<td>Regional</td>
<td>Short term</td>
<td>Low</td>
<td>Probable</td>
<td>Low</td>
<td>Low (Section 4.5.4)</td>
<td>Negative</td>
<td>Low</td>
</tr>
<tr>
<td>Increased number of road accidents due to increased traffic (operation)</td>
<td>Regional</td>
<td>Long term</td>
<td>Low</td>
<td>Probable</td>
<td>Low</td>
<td>Low (Section 4.5.4)</td>
<td>Negative</td>
<td>Low</td>
</tr>
<tr>
<td>Spillage of hazardous material during transportation by road during operation</td>
<td>Regional</td>
<td>Long term</td>
<td>Low</td>
<td>Probable</td>
<td>Low</td>
<td>Low (Section 4.6.4)</td>
<td>Negative</td>
<td>Medium</td>
</tr>
</tbody>
</table>
6. **ASSESSMENT OF RAIL AS AN ALTERNATIVE TO ROAD (FREIGHT)**

6.1 **Introduction**

There are various modes of transport that can typically be considered in the transportation of raw materials and products in a production process. Modes such as road based, rail based, sea based and conveyers are commonly used in the industry. These modes are typically selected based on the infrastructure available, the environment in which it will operate and the feasibility of it. Refer to Annexure C for some generic advantages and disadvantages of these modes. The fact that AP will generate 56 daily loaded heavy vehicle trips to transport aluminium ingots to the harbour, and that CDC is planning a rail line running from the proposed harbour past the metallurgical cluster to link with the existing rail network, opens the option of using rail rather than road to transport ingots. This option was also raised during the public participation process (refer to Annexure A).

The purpose of this chapter is subsequently to assess the possibility of introducing rail as a mode of transport, rather than heavy vehicles, to transport ingots to the harbour.

6.2 **Rail as an alternative**

Before the advantages and disadvantages of rail and road in the context of the Aluminium Pechiney development can be discussed, one should first assess whether rail can be considered as an alternative. This means firstly that there must be a possibility of constructing a proper rail line to the smelter, and secondly that it is feasible to operate it.

The planned Coega rail line does not terminate at the harbour nor does it access the Aluminium Pechiney site. An analysis to determine whether it is possible would require detailed surveys and designs which were not within the brief of this study. However, in discussions with rail planners and designers involved in the Coega rail study, it was apparent that a complete rail link may be possible. Such a rail line could either be dedicated to Aluminium Pechiney (owned by Aluminium Pechiney) or it could connect with the existing network and be used with the approval of Spoornet. The line could be operated by Spoornet or Aluminium Pechiney.

There is subsequently a slight possibility that a rail line could be built and operated. The technical and economic feasibility of this alternative would require a more detailed analysis.

6.3 **Road versus rail**

The main difference between road and rail transport is the difference in capacity and the subsequent implications of it. As indicated in the assessment, the road transport will generate 56 daily loaded trips to the harbour on a public road, while rail will probably require one or two trips per day on a rail line. Based on the advantages and disadvantages of each mode as listed in Annexure D, rail transport is safer and environmentally friendlier than road transport.
transport, but may not be economically viable due to less efficient product handling processes.

6.4 Recommendation

It appears that rail might be an option, but given that this is not included in CDC and AP planning to date, it might not be a short-term alternative. However, as energy costs increase, government policy in favour of rail is implemented, neighbouring developments are constructed to share the rail infrastructure, more appropriate loading facilities are developed and Aluminium Pechiney requires more capacity to expand, the alternative of rail may become more attractive and feasible. It is therefore recommended that AP should investigate the technical and economic feasibility of transporting ingots by rail and allow for a possible rail line to be incorporated into their future operations. This would include a site layout that can accommodate a rail line with minimum interference in day-to-day transport and operations.

7. CONCLUSIONS AND RECOMMENDATIONS

1. During the peak period of the construction phase a significant number of additional vehicles will be generated. It is unlikely that the existing road infrastructure can accommodate this traffic at acceptable levels of service. The mitigation measures recommended require coordination between the construction programme of the AP smelter and the Coega road network. It is recommended that AP and CDC monitor progress on the construction of the Coega road network and implement upgrading at critical intersections if required.

2. AP management should take cognisance of the impact and mitigation measures identified in Sections 4 and 5 for the construction and operational phase of proposed plant in the Coega IDZ.

3. AP management should advise all contractors of the mitigation measures proposed for construction as listed in Section 4 during the construction tender process.

4. AP should take note of the legal requirement to transport abnormal loads and hazardous loads, especially as contained the National Road Traffic Regulations (1999) Chapter 8. According to this regulation, the consignor (AP), the consignee and the operator should agree on their responsibilities for the transportation of hazardous substances. However, in the event that hazardous substances are transported by sea, proper international permits will have to be applied according to the Basil Convention. Refer to the Materials Handling and Waste Management specialist study (6) for the requirements of these applications.
5 Based on a brief assessment in Section 6, it is recommended that AP should investigate the technical and economic feasibility of transporting ingots by rail and to allow for a rail service to be incorporated into their future operations when and if such a service becomes more attractive and feasible. However, as a short-term alternative AP should investigate the use of vehicles with a load carrying capacity higher than 24 tons to transport ingots to the harbour in order to reduce the number of heavy vehicles on Neptune and Ranger roads.

6 Taking into account the impact and mitigation measures identified in this assessment, this study concludes that there appear to be no transport-related fatal flaws that can seriously hamper the development of the AP smelter in the Coega IDZ.
8. REFERENCES


## ANNEXURE A:
### RESPONSE TO ISSUES RAISED IN THE PUBLIC PARTICIPATION PROCESS AS CONTAINED IN THE FINAL SCOPING REPORT

### EXTRACT FROM FINAL SCOPING REPORT

<table>
<thead>
<tr>
<th>ISSUE</th>
<th>SCOPING REPORT RESPONSE</th>
<th>SPECIALIST STUDY RESPONSE</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.1 Transportation of Goods</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.1.1 How will Aluminium Pechiney haul material between the smelter and the harbour? Has rail been considered? There is a definite over-utilisation of roads and under-utilization of rail in South Africa and the maximum use of rail will be preferable to roads.</td>
<td>The majority of raw materials would be transported by conveyor from the harbour to the smelter; and finished products (ingots) will be transported by truck from the smelter to the harbour (see section 3.4.1). Alternative transport modes will be considered in the traffic and transportation study.</td>
<td>The option of using rail-based transport rather than road-based transport is considered in Section 6.</td>
</tr>
<tr>
<td>6.2 Integrated Transport Planning</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.2.1 The siting of the Aluminium Pechiney plant needs to take into account the proposed future commuter rail network planned for the IDZ. Cognisance needs to be taken of the existing and planned future rail lines for the IDZ. In particular, a proposed future commuter rail link is planned to link future lines from Uitenhage to Motherwell through the metallurgical cluster to the existing lines at the Aloes and Coega stations.</td>
<td>This comment has been noted and brought to the attention of the CDC. Within the IDZ, rail traffic has been investigated. This option is being kept open and may be implemented once the number of potential commuters and their actual location have been determined. The potential for rail transport associated with the smelter will be considered in the traffic and transportation specialist study.</td>
<td>The specialist study refers to the planned extension of the commuter and freight rail lines (Section 3.3). However, owing to uncertainty over when the rail lines will be operational, the impact assessment is based on the worst-case scenario assumption that it will not be implemented in the near future. Recommendations in the study do emphasise the need to expand and support rail-based transport.</td>
</tr>
<tr>
<td>ISSUE</td>
<td>SCOPING REPORT RESPONSE</td>
<td>SPECIALIST STUDY RESPONSE</td>
</tr>
<tr>
<td>-------</td>
<td>-------------------------</td>
<td>---------------------------</td>
</tr>
<tr>
<td>6.2.3 How will workers gain access to the site? There is at present no transportation to Coega.</td>
<td>It is anticipated that workers will gain access to the site by means of private vehicles, buses and minibus taxis. Transportation planning will be coordinated by the CDC, with buses to be provided to collect workers from the construction village and some other key areas.</td>
<td></td>
</tr>
</tbody>
</table>
ANNEXURE B:
TRAFFIC GENERATED DURING CONSTRUCTION AND OPERATIONAL PHASE

TRIP GENERATION DURING CONSTRUCTION PHASE

The estimated traffic volumes during the construction phase are based on the following assumptions:

- 20% of the construction workers will originate from the Port Elizabeth area, 55% from the Motherwell area, 20% from the Uitenhage area, and 5% from the eastern area.
- The modal split for workers originating from Port Elizabeth and the eastern area is 35:35:30, and for workers from the Motherwell and Uitenhage areas 5:70:25 (The modal split is: private cars: bus : minibus taxi). This results in an overall model split of 12:62:26. The general modal split for the Nelson Mandela area is 30:35:35 [8], but since the model is based on the understanding that during construction activities a high proportion of labourers will commute using a dedicated bus service, the higher values for bus services can be substantiated.
- The vehicle occupancy is 1,6 persons per vehicle for private cars, 50 persons per vehicle for buses and 12 persons per vehicle for minibus taxis. These figures are commonly used in the Nelson Mandela Metropolitan Municipality transport models[8]. Current bus occupancy figures[8] are, however, of the order of 43 persons per bus, but the likely availability of a dedicated bus service being provided during construction can be used to justify this increased figure.
- The estimated figure of 150 heavy vehicles per day (15 per hour during a 10-hour per day shift) required to transport construction material and equipment, as provided by Aluminium Pechiney [9], was accepted as “reasonable”.
- The percentage of trips generated in the opposite direction to the peak direction is 20%, 50% and 50% for private cars, buses and minibus taxis respectively. This means for example that 20% of private cars travelling to the site during the morning peak hour will travel back to their origin still during the peak hour (typically dropping somebody off at the site). For buses and minibus taxis, this means that a percentage of the vehicles will either hold at the destination or will only make the return trip in the off-peak period.
**Trips generated during peak hour in the construction phase**

<table>
<thead>
<tr>
<th>Transport</th>
<th>Origin</th>
<th>Proportion</th>
<th># People</th>
<th>Modal split</th>
<th>Vehicle trips in peak direction</th>
<th>Vehicle trips in opposite direction</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>PC BS TX RL HV</td>
<td>PC BS TX RL HV TT</td>
<td>PC BS TX RL HV TT</td>
</tr>
<tr>
<td>People</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>PE area</td>
<td>20%</td>
<td>1200</td>
<td>35 35 30 0 0</td>
<td>263 8 30 0 0 301</td>
<td>53 4 15 0 0 72</td>
</tr>
<tr>
<td></td>
<td>Motherwell area</td>
<td>55%</td>
<td>3300</td>
<td>5 70 25 0 0</td>
<td>103 46 69 0 0 218</td>
<td>21 23 34 0 0 78</td>
</tr>
<tr>
<td></td>
<td>Uitenhage area</td>
<td>20%</td>
<td>1200</td>
<td>5 70 25 0 0</td>
<td>38 17 25 0 0 79</td>
<td>8 8 13 0 0 28</td>
</tr>
<tr>
<td></td>
<td>Eastern area</td>
<td>5%</td>
<td>300</td>
<td>35 35 30 0 0</td>
<td>66 2 8 0 0 75</td>
<td>13 1 4 0 0 18</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>100%</td>
<td>6000</td>
<td></td>
<td>469 74 131 0 0 674</td>
<td>94 37 66 0 0 196</td>
</tr>
<tr>
<td>Material</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>PE area</td>
<td>60%</td>
<td>9</td>
<td>0 0 0 0 0 100</td>
<td>0 0 0 0 9 9</td>
<td>0 0 0 0 9 9</td>
</tr>
<tr>
<td></td>
<td>Eastern area</td>
<td>20%</td>
<td>3</td>
<td>0 0 0 0 100</td>
<td>0 0 0 0 3 3</td>
<td>0 0 0 0 3 3</td>
</tr>
<tr>
<td></td>
<td>Northern area</td>
<td>20%</td>
<td>3</td>
<td>0 0 0 0 100</td>
<td>0 0 0 0 3 3</td>
<td>0 0 0 0 3 3</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>100%</td>
<td>15</td>
<td></td>
<td>0 0 0 0 15 15</td>
<td>0 0 0 0 15 15</td>
</tr>
</tbody>
</table>

**Mode characteristics:**

<table>
<thead>
<tr>
<th>Mode (abbreviations)</th>
<th>Persons/vehicle</th>
<th>Opposite direction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Private cars (PC)</td>
<td>1,6</td>
<td>20%</td>
</tr>
<tr>
<td>Buses (BS)</td>
<td>50,0</td>
<td>50%</td>
</tr>
<tr>
<td>Taxis (TX)</td>
<td>12,0</td>
<td>50%</td>
</tr>
<tr>
<td>Rail (RL)</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Heavy vehicles (HV)</td>
<td>N/A</td>
<td>100%</td>
</tr>
</tbody>
</table>
TRIP GENERATION DURING OPERATIONAL PHASE

Estimated heavy vehicle trips generated for the transportation of materials during the operational phase

<table>
<thead>
<tr>
<th>Material</th>
<th>Extent tons p.a.</th>
<th>One-way trips per day (Total trips per day)</th>
<th>One-way trips in peak hour (Total trips in peak hour)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liquid pitch</td>
<td>38 000</td>
<td>5 (10)&lt;sup&gt;A&lt;/sup&gt;</td>
<td>0.5 (1,0)&lt;sup&gt;A&lt;/sup&gt;</td>
</tr>
<tr>
<td>Aluminium fluoride</td>
<td>8 800</td>
<td>1 (2)&lt;sup&gt;A&lt;/sup&gt;</td>
<td>0.1 (0,2)&lt;sup&gt;A&lt;/sup&gt;</td>
</tr>
<tr>
<td>Heavy fuel oil</td>
<td>31 800</td>
<td>5 (10)&lt;sup&gt;A&lt;/sup&gt;</td>
<td>0.5 (1,0)&lt;sup&gt;A&lt;/sup&gt;</td>
</tr>
<tr>
<td>Aluminium ingots</td>
<td>485 000</td>
<td>56 (112)&lt;sup&gt;B&lt;/sup&gt;</td>
<td>2.3 (4,6)&lt;sup&gt;B&lt;/sup&gt;</td>
</tr>
<tr>
<td>Waste</td>
<td>27 600</td>
<td>9 (18)&lt;sup&gt;A&lt;/sup&gt;</td>
<td>0.9 (1.8)&lt;sup&gt;A&lt;/sup&gt;</td>
</tr>
<tr>
<td>Total</td>
<td>591 200</td>
<td>76 (152)</td>
<td>4.3 (8.6)</td>
</tr>
</tbody>
</table>

Notes on table:

Payload capacity of vehicles is 24 tons
A: Based on 10 hours a day (8:00 to 18:00) and 6 days a week
B: Based on 24 hours a day and 7 days a week

The estimated traffic volumes during the operational phase are based on the following assumptions:

- 35% of the workers will originate from the Port Elizabeth area, 40% from the Motherwell area, 20% from the Uitenhage area and 5% from the eastern area.
- The modal split for workers originating from the Port Elizabeth and eastern areas is 50:0:50 and for the Uitenhage and Motherwell areas 5:0:95. (The modal split is: private cars : buses : minibus taxis respectively.) These figures result in an overall modal split of 36:0:63 which compares well with the recognised private versus public transport split in the Nelson Mandela area. Owing to the small number of people requiring public transport, the public transport component for the workers will most probably be accommodated by minibus taxis alone.
- The vehicle occupancy is 1.6 persons per vehicle for private cars and 12 persons per vehicle for minibus taxis. These figures are typical of those used in the Nelson Mandela Metropolitan Municipality transport models.
- It is expected that 134 heavy vehicle trips per day (7 per hour during the typical morning and afternoon peak hours) will be generated during the operational phase to transport raw materials and ingots. A further 18 return trips will be required to transport the waste generated on site to dedicated waste disposal sites.
- The percentage of trips generated for personnel transport in the opposite direction to the peak direction is 20% and 50% for private cars and minibus taxis respectively. This means, for example, that 20% of private cars travelling to the plant in the morning peak hour will travel back to their origin still within the peak hour (typically dropping somebody off at the plant). For minibus taxis it means that a percentage of the vehicles will hold at the destination during the off-peak
hours. For the transport of raw materials and finished product 100% of trucks driving to the smelter will be leaving again during the peak traffic period.

- It is assumed that there will be approximately 9 trucks per day transporting waste off the Aluminium Pechiney site with carrying capacities of 10 and 15 tons per truck (2 trucks a day will transport general waste to the general waste disposal sites, 2 trucks a day will transport hazardous waste to a hazardous waste disposal site, and 5 trucks a day will transport re-useable and recyclable waste to various centres in Port Elizabeth or South Africa (e.g. cement or lime plants, dross recycling plant)).
Trips generated during peak hour in the operational phase

<table>
<thead>
<tr>
<th>Transport</th>
<th>Origin</th>
<th>Proportion</th>
<th># People</th>
<th>Modal split</th>
<th>Vehicle trips in peak direction</th>
<th>Vehicle trips in opposite direction</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>PC BS TX RL HV</td>
<td>PC BS TX RL HV TT</td>
<td>PC BS TX RL HV TT</td>
</tr>
<tr>
<td>People</td>
<td>PE area</td>
<td>35%</td>
<td>157.5</td>
<td>70 0 30 0 0 0</td>
<td>92 0 4 0 0 0 96 18 0 2 0 0 20</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(excluding Motherwell area shift)</td>
<td>40%</td>
<td>180</td>
<td>5 0 95 0 0 0</td>
<td>8 0 14 0 0 22 2 0 7 0 0 9</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Uitenhage area workers)</td>
<td>20%</td>
<td>90</td>
<td>5 0 95 0 0 0</td>
<td>4 0 7 0 0 11 1 0 4 0 0 4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Eastern area</td>
<td>5%</td>
<td>22.5</td>
<td>70 0 30 0 0 0</td>
<td>13 0 1 0 0 14 3 0 0 0 0 3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>100%</td>
<td>450</td>
<td>116 0 26 0 0 142 23 0 13 0 0 36</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Transport</th>
<th>Origin/Destination Proportion</th>
<th># Trips</th>
<th>Modal split</th>
<th>Vehicle trips in peak direction</th>
<th>Vehicle trips in opposite direction</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>PC BS TX RL HV</td>
<td>PC BS TX RL HV TT</td>
<td>PC BS TX RL HV TT</td>
</tr>
<tr>
<td>Material &amp; Port of Ngqura</td>
<td>60%</td>
<td>3.0</td>
<td>0 0 0 0 100</td>
<td>0 0 0 0 3 3</td>
<td>0 0 0 0 3 3</td>
</tr>
<tr>
<td>waste PE area</td>
<td>20%</td>
<td>1.0</td>
<td>0 0 0 0 100</td>
<td>0 0 0 0 1 1</td>
<td>0 0 0 0 1 1</td>
</tr>
<tr>
<td>Rest of SA</td>
<td>20%</td>
<td>1.0</td>
<td>0 0 0 0 100</td>
<td>0 0 0 0 1 1</td>
<td>0 0 0 0 1 1</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>100%</td>
<td>5.0</td>
<td>0 0 0 0 5 5</td>
<td>0 0 0 0 5 5</td>
</tr>
</tbody>
</table>

Mode characteristics:

<table>
<thead>
<tr>
<th>Mode (abbreviations)</th>
<th>Persons/vehicle</th>
<th>Opposite direction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Private cars (PC)</td>
<td>1.2</td>
<td>20%</td>
</tr>
<tr>
<td>Buses (BS)</td>
<td>50.0</td>
<td>50%</td>
</tr>
<tr>
<td>Taxis (TX)</td>
<td>12.0</td>
<td>50%</td>
</tr>
<tr>
<td>Rail (RL)</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Heavy vehicles (HV)</td>
<td>N/A</td>
<td>100%</td>
</tr>
<tr>
<td>Total (TT)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## Annexure C: Advantages and Disadvantages of Various Modes of Transport

Generic advantages and disadvantages of the various modes of transport

<table>
<thead>
<tr>
<th>Transport mode</th>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
</table>
| Road           | • Well established national infrastructure  
• Accessible by any legal road vehicle  
• Numerous land-based routes  
• Serves all national destinations  
• Maintained by local, provincial and national authorities  
• Road vehicles are readily available and affordable | • Limited control of accessibility and use causes mismatch in demand and supply  
• Limited loading capacity  
• Extended travel times during peak hours and incidents/congestion  
• Noise  
• Atmospheric emissions  
• Restricts pedestrian movement |
| Ship           | • Capable of handling large loads  
• No effect on other modes | • Dependent on shipping schedules  
• Limited to destinations with a port |
| Conveyor       | • Operator has total control over usage  
• Limited effect on other modes  
• Capable of handling continuous loads | • High initial costs of infrastructure  
• High maintenance cost  
• No flexibility in system during long shut-down periods  
• Fixed origin and destination  
• Noise |
| Rail           | • Access and usage are controlled  
• Capable of handling large loads | • Requires high-cost on-site infrastructure and rolling stock  
• Rolling stock expensive to acquire and maintain  
• Fixed origins and destinations |
ANNEXURE D:
ADVANTAGES AND DISADVANTAGES OF ROAD AND RAIL
## Comparison of road and rail transport modes in the context of the Aluminium Pechiney development

<table>
<thead>
<tr>
<th></th>
<th>Road transport</th>
<th>Rail transport</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>COST</strong></td>
<td>Lower investment in specialised equipment to handle metal movements at smelter and port.</td>
<td>Requires higher cost to maintain. More dependent on continuous increasing fuel prices</td>
</tr>
<tr>
<td><strong>IMPACT ON SURROUNDING LAND</strong></td>
<td>Common infrastructure shared by DZ and port users.</td>
<td>Rail line can run on road surface - share the same area in plant and harbour</td>
</tr>
<tr>
<td><strong>INFRASTRUCTURE AND OPERATIONS</strong></td>
<td>Technology established for direct loading of ingots from casting operations to truck/trailer combination. Wide availability of transport equipment through local subcontracting arrangements.</td>
<td>Small loads require high frequency of trips.</td>
</tr>
<tr>
<td></td>
<td>Road transport</td>
<td>Rail transport</td>
</tr>
<tr>
<td>----------------------</td>
<td>----------------</td>
<td>----------------</td>
</tr>
<tr>
<td><strong>Advantages</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SAFETY</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ENVIRONMENTAL</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>High number of heavy vehicle trips on public roads can increase frequency and severity of roads accidents</td>
<td>More energy efficient</td>
</tr>
<tr>
<td></td>
<td>Low levels of traffic low enforcement</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Higher levels of noise and air pollution</td>
<td></td>
</tr>
</tbody>
</table>

A  The option of loading the ingots directly onto a full train set, rather than breaking the set into wagons to be separately loaded in the cast house, may not require a shunting yard. In this option other shunting yards in the CDC can be used for maintenance purposes.