13. TRAFFIC AND TRANSPORT

Goba Pty Ltd was appointed by Bohlweki Environmental to undertake a traffic/transportation impact study as part of the Environmental Impact Assessment for the proposed Power Station development to be located near Lephalale (previously Ellisras) in the Limpopo Province. A study area locality plan is shown in Appendix W, Figure 1.

This report contains a description of the Status Quo transport environment and infrastructure, the transport/traffic impact for the construction and operation of the proposed Power Station and access road alternative evaluation. The proposed Power Station is to be situated on the farm Naauwontkomen and the proposed Ash Dump on the adjacent farm Eenzaamheid.

13.1. Status Quo Conditions

The following section summarises the present conditions related to traffic/transportation for the development of the proposed Power Station.

13.1.1. Provincial Roads and Traffic Volumes in the Surrounding Area

The latest Provincial traffic counts that could be obtained were 12hour (06:00 to 18:00) traffic counts undertaken in 2004. The daily traffic volumes may typically be 20% higher. These traffic volumes have been captured on Figure 2, Appendix W depicting all the major Provincial Roads approaching Lephalale. The major road approaching from the south (via Vaalwater), route R517 or Road P198-1, carries 838 vehicles with 8% of these being heavy vehicles. This road is in very good condition, apart from some isolated patches. There is however a significantly steep pass which affects heavy vehicle speeds. This is the preferred route for all traffic from the south. A secondary route from the south is the road from Thabazimbi (R510) or road P84-1. This route carries 494 vehicles with 22% of these being heavy vehicles. Although only average in condition, this seems to be the preferred heavy vehicle route judging from the significantly higher percentage of heavy vehicles, probably because the grade is not as steep as the P198-1.

The road extending from Lephalale to Steenbokpan (D1675) passing through the Township of Onverwacht carries 3346 vehicles over 12 hours. This high traffic volume, in relation to other surrounding provincial roads, only extends to the Grootegeluk mine, the current Matimba Power Station and Marapong Township. Notably this volume is local in nature but four times higher than the provincial roads from the south.

The road to Steenbokpan (D1675) only carries 155 vehicles over 12 hours and becomes gravel several kilometres west of the Afguns Road(D2649) turnoff. The Afguns road only carries 20 vehicles per day. The estimated Daily E80's (Equivalent 80KN axle loads) for the same provincial roads are shown in Figure 3, Appendix W.

13.1.2. Description of Road Infrastructure

Photographs of the most significant road junctions are shown together with a map index in Appendix W.

The present Matimba Power Station is located some 10 km from the residential township of Onverwacht located on an east-west aligned provincial tarred road with end the destination of Stockpoort (Botswana /RSA border). Onverwacht is located 3km west of Lephalale.

The Grootegeluk Mine and Marapong township are located a further 3km northwest on the same road (D2001).

Some 8 km west of Onverwacht is a tarred road to Steenbokpan proceeding due west (D1675). Off this road is another turnoff due south to Afguns (D2649). For ease of description the roads will be described by their end destination.

A map highlighting these roads and other transport infrastructure is shown in Appendix W., Figure 4.

13.1.3. Description of Travel Patterns

Detailed 12 hour classified traffic counts were undertaken in April 2005 at the following locations:

- Nelson Mandela Drive & Apiesdoring (Onverwacht)
- Stockpoort Road & Steenbokpan Road
- Stockpoort Road & Matimba Power Station access
- Stockpoort Road & Grootegeluk Mine/Marapong

A summary of the counts is shown in Figure A1, A2 and A3, Appendix W. for the morning peak , afternoon peak and 12 hour time periods.

The traffic counts undertaken in April 2005 indicate that 94% of the daily traffic to the present Matimba Power Station originates from Lephalale/Onverwacht with the other 6% coming from the Grootegeluk Mine itself. No traffic comes from the Steenbokpan (D1675) or Afguns (D2649) roads.

The peak hour of vehicular traffic at the Matimba Power Station access gate was observed to be between 06:30 and 07:30 in the morning and between 15:45 and 16:45 in the afternoon consistent with shift work at the facility.

There is a significant vehicular movement to/from the Marapong township (adjacent to Matimba) from/to Lephalale/Onverwacht during the morning and afternoon peaks.

Vehicular traffic to/from the Kumba Grootegeluk Mine is similar in magnitude to that to/from the Matimba Power Station.

The results of the traffic evaluation of the peak hour operations at the key intersections is shown in Table A1, Appendix W.. These results indicate high levels of service at all junctions with significant spare capacity.

13.1.4. Location of Employee Residences

The travel patterns established from the traffic counts indicate clearly that the major source of employees or their residential areas are located in Onverwacht, Marapong and Lephalale itself. This is not expected to change significantly for the operation of the proposed new power station.

13.1.5. Other Transport Infrastructure

There is a railway line from Thabazimbi to the Grootegeluk Mine which has a loop at the end of the line located just north of the mine and the mine itself has a rail siding branching from the main rail line.

There is presently a conveyor line supplying the Matimba Power Station with coal which traverses the provincial road to Stockpoort. The transport infrastructure mentioned is depicted in Appendix W, Figure 4.

13.2. Assumptions for Traffic/Transport Impact

13.2.1. Proposed Power Station

- Present Matimba Power Station output is approximately 4000 MW.
- Matimba B will have a maximum capacity of approximately 4800 MW.
- Matimba B will also be a dry Cooled power station.
- The proposed new power station will require at least one major access road for employees from the nearest provincial road to the site.
- The number of employees and vehicles generated/attracted to the proposed Matimba B Power Station will be based on the proportion of the power station output. As a result a significant workforce would need to be housed most

probably in the expansion of the present residential areas of Onverwacht and Marapong.
- Matimba B Power Station will be located more or less centrally on the farm of Naauwontkomen, or possibly slightly to the south.
- The ash dump, ash processing and ancillary facilities will be located on the adjacent farm Eenzaamheid.

13.2.2. Coal Supply

- The coal supply from the Kumba Grootegeluk Mine is infinite in magnitude for the design life of both the present and proposed power station.
- Coal supply transport will be undertaken via ground level conveyors.
- These conveyors will generally pass under any road, rail or powerline infrastructure when crossing it.

13.2.3. Ash Handling

- The transport of ash from the power station to the ash dump will be via ground level conveyor systems.
- These conveyors will generally pass under any road, rail or powerline infrastructure when crossing it.
- Should a decision be made to use either Wet or Dry Flue Gas Desulphurisation for the reduction of sulphur dioxide (SO_2) emissions into the atmosphere, the resulting waste product will be combined with fly ash and dumped on the ash dump via the same ash conveyors.
- In the event that an emissions control technology such as FGD is implemented, the life of the ash dump would be significantly reduced and its extent significantly enlarged

13.3. Traffic/Transport Impacts

13.3.1. Access Road/ Provincial Road Re-alignment Alternatives

The present Provincial Road (D1675) to Steenbokpan cuts directly through the middle of both the farm Naauwontkomen and Eenzaamheid. As the planned Power Station footprint and Ash Dump footprint require the full extent of the farm areas, the Provincial Road would have to be realigned. Two viable alternatives have been identified and are the subject of the following best alignment traffic transport evaluation.

The proposed Matimba B Power Station footprint, Ash Dump footprint and infrastructure is shown in Figure B1, Appendix X..

The Provincial Roads Authority would also have to be consulted to re align the road.

- *Alternative 1- Northern Alignment*
  Alternative 1 deviates from the present tarred Provincial Road (D1675) at a point 1.65km from the D2001 road junction at a point designated A. From this point the alignment denoted ABCDEFGH basically follows the northern border of the two farms to meet with the present alignment again some 11km at point H, which coincides with the western boundary of the farm Eenzaamheid. The intermediate points have been so denoted to identify significant crossings or features as described below:
  - **A** start point
  - **B** proposed new junction with provincial road D2649
  - **C** at grade rail crossing
  - **D** coal conveyor crossing
  - **E** proposed new Power station access road
  - **F** Alt 2 merge point
  - **G** proposed Ash Dump access road
  - **H** end point

  Salient features of Alternative 1 can be summarised as follows:
  - it is only 800m longer than the present alignment
  - a 90degree junction can be formed with the extension of D2649(K-B)
  - the level crossing is very similar to the present condition
  - it has no unnecessary bends in the alignment
  - the alignment is located on the northern border of the farms allowing for long term future expansion of both Power Station and Ash Dump southwards
  - a 100km per hour design speed can easily be maintained

- *Alternative 2 - Southern Alignment*
  Alternative 2 deviates from the present tarred Provincial Road (D1675) at a point 2.3km from the D2001 road junction at a point designated J. From this point the alignment denoted JKLMNFGH basically follows the southern border of Naauwontkomen farm, turns 120degrees northward along the border between the two farms and then turns 100degrees left to meet with the proposed northern alignment again some 12.6km at point H, which coincides with the western boundary of the farm Eenzaamheid. The intermediate points have been so denoted to identify significant crossings or features as described below:
  - **J** start point
  - **K** proposed new junction with **existing** provincial road (construction road)
  - **L** proposed new Power station access road

- **M** at grade rail crossing
- **N** proposed secondary Power station access road
- **F** Alt 2 merge point
- **G** proposed Ash Dump access road
- **H** end point

Salient features of Alternative 2 can be summarised as follows:

- it is 2350m longer than the present alignment
- a complex junction needs to be formed with the existing road if it needs to be used for construction purposes
- the at-grade rail crossing at point M is not ideal on a bend (safety hazard)
- it has two significant bends in the alignment (not ideal for Provincial road)
- the alignment traverses the border of the farms necessitating an ash conveyor crossing and impairing a potential internal farm road connection between farms
- the 100km per hour design speed needs to be reduced for the intermediate section (60 km per hour maximum) as the alignment negotiates two significant bends

As the alignment of Alternative 2 is somewhat sub-standard in terms of a Provincial 100km per hour design speed, an Alternative 2B has been proposed to effectively iron out the severe bends of Alternative 2. This is shown as a dashed line in Figure B1. This option requires more land take and sterilisation of the Eskom property and also requires the gravel extension of Road D2649 to form a new junction perpendicular with the re-aligned road D1675. The length of the new alignment is then reduced to be some 900m longer than the present alignment. Unfortunately there is still an unsafe level crossing on a bend albeit of larger radius.

In comparison the distance to the proposed new power station is the same. Alternative 1 needs a coal conveyor crossing and Alternative 2 and 2B needs an ash conveyor crossing. They both require an at-grade rail crossing. Alternative 2 is a sub-standard Provincial Road alignment with a potentially unsafe at-grade crossing on a bend and the estimated construction cost is 15% higher than Alternative 1, based on its length. Alternative 2B corrects the sub standard bends to 100km per hour design speed and is of equivalent length to Alternative 1 therefore being of equivalent construction cost. As Alternative 1 is far more linear in alignment, is located out of future expansion's way and does not have a potentially unsafe at-grade crossing on a bend, it is preferred.

The preferred road alignment for the proposed Matimba B Power Station is Alternative 1- the Northern Alignment.

The provincial road re-alignment impact is moderately severe, the extent is regional, the duration is permanent, it will definitely occur, its significance is moderate, and the degree of certainty is definite.

13.3.2. Transport of Components during Construction

Eskom technical consultants have indicated that one or several very large 250-350 ton component parts would need to be transported to the Site from either Durban harbour or Richards Bay. The frequency of delivery would be no more than 1 every six months. This would require abnormal load transport and the application for the permit to do so is a lengthy and costly process which is outlined below.

The most likely route from Durban harbour or Richards Bay follows National Route N2 along the Kwazulu-Natal coast via Pongola and Piet Retief to Ermelo. From there National Route N11 needs to be followed via Middelburg to Marble Hall. The route then deviates to Nylstroom across the N1, onto Vaalwater and westward along Route R33 and R510 to avoid the steep grades of P198-1 to Lephalale. From Lephalale the route follows Road D1675(Nelson Mandela drive), turning off towards Steenbokpan and the proposed Matimba B site. The overall distance is 835km from Durban to Matimba B.

- *Abnormal Load Permit Application*
  The critical part of the Abnormal Load Route Permit application is the survey of the prospective route by a qualified structural Engineer who needs to examine all the bridges/overpasses/underpasses and issue a certificate of compliance for the particular vehicle type/width/length and height.

  It is estimated that the whole survey and Application procedure may take three to four months to complete, and this would have to be scheduled in the construction programme of the Matimba B Power Station. Although the tonnage is significant the low frequency of the trips means that the traffic loading impact is negligible. Close to the construction site, turning radii of 50m is required for the large superlink loads.

  The transport of components impact is slight, the extent is regional, the duration is very short term, it will definitely occur, its significance is low, and the degree of certainty is definite.

13.3.3. Construction Traffic

This traffic relates directly to the traffic expected during the construction of the proposed Power Station itself, which is expected to take place over a period of 42 months. It is anticipated and estimated that the number of construction

employees to/from the construction site will be of the order of 4000 per day. There is a possibility that a temporary construction camp could be established on the farm Eenzaamheid, to accommodate 2000 construction employees. These employees would not need to use the external roads to access the site. It is conservatively assumed that 1600 (80%) of the balance would typically be transported to site from Marapong by bus. The balance, 400, would arrive by car from Lephalale and Onverwacht. In vehicular terms 32 buses are required and 333 cars are expected to be generated assuming an average occupancy of 1.2 per car. Of this daily construction employee traffic 75% is conservatively assumed to arrive in the a.m. peak hour and depart in the p.m. peak hour.

The magnitude and exact nature of heavy vehicle construction traffic is very difficult to determine. The sources of construction materials, supply of material components and the construction programme all influence the nature and frequency of road-based vehicle transport to/from the site. The source of construction material would mainly be Gauteng. The raw materials for the on-site Cement plant can arrive by rail. Obviously a rail siding would have to be constructed and the possible alignment of this siding is shown in Figure B1, Appendix X.

The heavy vehicle construction traffic is assumed to amount to 20 trucks per day. 50% of the trucks are expected to arrive during the A.M peak hour and depart in the P.M. peak. The cumulative vehicular traffic impact of construction employees and heavy construction vehicles is shown in Figures B2 to B7, Appendix X, for the a.m. peak, p.m. peak and 12 hour periods respectively.

A traffic evaluation was performed at the key intersections under consideration. A mid time period of 2008 was chosen to represent the construction traffic scenario. The results for the 2008 traffic impact compared to the 2005 existing traffic are shown in Table B1 for the a.m. and p.m. peak hour (Appendix X).

The results show that the 2008 construction traffic impact on peak hour traffic operations at the key intersections surrounding Matimba is not significant.

The impact on pavement loading to the surrounding roads may, however, be more significant. Assuming the 20 truckloads per day which are fully loaded inbound (3.5 E80s per truck) and empty outbound (1.8 E80s per truck) translates to 106 E80s per day along Road D1675 which presently carries an estimated 530 E80s per day. This represents a proportion of 20%. The accumulative additional axle loading over a sustained 42 month period is 138 012 E80s. The overall impact of the construction traffic during the construction period translates to advancing the need for pavement rehabilitation by 20%. This situation is the worst-case for the Provincial road D1675. As the traffic dissipates along the R510 (Road P84-1) and R517 (Road P198-1) the proportional impact becomes reduced

as it is highly unlikely that 20 trucks per day could be sustained for the entire construction period.

The additional impact on the pavement of the section of road (D2001) from the D1675 turnoff to Marapong for 64 buses per day(2.5 E80s per bus) is 160 E80s per day. This represents a proportion of 36% of the present daily loading of 445 E80s. If this is accumulated over the 42 month construction period the impact will be 208 320 E80s. If the roads were planned to be rehabilitated in 7 years time then the impact of the bus traffic would mean that rehabilitation would have to be undertaken in 4 years and 6 months time, an advance of 2.5 years.

For the section of the new aligned provincial road D1675 from the D2001 junction to the proposed Matimba B Power Station site turnoff the estimated E80s is 266 E80s per day. At present there are only 45 E80s per day. The construction traffic loading therefore represents an impact which is sixfold the present situation.

The effect on pavement loading and subsequent advance of any rehabilitation programme should be mitigated after completion of construction. Such mitigation and associated costs would need to be discussed between Eskom and the provincial roads authority. Agreement would need to be reached regarding mandates and responsibility for the road rehabilitation for 20km of Road D1675 (Lephalale to Matimba B) and Road D2001 from D1675 to the Marapong turnoff.

The construction traffic impact is moderately severe, the extent is localised, the duration is short term, it will definitely occur, its significance is moderate, and the degree of certainty is probable.

13.3.4. Transport of Employees (Operational Traffic)

The additional traffic generated in transporting employees from their residences to work at the proposed Power Station and back was evaluated with Onverwacht and Marapong being the major residential areas. In vehicular terms presently Marapong contributes 16 % and Onverwacht/Lephalale 82% to the Matimba Power Station traffic.

In broad terms the nature and magnitude of traffic to Matimba Power Station is expected to double with the employee traffic being directed to the location of the new proposed power station site. In addition it was assumed that the increase in production required by the Grootegeluk Mine would result in a 50% increase in their expected traffic. All this traffic was superimposed on the existing 2005 scenario for the a.m. peak, p.m. peak and 12 hour periods which was expected to materialize by 2010 (Appendix Y).

This traffic was evaluated at the key intersections along the present Stockpoort (D2001) and Steenbokpan (D1675) provincial roads during the peak hours and compared to the existing 2005 Levels of Service. In magnitude the additional Matimba B traffic represents a traffic growth rate of 6% p.a over 5 years. The results of the traffic evaluation indicate that the impact of the 2010 operational traffic is small as there is presently sufficient spare capacity at all key junctions to accommodate this traffic increase (Appendix Y).

The impact of the proposed Matimba B Operational traffic on the road pavement varies from a 17.6% increase on road D2001, a 22% increase on the Onverwacht section of road D1675 to a 700% increase on the section just east of the new Matimba B access. The large increase of 700% is only because the base traffic figures are so low. In real terms even this large increase only translates to a very small number of E80s per day, well within the design limits of a lightly trafficked pavement. The increase of 17.6% and 22% is comparable to the 20% increase due to construction traffic.

The effect on pavement loading and subsequent advance of any rehabilitation programme should be mitigated. Such mitigation and associated costs would need to be discussed between Eskom and the provincial roads authority. Agreement would need to be reached regarding mandates and responsibility for the road rehabilitation for 20km of Road D1675 (Lephalale to Matimba B) and Road D2001 from D1675 to the Marapong turnoff. The negotiation should however also consider the economic growth, job opportunities and increased local economy created by the proposed Power Station.

The operational traffic impact is moderately severe, the extent is localised, the duration is long term, it will definitely occur, its significance is high, and the degree of certainty is definite.

13.3.5. Coal Supply Transportation

The coal supply conveyor is required to serve the proposed Power Station from the Grootegeluk Mine coal washing plant to the Power Station. Two alternative alignments have been identified.

Alternative 1 follows the present Rail infrastructure (offset 100-150m), needs to cross the preferred road alignment at location D (conveyor under road) after which it turns due west towards the Power Station. The length of this Alternative 1 is 8.13km.

Alternative 2 deviates from the alignment along the rail line, directly across the Grootegeluk Mine property to cross the preferred road alignment near point E

before proceeding westward to the Power Station. The alignments are shown in Figure B1, Appendix X. The length of Alternative 2 is 6.73km.

Although Alternative 2 is significantly shorter and would therefore cost less, the Alignment is subject to the agreement of the Grootegeluk Mine. It has been determined that the Mine is NOT in favour of any conveyor crossing their property in that vicinity and they are in favour of the Alternative 1 alignment.

The Alternative 1 coal supply conveyor alignment is preferred.

The coal supply transport impact is slight, the extent is localised, the duration is long term, it will definitely occur, its significance is low, and the degree of certainty is definite.

13.3.6. Ash Transportation

As the Ash processing facilities will be located on the Eenzaamheid farm which is directly adjacent to Naauwontkomen, the ash conveyor alignment is direct and simple.

If the preferred road alignment is to be used then no road crossing will be necessary.

The ash transport impact is slight, the extent is localised, the duration is long term, it will definitely occur, its significance is low, and the degree of certainty is definite.

13.3.7. Transportation of Sorbent for Flue Gas Desulpurisation Plant

Flue Gas Desulpurisation (FGD) is the principal technology used to control sulphur dioxide (SO_2) emissions from Pulverised Fuel coal fired combustion processes. There are two commercial categories of FGD, namely Wet and Dry. The Wet FGD process utilises limestone as raw material and the Dry FGD process utilises lime as raw material.

The transportation and storage of lime has to be in enclosed containers at all times and can only be sourced from the Northern Cape some 850km away from Matimba B. Although the transportation thereof could best be accomplished by rail, the delivery cost per ton is 5.6 times that of limestone. Limestone can best be sourced from Dwaalboom in the Northwest Province which is loacted a distance of 190km from Matimba B. As both suppliers have rail sidings and spurs and the distances are significant, it is recommended that the transport of raw material be undertaken by rail.

If the FGD process is to be used, Eskom will have to construct a new rail siding, loop and marshalling yard to supply the Matimba B Power Station. Its alignment and probable location is shown in Figure B1, Appendix X.

Case studies have shown that the tonnage of limestone required for Wet FGD is 1.8 times that of lime required for Dry FGD and that when fully operational some 1.3 million tons of limestone will be required per annum. It is inconceivable that this enormous quantity of limestone should be transported by road. This would mean 92 40 ton trucks per day for every day of the year. The same tonnage could be accomplished by 1178 trains per annum each of 38 wagons carrying 30 tons each. This translates to 3.23 trains per day for every day of the year. The present train volume is 2 trains per day.

Even this low quantity of trains has a highly significant impact on the offloading facilities required. This quantity of material will require a marshalling yard of some kind or rail loop around/adjacent to the Power Station site to be able to offload a train within 8 hours. Also to be noted is that the grade of a marshalling yard can only be 1:800 and the radius of the loop should be a minimum of 300m. The length of train sould also not be longer than 1000m to be able to be accommodated on the loop section without crashing into its own tail.

The above quantities mean that the lowest environmental impact would be achieved by transporting the raw materials for Flue Gas Desulphurisation by rail.

The FGD transport impact is moderately severe, the extent is regional, the duration is long term, it may occur, its significance is high, and the degree of certainty possible.

13.4. Conclusions

A summary of the EIA traffic / transport impact reults are included in Appendix Z.

- The preferred road alignment for the proposed Matimba B Power Station is Alternative 1- the Northern Alignment.
- The provincial road re-alignment impact is moderately severe, the extent is regional, the duration is permanent, it will definitely occur, its significance is moderate, and the degree of certainty is definite.
- The transport of components impact is slight, the extent is regional, the duration is very short term, it will definitely occur, its significance is low, and the degree of certainty is definite.
- The construction traffic impact is moderately severe, the extent is localised, the duration is short term, it will definitely occur, its significance is moderate, and the degree of certainty is probable.

- The operational traffic impact is moderately severe, the extent is localised, the duration is long term, it will definitely occur, its significance is high, and the degree of certainty is definite.
- The Alternative 1 coal supply conveyor alignment is preferred (along present rail alignment) to Naauwontkomen.
- The coal supply transport impact is slight, the extent is localised, the duration is long term, it will definitely occur, its significance is low, and the degree of certainty is definite.
- The ash transport impact is slight, the extent is localised, the duration is long term, it will definitely occur, its significance is low, and the degree of certainty is definite.
- The impact of the transportation of sorbent for FGD is moderately severe, the extent is regional, the duration is long term, it may occur, its significance is high, and the degree of certainty possible.

13.5. Recommendations

In the event that Flue Gas Desulphurisation is accepted as an appropriate abatement technology, it is recommended that a detailed evaluation be undertaken for the transport of Flue Gas Desulphurisation raw material supply to optimise the placement of infrastructure and minimise operations costs.

It is recommended that the effect on pavement loading and subsequent advance of any road rehabilitation programme should be mitigated after completion of construction. Such mitigation and associated costs would need to be discussed between Eskom and the provincial roads authority. Agreement would need to be reached regarding mandates and responsibility for the roads rehabilitation programme for 20km of Road D1675 (Lephalale to Matimba B) and Road D2001 from D1675 to the Marapong turnoff.