GAUTENG DEPARTMENT OF PUBLIC TRANSPORT, ROADS AND WORKS

ADDENDUM TO THE DRAFT ENVIRONMENTAL IMPACT ASSESSMENT REPORT FOR THE PROPOSED GAUTRAIN RAPID RAIL LINK BETWEEN JOHANNESBURG, PRETORIA AND JOHANNESBURG INTERNATIONAL AIRPORT

MAIN SUMMARY REPORT

Submitted to the Gauteng Department of Agriculture, Conservation, Environment and Land Affairs

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EXECUTIVE SUMMARY: CONCLUSIONS OF THE ENVIRONMENTAL IMPACT ASSESSMENT (EIA) FOR THE PROPOSED GAUTRAIN PROJECT

Eighteen specialist environmental reports and two further specialist reports (an Environmental Resource Economics and a Heritage Impact Assessment study) have formed the backdrop to the draft EIA report and this Addendum for the proposed Gautrain Rapid Rail Link project. Since the Gautrain rail corridor passes through an already largely urbanised area, most identified impacts in the EIA pertain to the social and socio-economic environment. Potential impacts on the biophysical environment are relatively few and localised.

The focus of the EIA has been on route alignment alternatives. The originally published reference route in January 2002 has been changed and refined as a direct result of the public participation process and the findings of the EIA.

The project as a whole has been independently reviewed and found to be both financially and economically feasible. Whilst concerns about environmental impacts in affected communities have been raised, many Interested and Affected Parties (I&APs) have still expressed support for the project as a whole. In addition, although certain individuals involved in the public participation process during the EIA indicated that they would not use the train, the ultimate target for train ridership is only 1 in 5 (20%) of the current private car users in the Pretoria-Johannesburg corridor.

The technology to be used for the train has been ring-fenced, to ensure proven systems and internationally accepted standards are followed, and to exclude untested or very expensive technologies, but the type of train and rolling stock to be used remains the responsibility of the bidders in their design proposals for this Public Private Partnership (PPP) project.

Based on the findings and recommendations of the specialist studies and a synthesis of environmental impacts, a recommended route alignment for the entire rail system between Johannesburg, Tshwane and Johannesburg International Airport is shown overleaf.

The draft EIA report and this Addendum concludes that the project is acceptable from an environmental perspective, provided mitigatory measures mentioned in the specialist studies in the draft EIA report and in the updated draft Environmental Management Plan (EMP) in this Addendum are taken into consideration, and subsequently enhanced by the successful Concessionaire to guide final design, construction and operation of the Gautrain.

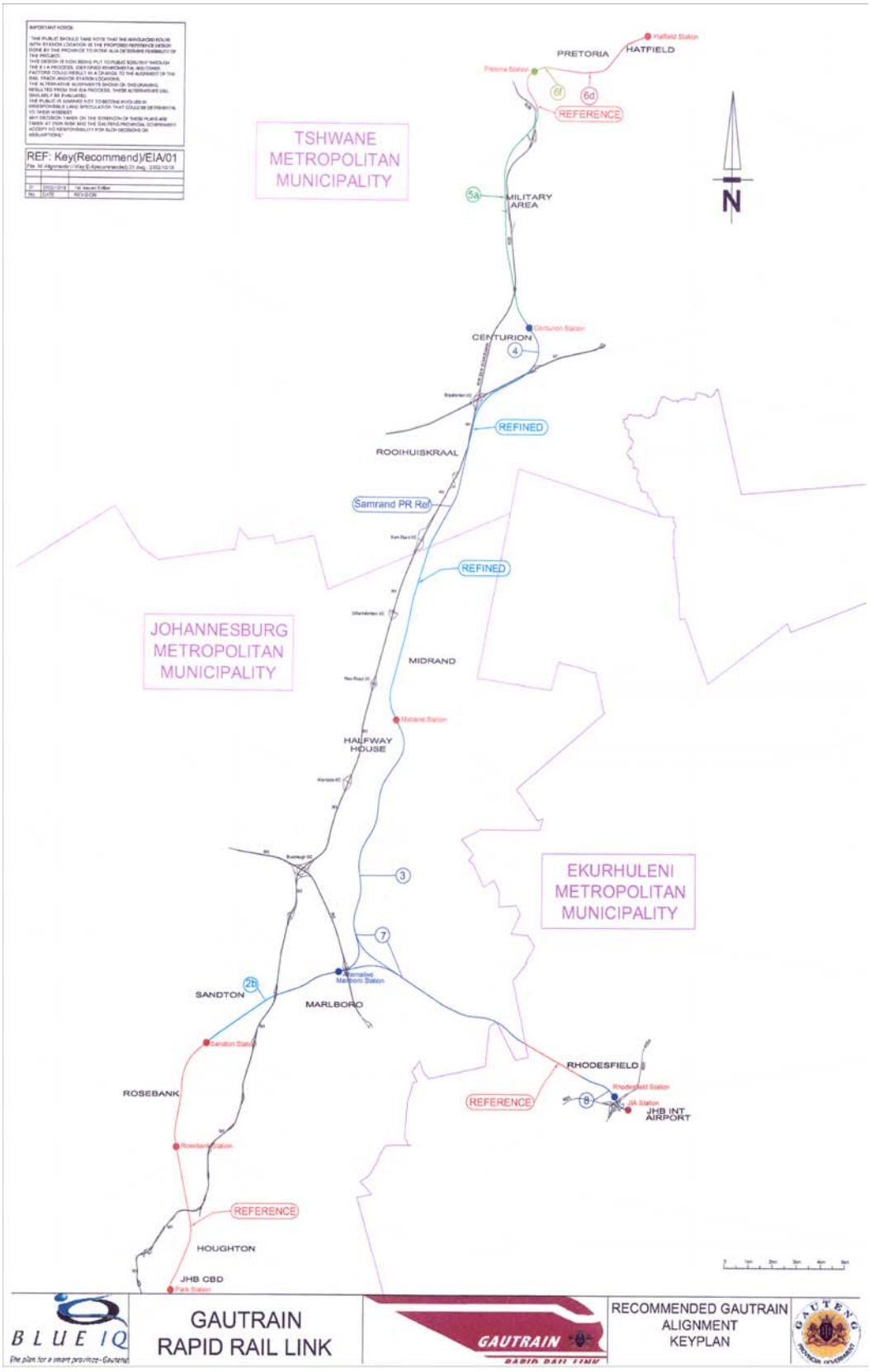
REF: Key(Recommend)/EIA/01
TSHWANE METROPOLITAN MUNICIPALITY
JOHANNESBURG METROPOLITAN MUNICIPALITY
EKURHULENI METROPOLITAN MUNICIPALITY
PRETORIA
HATFIELD
REFERENCE
MILITARY AREA
CENTURION
REFINED
ROOIHUISKRAAL
Samrand PR Ref
MIDRAND
HALFWAY HOUSE
SANDTON
MARLBORO
ROSEBANK
RHODESFIELD
JHB INT AIRPORT
HOUGHTON
JHB CBD
N
BLUE IQ
GAUTRAIN RAPID RAIL LINK
GAUTRAIN
RECOMMENDED GAUTRAIN ALIGNMENT KEYPLAN
GAUTENG

Figure A2

If the project proceeds, the EMP will be further updated, and mitigation measures refined, once the preferred bidder's proposals for the design, construction and operation of the train system are known.

ACRONYMS AND ABBREVIATIONS

BID	Background Information Document
EIA	Environmental Impact Assessment
ERE	Environmental Resource Economics
EMP	Environmental Management Plan
Gautrans	Gauteng Department of Public Transport, Roads and Works
GDACEL	Gauteng Department of Agriculture, Conservation, Environment and Land Affairs
GDP	Gross Domestic Product
HIA	Heritage Impact Assessment
ITP	Integrated Transportation Plan
I&APs	Interested and Affected Parties
JIA	Johannesburg International Airport
LIDP	Local Integrated Development Plan
NEMA	National Environmental Management Act
NLTTA	National Land Transport Transition Act
PFMA	Public Finance Management Act
PLTF	Provincial Land Transport Framework
PPP	Public Private Partnership
ROD	Record of Decision
SANRAL	South African National Roads Agency Ltd
SARCC	South African Rail Commuter Corporation
SDI	Spatial Development Initiative

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1. INTRODUCTION

1.1. Purpose of this Document

The draft Environmental Impact Assessment (EIA) report for the proposed Gautrain Rapid Rail Link project was made available to Interested and Affected Parties (I&APs) for comment on 21 October 2002. At the same time, the draft report was also submitted to the Gauteng Department of Agriculture Conservation and Environment and Land Affairs (GDACEL), the decision making authority on the EIA. The draft EIA report was originally made available for public comment until 21 November 2002 - a period of 30 days. The comment period was subsequently extended by a further 30 days (until 21 December 2002) at the request of I&APs.

This Addendum to the draft EIA report contains the following further information in support of the EIA application for the Gautrain:

- Errata and Supplementary Information

  Appendix A of the Addendum corrects the main errors identified in the draft EIA specialist reports, either brought to light during the review process or during the I&AP comment period on the draft EIA report. Minor amendments or additions to the draft specialist reports, as a result of omissions, or to provide clarity as a result of discussions with I&APs pending route refinements, have also been included in Appendix A, together with current information regarding the proposed station locations and parking requirements at the stations, as well as maps and plans of route refinements agreed with key I&APs on the recommended route since the release of the draft EIA report.
- Public Participation

  Minutes of the public meeting held with I&APs in Pretoria, since the release of the draft EIA report, are included in Appendix B of the Addendum. A list of all Focus Group meetings held with I&APs since the inception of the EIA is also included in Appendix B. A set of all the minutes to the Focus Group and public meetings, details of I&APs on the public participation database, all comments received from I&APs and media coverage of the project have been forwarded to GDACEL to assist them in their decision making.

- Further Studies

  New information which has become available during the review period, or new studies that have been completed as a result of the comments received from I&APs on the draft EIA report, have been included as Supplementary Volumes to the Addendum.

  The new information includes:

  * A further Environmental Resource Economics (ERE) study (Supplementary Volume 1 to the Addendum) on the recommended route alignment between Pretoria Salvokop/Station and the proposed Hatfield Station in Tshwane, in order to provide additional information and to assist decision making on the external welfare impacts and mitigation costs of the recommended route via Muckleneuk (6FD) in comparison with a tunnelled route via Park Street (6B). Additional information acquired on noise and visual impacts to assist the ERE study is also included.
  * A Phase Two Heritage Impact Assessment (HIA) report (Supplementary Volume 2 to the Addendum) on the recommended route alignment contained in the draft EIA report between Park Station, Johannesburg and Hatfield Station in Tshwane (the Phase One study contained in the draft EIA report evaluated alternative routes from a heritage perspective).
  * The full results of the draft localised traffic impact studies (Supplementary Volume 3 to the Addendum) undertaken by Gautrans, the project proponent, for the proposed Gautrain stations.

- Comments and Responses on the Draft EIA Report

  A summary of the comments received on the draft EIA report, as well as the draft ERE and HIA reports has been included as Appendix C to the Addendum. The full copies of the correspondence received on the aforementioned draft reports and the full responses to them follow in Appendix D of the Addendum. All I&APs who submitted comments have received individual replies.

- Synthesis of Environmental Impacts

  Lastly, Volume 6 of the draft EIA report, which synthesised and summarised the EIA team's key findings, has been revisited in the following section of the Addendum in the light of the new information acquired during the review period, and the comments received from I&APs on the draft EIA, ERE and HIA reports. The final conclusions and recommendations of the EIA are contained in this section of the Addendum, together with an updated draft Environmental Management Plan (EMP). The draft EMP will be further refined if the project is approved by GDACEL according to the conditions of their Record of Decision. The EMP will also need to be updated once the final designs of the successful bidder for the Gautrain are tabled.

2. SYNTHESIS OF ENVIRONMENTAL IMPACTS

2.1 Introduction

This section of the Addendum to the draft EIA report revisits the main findings of Volume 6 of the draft EIA report in the light of the further studies undertaken and comments received on the draft EIA report. It firstly addresses issues of a more general nature pertaining to the EIA and public participation processes, the Gautrain as a Public Private Partnership (PPP) project and environmental matters affecting all sections of the recommended route, as well as general mitigation measures. Thereafter it focuses on specific environmental impacts pertaining to the different sections of the recommended route alignment, including more specific mitigation measures.

The mitigation measures have been highlighted for the attention of the bidding consortia for the project so that they may incorporate these into their design proposals. This section of the Addendum does not analyse in detail every single issue raised by I&APs. For this, the reader is referred to Appendix C to the Addendum which summaries all the issues and comments received in the draft EIA report, and Appendix D to the Addendum, where all the comments received from I&APs, and the responses of the EIA team, are captured.

2.2 EIA Process

The EIA process for the proposed Gautrain Rapid Rail Link project has been specifically agreed to by GDACEL, as reflected by its approval of the Plan of Study and the amended Plan of Study for the EIA process.

On the advice of GDACEL, a reference route for the proposed Gautrain project, that in turn emerged from a feasibility study, that evaluated alternative routes and included environmental screening of these alternatives, was published at the initiation of the EIA. Route alignment alternatives to the reference route then emerged via the public participation process for the EIA. The feasible route proposals were then evaluated and compared in detail by the different specialists in the EIA team. This proved to be an effective and efficient manner in which to assess the potential environmental impacts of the proposed project. We submit that the EIA and public consultation processes have been thorough and comprehensive and have been in compliance with all relevant statutory provisions.

Concerns raised about the draft EIA report regarding the final design, planning, construction and traffic impacts of the project will be addressed in the final Environmental Management

Plan (EMP), once the detailed design has been completed by the successful bidder. This is a typical characteristic of large scale Public Private Partnership (PPP) projects such as this one, where the project process, by its nature, requires many developmental phases. In view of this, it is our opinion that the EIA process that has been followed takes this PPP process into account and has investigated the relevant issues in sufficient detail to recommend a route alignment for the proposed project. Should a new route, which has not been the subject of an environmental assessment, be suggested by the successful bidder in the design phase of the project, then the Gauteng Transport Infrastructure Act No. 8 of 2001 requires that an environmental assessment be completed to the satisfaction of GDACEL on the new route.

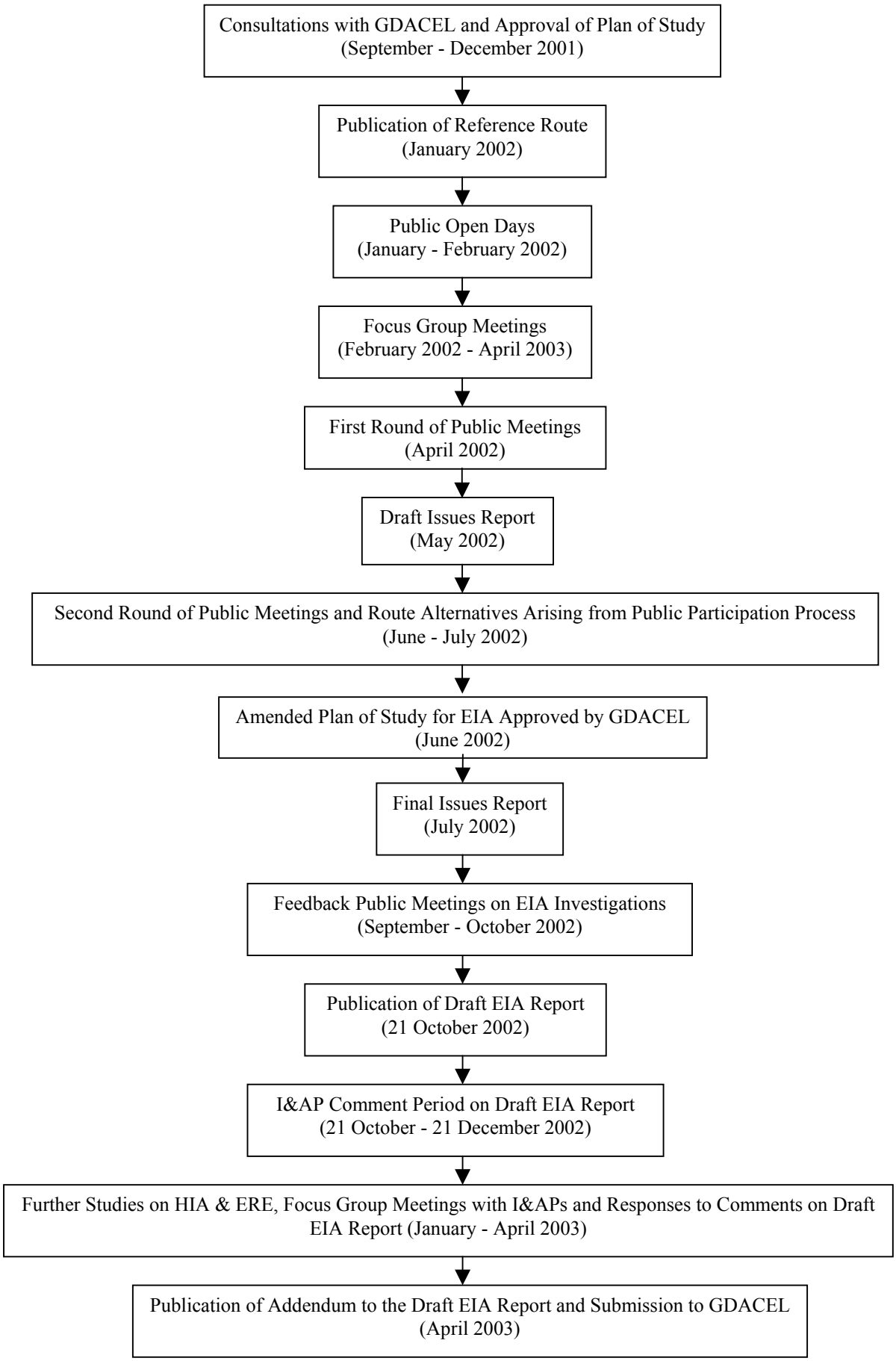
2.3 Public Participation Process

The public participation process for the Environmental Impact Assessment (EIA) was a crucial mechanism to inform the public, the authorities and Interested and Affected Parties (I&APs) about the need for, purpose and aims of the proposed Gautrain Rapid Rail Link project. However, it also served to elicit the issues, concerns, needs and requirements of I&APs as input into the EIA, and many useful suggestions in regard to the route alignments were incorporated directly into the EIA process. The objectives of the public participation process included:

- the facilitation of a focused public involvement and consultation process to enable I&APs to provide input into the EIA process and share information;
- the investigation of the issues and concerns and route alignment alternatives raised by I&APs; and
- to function as an on-going data-gathering and facilitation tool for input into the EIA specialist studies and for the development of mitigation measures.

The public participation process for the EIA (see Figure 2.1) commenced in January 2002 and was carried out in terms of the Environment Conservation Act of 1989 and the National Environmental Management Act of 1998. After consultations with the Gauteng Department of Agriculture, Conservation, Environment and Land Affairs (GDACEL), the authorising body for the EIA, a Plan of Study for the EIA was approved, which stipulated that a proposed reference route for the Gautrain be published and put to public scrutiny. In accordance with the EIA Regulations, advertisements about the EIA were placed in regional and national newspapers and also in public places. The advertisements contained a map of the proposed reference route for the Gautrain, as well as the details of the public Open Days at which the reference route would be shown in detail on aerial photographs.

FIGURE 2.1 EIA AND PUBLIC PARTICIPATION PROCESS FOR THE GAUTRAIN PROJECT



In addition to formal advertising, press releases were issued to national, regional and local newspapers, journals and magazines, TV stations and community radio stations. A media conference was also held on 16th January 2002. The purpose of the media conference was to communicate information regarding the EIA process as widely as possible.

An EIA website (www.gautraineia.co.za) for the project was also developed and made accessible from January 2002. The website provided background information on the EIA process and allowed I&APs to register their interest in the project and the EIA, ask questions and provide comments.

Potential I&APs with an interest in the project continued to be identified throughout the EIA process. Specific attention was paid to potentially affected residents organisations, environmental interest groups and relevant authorities.

Five Open Days were held (in Johannesburg, Sandton, Midrand, Centurion and Pretoria) when the reference route was published. The purpose of the Open Days was to provide I&APs with information about the project, identify issues and concerns and answer any initial questions regarding the project and the EIA process.

A Background Information Document (BID), or briefing paper, was compiled and distributed to all I&APs. The BID was made available at the Open Days and throughout the remainder of the EIA. The document contained information regarding the EIA process, the proposed project and the consultants involved. The document also contained a registration sheet, which enabled I&APs to register their interest in the project, and so receive future communication regarding the project.

Formal meetings were conducted with specific groups of key stakeholders. These Focus Group meetings commenced after the Open Days, and continued throughout the duration of the EIA until the submission of this Addendum to GDACEL. Stakeholders were grouped according to formal associations or their specific interests in the project. Minutes of these meetings were compiled and distributed to the I&APs who were present for verification.

A series of seven initial public meetings on the project were held between 10th and 23rd April 2002, at key centres along the route. Invitations were mailed to all I&APs on the database, and advertisements regarding the public meetings were placed in the newspapers. At these meetings, an indication was also given by I&APs of possible route alignment alternatives that

should be considered in the EIA. Minutes of the meetings were compiled and distributed to I&APs who were present for verification.

Issues and concerns raised by I&APs from January to March 2002 were captured in a draft Issues Report, which was made available in public places (e.g. libraries and local information centres, on the project EIA website, as well as the offices of the lead environmental consultants) from 16th May 2002, for a 30-day comment period, until 18th June 2002. Comments were received from the public and continued to be received from new I&APs potentially affected by route alignment alternatives proposed for inclusion in the EIA. The Issues Report was subsequently updated and made available on the website, at public places, as well as to key I&APs on request, from 31st July 2002, and was also forwarded to GDACEL for their information.

The Plan of Study for the EIA was subsequently amended, and approved by GDACEL, to take account of the feasible route alignment alternatives which emerged during the public participation process and which were included in the EIA for evaluation.

A second series of public meetings was held between 26th June 2002 and 1st July 2002 to inform I&APs of the feasible alternative route alignments that had arisen out of the public participation process and which were to be included in the EIA. Three public meetings were held in Sandton, Centurion and Pretoria, which were the areas most affected by route alignment alternatives and where new I&APs needed to be brought into the EIA process. The public meetings were primarily held to allow the public (especially newly affected I&APs) to gain information about the project and the alternative route alignments, and to provide feedback on these alignments, the EIA process and the EIA specialist studies.

Feedback public meetings were held in September and October 2002 towards the end of the EIA process. The main objective of these public meetings was to provide the broader public with feedback on the main findings of the EIA and proposed mitigation measures, as well as to provide them with the opportunity to raise any queries and comments regarding the EIA studies and the proposed Gautrain project.

The draft EIA report was released for public comment on 21 October 2002 for a 30-day comment period. This was subsequently extended until 21 December 2002 to allow I&APs sufficient time to comment on the draft report. Since that time, a further specialist Environmental Resource Economics (ERE) study and the Phase 2 Heritage Impact Assessment (HIA) study, whose focuses were mainly the Pretoria area, have been conducted

mainly in response to comments from I&APs. Draft reports emanating from these studies were released for public comment prior to finalisation. The draft ERE report was released for public comment on 3 February 2003 until 10 February 2003. The draft HIA report was released on 11 March 2003 for public comment until 19 March 2003. This latter comment period was subsequently extended until the 24 March 2003. These reports, together with the localised traffic impact studies undertaken by Gautrans, constitute the only substantive new information included in this Addendum.

The public participation process has been comprehensive and extensive incorporating the input, views, issues and concerns of wide range of stakeholders. Over 5500 individuals and organisations (the latter in turn representing large memberships) were registered on the public participation database. The total number of Focus Groups and public meetings held over the course of the EIA is summarised below.

Table 2 1: Meetings held with I&AP Groupings during the EIA Process

Section of Route	No of Focus Group Meetings	No of Public Meetings	Total
Johannesburg – Sandton	14	3	17
Sandton – Marlboro	17	3	20
Marlboro – Midrand	2*	-	2
Midrand – Centurion	9	2	11
Centurion – Pretoria	8	4	12
Pretoria – Hatfield	46	3	29
Marlboro – JIA	11*	2	13
Total	**107**	**17**	**124**

*1 joint meeting involving stakeholders in the Marlboro – Midrand and Marlboro – JIA sections of the route was held.

The Focus Group meetings on the environmental impacts of the recommended route alignment have continued with some I&APs after the submission of the draft EIA report. The EIA team has also periodically attended a number of other meetings held with local authorities, government departments and other key stakeholders. These meetings were chaired by the Gautrain Technical Team, through which individual working groups were established to deal with specific issues involving these stakeholders.

To obtain some degree of consensus about the preferred route alignment amongst a disparate range of stakeholders has proved a challenge. Ultimately, the professional judgement of the

EIA specialists, taking into account numerous technical and financial considerations, was exercised in drawing their conclusions and recommendations.

Every attempt has been made to involve as many affected people as possible in the project. In certain cases individual communication with particular affected landowners took place once these parties had registered as interested and affected parties (I&APs) for the project. The project has received widespread publicity and people were constantly urged through the media and at public meetings to become involved in the project. The requirements relating to public consultation in both the EIA Regulations and the National Environmental Management Act have been complied with.

Apart from participation in consultations with Interested and Affected Parties (I&APs) throughout the EIA process, the Gautrain Technical Team has furthermore taken the following steps to ensure an integrated process and proper consultation with other planning authorities:

- Establishment of a Project Steering Committee on which municipalities, the SARCC and other Provincial Departments are represented.
- Use and extension of the Gauteng Transport Demand Model rather than developing a dedicated Gautrain model.
- Consultations with municipalities, including a presentation to the Johannesburg Local Integrated Development Plan (LIDP) project committee.
- Consultations with SANRAL (South African National Roads Agency Ltd).
- Consultations and exchange of information with the Super Highways Toll Scheme developers.
- Consultations with the Alexandra Urban Renewal project and Gauteng Housing Department.
- Consultations with Johannesburg Planners regarding the planning of the proposed Marlboro Station.
- Consultations with the minibus taxi industry.

Gautrans is committed to an integrated planning process and a holistic approach to transportation planning in particular. For this purpose it has established consultative forums, such as the Transportation Co-ordinating Committee (TCC), on which all municipalities are represented, as well as a Gauteng Rail Planning Committee on which municipalities and the South African Rail Commuter Corporation (SARCC) are represented.

2.4 Key Issues for Consideration in the Decision Making Process

In synthesising the EIA specialists' findings, the EIA team has been guided by the requirements of section 24(7) of the National Environmental Management Act (NEMA) in conducting the assessments and making recommendations. The requirements of NEMA relating to the EIA process and to public participation have been addressed in the previous sections of this Chapter.

In the following sections of this part of the Addendum, the synthesis aims to provide a summary of the key environmental impacts and mitigation measures, as they apply at a project level, or across the whole of the recommended route alignment. This includes an analysis of the no-go option. Thereafter, the key findings of the specialist investigations are summarised as they relate to sections of the route corridor, viz.:

- Park Station, Johannesburg to Sandton via Rosebank
- Sandton - Marlboro
- Marlboro - Midrand
- Midrand - Centurion
- Centurion - Pretoria
- Pretoria - Hatfield
- Marlboro - JIA

The rating and ranking of route alignment alternatives in the draft EIA report was ultimately based on both the individual and collective professional judgements of the specialists in the EIA team. The errors contained in some of the ranking tables in the draft EIA report have been rectified (See Appendix A). These corrections have no bearing on the conclusions drawn from the tables in the draft EIA report. The ratings set out in Chapter 34, Volume 6 of the draft EIA report were used as a tool in reaching the recommendations contained in the report.

The rating and ranking exercise was not intended to be a purely statistical appraisal, but was a means to establish route preferences when taking into account subjective and variable issues typically encountered in the environmental and social sciences. It must be stressed that the evaluations of the route alternatives by the EIA team as set out in the ratings in Chapter 34, Volume 6 of the draft EIA report were based on the environmental advantages and disadvantages of each route, identified by the specialists, without taking into account any technical and financial implications of the different alternatives. The team did however

consider economic and technical issues in making the final recommendations as we are required to do in terms of the National Environmental Management Act.

2.4.1 Need for and Feasibility of the Gautrain Project and the 'No-go' Option[1]

Background

The Gautrain Rapid Rail Link is one of the Spatial Development Initiatives (SDIs) of the Gauteng Provincial Government. The Gauteng SDI projects, including the Gautrain, are aimed at stimulating development in specific areas of the province with a high potential for economic growth, thereby creating employment opportunities. The Gautrain project is also in line with national government's stated policy to promote public transport, and to prioritise it over private transport. The project is targeted at attracting current private car-users to the rapid rail system, and thereby alleviating congestion on the roads between Pretoria and Johannesburg, where the traffic volumes have been growing at a rate of approximately 7% per annum for more than a decade.

The project proponent is Gautrans, the Gauteng Department of Public Transportation, Roads and Works. The EIA application for the Gautrain project is for the planning, design, financing, construction, operation and maintenance of approximately 80 kms of new railway line between Johannesburg, Tshwane and Johannesburg International Airport (JIA). The network consists of two spines, one linking Johannesburg and Tshwane and the other linking Sandton and JIA.

Broadly speaking, most of the I&APs and community groupings engaged during the EIA process were supportive of the general aims of the proposed Gautrain project. Concerns were largely focused on the route alignment and the potential environmental impacts associated with the alternative routes that emerged from the EIA process. However, a number of individuals and groupings have expressed doubts about the financial feasibility of the project, the projected patronage of the Gautrain and the integration of the proposed feeder and distribution public transport services, which will transport train users to and from the train stations.

[1] The information contained in this section is based on the independent macro-economic analysis contained in the draft EIA report. Baseline information required for the macro-economic study was obtained from Gautrans.

Financial/Economic Evaluation

The Gautrain Technical Team undertook a comprehensive survey, and modelled the projected ridership on the Gautrain. This model was reviewed by specialist consultants in London, and was also reviewed by Leeds University in the UK. The two bidding consortia also have to review this as part of their tasks in preparing their proposals, and their work will be reviewed by their lenders. The two bidding consortia include Cannac, the Canadian rail operator, and RATP, the public transport operator for Paris in France. From a transport economic perspective, the independent analysis conducted for the EIA shows that the Gautrain option (involving a combination of road and rail transport) would indeed lead to lower transport costs in the corridor between Pretoria and Johannesburg, compared to the base case (involving only road transport). Ultimately, the project is sufficiently large to also make a fundamental difference to land use and population density along the corridor, especially in the vicinity of the stations which will eventually further reduce demand for car travel in comparison to the option without rail. The project will, in addition, bring the Gauteng province in line with other commercial, financial and hi-tech areas elsewhere in the world, in comparable countries, with which South Africa needs to compete internationally.

The studies of a multi-disciplinary EIA specialist team, including transportation engineers and transportation economists, found conclusively that the Gautrain Rapid Rail Link system is both necessary and feasible. From a financial perspective the project is indeed affordable to the province and the country, which is implicit in the acceptance of the initial National Treasury Authorisations. Different economic scenarios faced by the country were examined and feasibility, viability and bankability models were reviewed. Calculations were checked and confirmed and no major problem areas were discovered. This type of project is by no means unique, in the context of a developing country, and the absence of such a project in South Africa could be harmful in terms of our perceived international competitiveness.

However, the most important factor is that the project has been prioritised and sanctioned as a crucial component of the province's strategy to grow its economy, create jobs and alleviate poverty. It therefore takes precedence over many other alternative uses and does not, according to the Provincial Treasury, jeopardise expenditure programmes in other sectors.

The economic benefits for the tax-payer, the economy of Gauteng and for the road users far exceed the project costs. The indications are that the Gautrain project will help to increase South Africa's Gross Domestic product (GDP) by R 2.6 billion per annum during the project implementation. Both the government's fiscal position and the country's balance of payments would be positively affected by the project over its economic life-span. As the Government's

contribution to the capital cost of the project forms the essence of the competitive bids, the province's feasibility results could not be made public.

An economic cost: benefit study was undertaken that proved that the benefits far outweigh the costs of the project. A summary report is available on the Gautrain web site (www.gautrain.co.za).

The project as conceived, is financially robust, and at this stage (before the bids have been received and evaluated) it is a sound proposition. There is no commitment until financial closure and this still needs National Treasury Authorisation, which is a very thorough process and will examine closely who takes the risks and potential project cost escalation.

Most of the financial risks have been contained and the fact that Gauteng will subsidise its share of the capital cost up front, instead of spreading it over the life of the project, means that future generations will have limited liability. The greatest risk remains potential ridership, but the evidence in favour of compelling pressures to induce passengers to use the Gautrain is substantial. Much will depend on the degree of success of the dedicated feeder and distribution systems, which have been made the responsibility of the bidders although Gautrans has completed plans in this regard. Assumptions made thus far regarding escalation and currency risk appear to be sound. Given that there has been no shortage of bidders including major banks, it can be concluded that many of the interested parties saw good commercial potential in the project, on the terms offered.

The cost estimates are, in general, not unreasonable and the ridership estimates are achievable in the medium term. It may also be concluded that the project is affordable and that it is part of an integrated transport strategy that is workable and that will, in time, fundamentally change land use patterns in its vicinity, which will lead to major savings in all types of infrastructure cost due to greater densification. These factors have not been included in the analysis. Property values in close proximity to the stations can, in addition, be expected to escalate over time.

Even if initial benefits are lower than anticipated, the long-term benefits will be significant and Gauteng will be able to continue to promote itself as a technology-based province able to compete internationally by offering world class support systems.

Even though this is by nature a capital-intensive project, the results of the independent economic modelling in the EIA strongly confirm the Gautrain's potential to be a major

facilitator of income and wealth elsewhere in the economy. For example, it is expected that a total number of 18 424 job opportunities (on average) per annum would be created by the project, of which about two-thirds would result from the improvement in the profitability and productivity of major users of both the train services and competing roads.

In summary, the Gautrain Rapid Rail Link project in its totality will contribute about one per cent to the GDP of Gauteng, which is no mean feat. Due to its relative size, and the long-term nature of the benefit streams the project will create, especially in downstream user industries, the capital/GDP ratio of the induced effects of the national savings and investment is well above the national average. This signifies the Gautrain's major contribution to the more efficient functioning of the Gauteng economy – given that approximately 74 per cent of its impact will be in the province itself. Thus, from the point of view of long-term growth, the Gautrain Rapid Rail Link project complies with the minimum economic efficiency and effectiveness criteria when viewed as a whole.

Technology/Transport and Land Use Policy

Some individuals have suggested that light rail or rapid bus systems would have been a much cheaper alternative. The drawback to this, however, is the limited volume of passengers that these alternative systems could handle.

The high speed electric-driven rail system currently being considered for the Gautrain Rapid Rail Link requires the curves on the route to have a radius of 1200-1800 meters, in order to ensure safe operation of the train, at speeds of over 160 km/h. Therefore, although the current recommended route does follow existing highway corridors to minimise environmental impacts, as far as is practically possible, the radii of many of the bends and the gradients of hills crossed by the highways do not allow for an exact match of the rail route, as motor vehicles do not have such stringent requirements for safe operation.

One of the parameters for the project is to utilise tried and tested rail technologies, which are in common use elsewhere in the world.

The station locations have also been chosen to support the Gauteng provincial government's existing Spatial Development Initiatives (SDIs), as well as to promote economic development in the areas around the stations. Certain station locations (eg. Johannesburg, Pretoria) have been selected as they provide business commuters with an interface between the established Metro Rail system and the Gautrain Rapid Rail Link. Station locations, such as Rosebank, Sandton and Midrand, have been selected as these areas have a high density of business

developments, and will be the destination stations for many business commuters, whereas other stations (eg. Centurion, Hatfield) have been positioned in areas where a large number of business commuters reside. Feeder and distribution services will be implemented as part of the project to increase the impact area of the stations and to serve other developments in the catchment areas of the stations. This includes educational facilities such as universities.

Station positions are also affected by the topography of an area and require a flat and straight alignment. These positions have been selected in consultation with local authorities to ensure that they will have the greatest impact. Educational institutions are also being encouraged to provide transport services to Gautrain stations to improve the accessibility of these facilities to students.

As part of the feasibility study, Gautrans visited most of the modern train systems in the world and had numerous discussions with specialists, transport authorities, manufacturers and operators worldwide. Gautrans took the decision that it would implement a system that represents world best proven technology. Systems that use the same technology are being constructed or have very recently come into operation internationally. The "stated preference" analysis undertaken for the project has provided confidence that the system, as proposed, will be successful. The proposed Gautrain system cannot be considered as similar to any current train system operating in South Africa, and the successful Concessionaire will be responsible for the marketing and advertising campaigns to ensure that the Gautrain will represent a transport mode of choice that will attract the required ridership and fully satisfy the need of passengers.

The Gautrain project is part of the Gauteng Provincial Land Transport Framework (PLTF) which was compiled in terms of the National Land Transport Transition Act No. 22 of 2000 (NLTTA) and is updated annually. It is also part of the Integrated Provincial Transport Network. It is thus not an ad hoc or loose standing element, but part of the provincial integrated holistic transport network.

Research has shown that even a vastly extended road network would not be the answer to growing traffic volumes in Gauteng, as this would not provide sufficient capacity. These findings endorse those found elsewhere in the world when tackling road congestion problems. From a technical (engineering) perspective, there was therefore a need to look at other modes in addition to (and in conjunction with) road transport.

The "Super Highways" toll road proposals indicate that the Gautrain Rapid Rail Link is not the only initiative to manage the growing traffic volumes. Continual improvements to the road network in Gauteng are part of the Integrated Transportation Plans (ITPs) and Integrated Development Plans (IDPs) of the various metropolitan municipalities in Gauteng. The Gautrain Rapid Rail Link Technical Team has consulted with representatives of the various municipalities in order to ensure that the proposed Gautrain Rapid Rail Link project will complement and be included in the ITPs and IDPs.

The NLTTA requires all levels of Government to actively support and promote public transport and give it priority above private transport. The promotion of public transport is also required in terms of the National Transport Policy. Public transportation systems, inter alia, have a lower land take, less pollution and lower environmental impacts, and provide a means of travel for people without cars. International studies have shown that a large proportion of tourists do not wish to rent cars, but would prefer to use public transport, on the condition that this is safe, secure and comfortable.

Currently, public transport in South Africa is mainly used by the lower income communities who do not own a motor car and do not have much of a modal choice, if any. Public transport is therefore not currently a mode of choice in South Africa. It is very important and necessary to establish in South Africa a public transport culture for persons with motor cars, as a mode of choice. A start needs to be made. The Gautrain will contribute significantly towards achieving this objective.

The Gautrain project is not intended solely for the upmarket affluent sector. It is part of the economic development strategy of the province that is aimed at the improvement of life for the entire community. The major part of the provincial budget is already spent on education, health, housing and other social services. The Gautrain will only represent a small component of the provincial budget and will partially be financed by the private sector. The Gautrain Rapid Rail Link is a Public-Private-Partnership (PPP) initiative that is regulated by the Public Finance Management Act (PFMA), No. 1 of 1999.

It must, however, be re-iterated that the project is extremely capital-intensive and that the further planning and management will require great attention, in order to maximise the efficiency and reduce the environmental impacts of the Gautrain Rapid Rail Link. The professionalism exhibited in project preparation to date does not give cause for concern in this regard. However, it will be important as a mitigation measure to ensure that key performance indicators are established and monitored regularly by the provincial authorities, in

consultation with appropriate stakeholders (eg. through working agreements with local authorities).

A further mitigation measure suggested is to develop a transport strategy linking travel demand management of the road system, the efficiency of the Gautrain feeder/distribution system and the level of ridership on the Gautrain itself (as required by the National Land Transport Transition Act, No. 22 of 2000 (NLTTA)).

The independent macro-economic analysis clearly concluded that the socio-economic benefits of the proposed Gautrain project are substantial. After evaluation of the findings of the other EIA specialists summarised below in relation to various sections of the route, it is concluded that the overall socio-economic benefits of the proposed project outweigh the negative environmental impacts identified in the draft EIA and further HIA and EIA reports. Although the no-go option was considered, it was therefore rejected. It is thus recommended that the project proceed, subject to the required financial approvals, and the implementation of the mitigation measures proposed in the environmental specialist reports in the draft EIA and the updated EMP in this Addendum.

2.4.2 Level of Available Information

Since the Gautrain is a PPP project, there remains at present a lack of detailed design information on which to develop precise mitigation measures tailored to specific areas or sites. This level of detail will only be possible once the final route alignment has been agreed, the draft detailed design drawings have been tabled and the type of train system and its supporting infrastructure has been selected.

Specialist work which will require verification at the detailed design stage will include noise and vibration, and the geohydrological evaluation, once detailed drilling along the route has been completed. The noise and vibration specialists in the EIA team have adopted 'worst case' scenarios in their investigations, so there is a strong possibility that the real situation will be better than predicted. In addition, a range of mitigation measures have been provided to deal with any unforeseen problems. The specialists are confident that, even should detailed drilling reveal geohydrological anomalies, the conservative approach adopted will allow for these to be accommodated at the design stage.

The lack of clear regulations and policy guidelines in South Africa as yet under the 1999 National Heritage Resources Act provided a challenge for the heritage specialists in defining the ambit of the Heritage Impact Assessment (HIA) undertaken for the project. Together with the unfamiliarity of some stakeholders with the Act and with heritage issues, this proved to be difficult in terms of interpreting and integrating heritage issues with other specialist areas where they overlapped (eg. visual, noise and vibration etc).

Despite the aforementioned shortcomings, the EIA team remain confident that the conclusions that have been drawn from the available facts and the detailed investigations undertaken are sound and based on sufficient information to recommend a route alignment for the project.

2.4.3 The Nature of the Environment and Mitigation Recommendations

The route corridor in which the proposed Gautrain project is located, follows one of the most urbanised and rapidly developing areas of Gauteng (viz. between Johannesburg and Tshwane). Most identified potential impacts emanating from the project, therefore, relate to the socio-economic environment rather than the biophysical environment. Potential impacts relating to the latter are localised and can largely be mitigated through careful design.

Key issues of a generalised nature, pertaining to the biophysical and socio-economic environments impacted by the project, are discussed below, with reference to the mitigation recommendations mentioned in the draft EIA report.

2.4.3.1 Biophysical Environment

<u>Flora and Fauna, Surface Water, Groundwater and Air Quality.</u>

Only one sensitive area (containing identified Red Data plant species) has been flagged for attention by GDACEL in terms of the recommended route alignment (see Section 2.11). Most of the other undeveloped areas affected by the recommended route are disturbed or man made environments, subject to invasion by exotic or alien species.

The attention of the bidding consortia is drawn to proposed mitigation measures for specific areas mentioned in the sections of the Addendum that follow, pertaining to the route alignments listed in Section 2.4.

General mitigation measures for potential minor impacts on the biophysical environment are included in the draft EIA report. The attention of the bidders is thus also drawn to the following sections of the draft EIA report.

Chapter 17:	Vegetation Study - pages 17-31 to 17-33. Avoidance where possible of the removal of established old trees.
Chapter 18:	Mammals and Herpetological Study - .pages 18-21 to 18-26.
Chapter 19:	Avifauna (Birds) Study - pages 19-30-19-34.Use of bird friendly powerline designs and avoidance of removal of trees where possible.
Chapter 20:	Invertebrates Study - pages 20-37 to 20-38.
Chapter 21:	Agricultural Potential Study - pages 21-5 to 21-7.
Chapter 22:	Surface Water and Wetlands Study - pages 22-58 to 22-59.
Chapter 23:	Groundwater, Geological and Geohydrological Study - pages 23-33 to 23-36.
Chapter 24:	Air Quality Study - pages 24-21 to 24-28. The air quality from ventilation shafts and tunnels should be checked once operation commences.

2.4.3.2 Socio-Economic Environment

Noise and Vibration, Social, Landuse, Traffic, Visual and Archaeology/Heritage

The bidding consortia should apply the most scrutiny in terms of their proposed design to the potential socio-economic impacts of the project.

Noise and vibration impacts have been difficult issues to explain to I&APs. Minimum standards in terms of noise and vibration have been recommended in the draft EIA report (see Chapter 12, Volume 3). In order to assist decision makers, I&APs and the bidding consortia, the work undertaken by the noise specialist has been summarised and clarified, together with a range of proposed mitigation measures for the recommended route alignment in Appendix A of the Addendum.

The scientific/technical procedures used to calculate the airborne noise, vibration and ground-borne noise impact are internationally accepted methods and these are listed in Chapter 12, Volume 3 of the draft EIA report. A conservative approach was taken.

Likewise the noise and vibration impact criteria are based on international standards and the standards specified are conservative.

The calculated values for noise and vibration presented in the various tables in Volume 3, Chapter 12 of the draft EIA report are unmitigated values, that is, these present the worst case scenario, as there are various measures that can be applied to reduce noise and vibration where these are found to exceed the impact criteria. The types of mitigating measures applicable are addressed in the report.

The draft EIA report recommends average and maximum noise and vibration levels that must be observed where the Gautrain passes through or underneath residential areas and educational precincts. These values are based on current best international practice. Where necessary, mitigating measures will be implemented to ensure that noise and vibration levels are kept within acceptable limits. These will ensure that there is no damage to property and/or disruption to normal activities.

The attention of the bidding consortia is drawn to proposed mitigation measures for specific areas mentioned in the sections of the Addendum that follow, pertaining to the route alignments listed in Section 2.4 above. General mitigation measures for potential impacts on the socio-economic environment are included in the draft EIA report. The attention of the bidders is thus also drawn to the following sections of the draft EIA report:

Chapter 9:	Landuse and Town Planning Aspects - pages 9-33 to 9-68.
Chapter 10:	Social Impact Assessment - pages 10-58 to 10-62.
Chapter 11:	Safety, Security and Health - pages 11-14 to 11-29, 11-33 and 11-34.
Chapter 12:	Noise and Vibration - pages 12-6,12-20 to 12-26, 12-36, 12-49 to 12-50, and Appendix 12B.
Chapter 13:	Traffic Impact Analysis - pages 13-26 to 13-28.
Chapter 14:	Heritage Survey - page 14-23, HIA Phase 2 Assessment: page 11-44; Appendix I.
Chapter 15:	Archaeological Study - page 15-3.
Chapter 16:	Visual Impact Assessment - pages 16-158 to 16-162.

It should be noted that draft localised traffic impact studies have been carried out by Gautrans (see Supplementary Volume 3 to the Addendum) and the findings documented in reports.

These reports specify required road upgrading and traffic control management measures to address potential traffic impacts in the vicinity of the proposed Gautrain station sites. Gautrans will provide funding for the required improvements in collaboration with the relevant local authorities. These road improvements will form part of the envisaged working agreements between Gautrans, the local authorities and the successful Concessionaire to ensure that the improvements are implemented as part of the Gautrain project.

It must be noted that the project is unlikely to "generate" significant additional traffic volumes but instead effect a diversion from road to rail mode and thus reduce traffic volumes on the broader road network. It is only on a localised scale that traffic is likely to be concentrated around stations.

A team of professionals, led by an urban designer and/or an architect, should be responsible for the design of each station, in order to ensure that each station blends in with the surrounding urban fabric. Facades and style of building should be matched to, or blend in with, that of existing buildings surrounding each station precinct. The final design of each station should satisfy local authority legislation and the Integrated Development Plans (IDPs) for each area.

An important aspect, which will require close attention by the bidding consortia, is that of environmental management during construction. The bidders will need to address issues surrounding construction techniques such as tunnelling, earth clearing and storage, blasting, disposal of soil from tunnelling, interruptions to services, safety and security, traffic control etc. Requirements in this regard have been laid out in the draft EMP (See Section 4). Close liaison with the affected communities and the relevant local, provincial and national authorities will be required, together with the need to acquire any licences associated with the construction phase.

2.5 Synthesis of Environmental Impacts : Johannesburg Park Station – Sandton Station

Park Station - Rosebank Station

The draft EIA report recommended that the reference alignment be followed on this section of the route.

The reference route from Johannesburg Park Station to Rosebank Station did not receive a lot of comment from I&APs during the public participation process for the EIA. This is most likely due to the fact that the route is deep in tunnel (over 80m below ground in places) and because it runs below Oxford Road in its approach to the proposed Rosebank Station.

The Gautrain Technical Team has revisited the possible re-alignment of the route north of Park Station along Clarendon Street, as proposed by the City of Johannesburg, to facilitate the placement of ventilation shafts. In determining the recommended route, special care was taken at the entrance to Park Station to minimise the impact on the basements and foundations of existing buildings. The alignment of the rail north of Park Station is influenced by the position of high rise buildings immediately to the north of the station. A further consideration is that one of these buildings has deep piled foundations. Thus it is not considered technically feasible to adjust the alignment from that proposed in the reference route as it exits Park Station

No significant noise and vibration impacts are predicted at the surface when the line is in tunnel. The noise and vibration limits set for the Gautrain will not be exceeded along most of this section of the rail corridor.

Low frequency noise due to ground-borne vibration may possibly be audible in the area above the tunnel beneath the Parktown ridge, notably those areas where the bedrock is close to the surface. The potentially affected areas include Houghton Estate (2.2-2.6 km) and The Wilds Botanical Garden (3.0 km). Of these the most critical section is through Houghton Estate where the Roedean school and the Parktown Vocational College may be affected. Mitigation measures are available, however, to reduce these impacts to within the prescribed limits where impacts will not be unreasonable. The bidder's attention is drawn to this matter in terms of the final design.

Indications are that the geology is relatively uniform in the area, but the bidders need to also include mitigation measures in their design and construction plans, should groundwater need to be dewatered during the tunneling process and to minimise impacts on underground aquifers and boreholes (see Chapter 23, Volume 4 of the draft EIA report). Loss of boreholes as a result of the tunneling will be compensated as part of the expropriation process for the project.

The Heritage Impact Assessment (HIA) completed as part of the EIA process has indicated that there will be no impacts on heritage resources along this section of the route, because the

tunnel will be at depth. The assessment indicated, however, that the placement of ventilation shafts for the tunnels should be checked at the final design stage to ensure that no heritage resources are affected.

Careful placement and design of tunnel ventilation shafts will mitigate the localised (noise and visual) impacts of these facilities and it is recommended that these be located on commercial properties or within road reserves, where possible, and not on residential properties or quiet suburban streets.

Although there is no evidence from the literature to suggest there may be a problem, air quality monitoring at the ventilation shaft flue outlets could be considered, once the rail system is commissioned, to establish whether there are any air quality issues associated with the air movement through the rail tunnels and shafts which require mitigation.

Since the reference alignment is in tunnel, no significant impacts will occur in terms of the biophysical environment. Attempts should be made, however, to retain any old established trees in the area around the proposed Rosebank Station and at the ventilation shaft sites where construction to the tunnel will be from the surface.

The Johannesburg Park and Rosebank Stations need to be designed to blend in with the existing urban fabric. Street trees lost to cut and cover construction operations at the station sites should be replaced with suitable indigenous trees as part of landscaping the station sites at the surface after construction is completed.

Three options were considered to provide parking facilities for the proposed Rosebank Station, namely:

i) On two residential erven east of Oxford Road on the corner of Oxford Road and Baker Street with access from Baker Street. This option was published as part of the original reference route and resulted in concerns being expressed by local I&APs, since Melrose residents wished to protect the residential character of the east side of Oxford Road.

ii) Underneath Oxford Road with access from Oxford Road south of Baker Street (left in slipway), exit to the service road, west of Oxford Road, in a northerly direction (left out slipway), and a left-in-left-out access from the southbound carriageway of Oxford Road at a position immediately south of the office building, east of Oxford Road. A circular ramp will provide access to two levels of underground parking. The ramp will be

restricted to the northern of the two erven mentioned above, while the southern erf will not be affected at all. No vehicular access will be provided from Baker Street and the Portman Place building will be shielded from the parking area access by the erf on the corner of Baker Street and Oxford Road (± 50m wide).

iii) Parking on the municipality owned land adjacent to Cradock Street. The existing parking lot is operated by a commercial parking company and uses a common access with surface parking as well as structured parking garages. The size and shape of the available area is insufficient to provide an adequate number of parking places. The size of land that is required for a multi-storey parking garage will have an unacceptable impact on the existing developments that front onto the parking area. From a town planning point of view, a parking garage in this area will be unacceptable.

It was originally recommended in the draft EIA report that the third option be implemented. After further investigations and consultations with Interested and Affected Parties (I&APs) in the Rosebank area, since the release of the draft EIA report, it is now recommended that the second option be implemented, namely integrated with the proposed station site under Oxford Road, with slipways that provide access to the underground parking. This solution is compatible with the original recommendation because no facilities, except the ramps down to the parking areas will be situated east of Oxford Road. The road access is bordered on the north by a business building, on the east by the parking area of a school, and to the south it is buffered from Portman Place by a residential building that is currently not used for residential purposes.

Rosebank Station - Sandton Station

The draft EIA report recommended that the reference route be followed on this section of the route.

Between Rosebank and Sandton, two route alternatives (routes 1a and 1b) were proposed to the reference route, because I&APs from Dunkeld/Hyde Park perceived that their suburbs would be affected by potential noise and vibration impacts from the Gautrain (that would in turn impact on property values in their area). These I&APs felt these potential impacts would be less of an issue below commercial areas in Fricker and Oxford Roads than below residential areas along Melville Road.

Other I&APs objected to the Fricker Road alternative on similar grounds and because there are a higher density of residences along the Fricker Road that could be affected, many of which have basements, and residents were concerned about perceived impacts on these basements.

No significant noise and vibration impacts are predicted at the surface when the line is in tunnel between Rosebank and Sandton. The noise and vibration limits set for the Gautrain will not be exceeded along this section of the rail corridor.

The assessment of environmental impacts of the reference alignment via Melville Road, alternative alignment 1a via Fricker Road and alternative alignment 1b via Oxford Road by the EIA specialist team has indicated that there are no differences in impacts between the three alternatives, as the routes are completely tunneled and at considerable depth beneath Dunkeld/Hyde Park. Therefore, due to various technical reasons, the reference alignment under Melville Road was recommended in the draft EIA report that was released on 21st October 2002.

Although the issues raised by the Dunkeld Village Association on behalf of potentially affected property owners are acknowledged (and this was reflected in the ranking comparison of the three routes), the overall findings of the EIA did not substantiate the perceptions in regard to impact of noise and vibration and therefore also in regard to the reduction of property values as a result of these impacts. The western end of the Fricker Road alternative (route 1a) contains a number of residential homes at a greater density than that found in the Dunkeld area above the reference route (indicating that a substantial number of people could potentially be affected on Fricker Road too). Furthermore, overseas evidence does not suggest that any long term negative property impacts can be expected from areas or developments above the tunnel. Given that the reference route also had a number of operational advantages (gentler curves leading to higher speeds and less maintenance and long term operational costs), the EIA team remain unconvinced that the alternative routes offer environmental advantages which outweigh the technical benefits of the reference route. It is acknowledged, however, that there are no fundamental differences between the routes from an environmental perspective. More detailed information is currently being provided by the Gautrain Technical Team to the geotechnical specialist engaged by the Dunkeld Village Association (the representative of I&APs in the area beneath which the recommended route runs), with the aim of addressing their concerns.

Indications are that the geology is relatively uniform in the area, but the bidders need to include mitigation measures in their design and construction plans, should groundwater need to be dewatered during the tunnelling process and to minimise potential impacts on underground aquifers and boreholes (see Chapter 23, Volume 4 of the draft EIA report). Loss of boreholes as a result of the tunnelling will be compensated as part of the expropriation process for the project.

The Heritage Impact Assessment (HIA) completed as part of the EIA process has indicated that there will be no impacts on heritage resources along this section of the route, because the tunnel will be at depth. The assessment indicated, however, that the placement of ventilation shafts for the tunnels should be checked at the final design stage to ensure no heritage resources are affected.

Careful placement and design of tunnel ventilation shafts will mitigate the localised (noise and visual) impacts of these facilities and it is recommended that these be located on commercial properties or within road reserves, where possible, and not on residential properties or quiet suburban streets.

Although there is no evidence from the literature to suggest there may be a problem, air quality monitoring at the ventilation shaft flue outlets could be considered, once the rail system is commissioned, to establish whether there are any air quality issues associated with the air movement through the rail tunnels and shafts which require mitigation.

Since the reference alignment is in tunnel, no significant impacts will occur in terms of the biophysical environment. Attempts should be made, however, to retain any old established trees at the ventilation shaft sites where construction to the tunnel will be from the surface.

2.6 Synthesis of Environmental Impacts : Sandton Station – Marlboro Station

The draft EIA report recommended that route alternative 2b be followed on this section of the route.

Consultations with I&APs in the communities between Sandton and Marlboro Gardens during the public participation process led to suggestions of a number of route alternatives in the area between Sandton and Marlboro (routes 2a, 2b, and 2c, which joined with a refined route alignment beneath Marlboro Drive and a new station location near to the Marlboro Drive / N3 Highway interchange, that would be more attractive to potential train users wishing to park

and ride at Marlboro Station from the N3). The route alternatives aimed to limit impacts on high value commercial and residential areas and recreational facilities, by remaining underground.

The most direct tunnel route (route 2b) between Sandton and Marlboro proved to be the route with the least environmental impact, as well as the preferred route from both a technical and financial perspective.

As with the issues surrounding the tunnelled route alternatives between Rosebank and Sandton, certain I&APs living above the recommended route in Sandton and Strathavon were concerned about the potential impacts resulting from noise and vibration and the potential knock on effect in terms of property values. To address their concerns, these I&APs proposed an underground alignment beneath Katherine Drive instead, since mainly commercial properties are located at the surface.

The Gautrain Technical Team evaluated several underground alternatives beneath Katherine Drive, but could not obtain a feasible alignment that connected to the proposed Sandton Station site. Alternative station sites were also investigated and found not to be feasible. Thus, an underground Katherine Drive alternative was not assessed in detail in the EIA.

No significant noise and vibration impacts are predicted at the surface where the recommended rail line (route 2b) is in tunnel between Sandton and Marlboro. The noise and vibration limits prescribed for the Gautrain will not be exceeded along this section of the rail corridor.

Surface air-borne noise will be eliminated other than from the ventilation shafts, which can be effectively mitigated. The vibration levels at the surface for the tunnel sections are at most 90dBV which is below the threshold humans will be able to perceive vibration. Given the precautionary and conservative approach adopted by the noise and vibration specialists, it is highly unlikely that people will be able to feel the vibration of a passing train. The gorundborne noise level drops 20 dBV or more when the track goes underground. The straight line tunnel route alternative 2b is, therefore, the preferred alignment from an environmental perspective, since the other route alternatives surface above ground for portions of the route.

Indications are that the geology is relatively uniform in the area, but the bidders need to include mitigation measures in their design and construction plans, should groundwater need

to be dewatered during the tunnelling process and to minimise potential impacts on underground aquifers, boreholes and any surface water features (see Chapter 23, Volume 4 of the draft EIA report). Loss of boreholes as a result of the tunnelling will be compensated as part of the expropriation process for the project.

The Heritage Impact Assessment (HIA) completed as part of the EIA process has indicated that there will be no impacts on heritage resources along this section of the route, because the tunnel will be at depth. The assessment indicated, however, that the placement of ventilation shafts for the tunnels should be checked at the final design stage to ensure no heritage resources are affected.

Careful placement and design of tunnel ventilation shafts will mitigate the localised (noise and visual) impacts of these facilities and it is recommended that these be located on commercial properties or within road reserves, where possible, and not on residential properties or quiet suburban streets.

Although there is no evidence from the literature to suggest there may be a problem, air quality monitoring at the ventilation shaft flue outlets could be considered, once the rail system is commissioned, to establish whether there are any air quality issues associated with the air movement through the rail tunnels and shafts which require mitigation.

The Sandton Station needs to be designed to blend in with the existing urban fabric. Street trees lost to cut and cover construction operations at the station site should be replaced with suitable indigenous trees as part of landscaping the station site at the surface after construction is completed.

Since the recommended alignment is in tunnel until Marlboro, no significant impacts will occur in terms of the biophysical environment. Attempts should be made, however, to retain any old established trees at the ventilation shaft sites where construction to the tunnel will be from the surface.

No objections from the Marlboro Gardens community have been received regarding the recommended alignment. Gautrans has undertaken to maintain the road links along the section of the route, west of Marlboro Station, where the alignment emerges above ground. At the Marlboro Station a slight adjustment of one of the streets in the proposed street network is required to accommodate the required number of parking bays at the station. The integration

of the station with the proposed development framework for the surrounding area has been discussed with the Planning Department of the City of Johannesburg.

Consultations with the Alexandra Renewal Project (ARP) team have taken place in identifying the preferred location of Marlboro Station. The station location in Alexandra Far East Bank Extension 7 is supported by the Alexandra Renewal Project team and has, accordingly, been incorporated in the planning done for Alexandra East Bank precinct. In accordance therewith, consultations also took place with the developers of Extension 7 to ensure that the station would be integrated with their imminent development.

Since the Marlboro Station position will be raised above the Jukskei River valley on a viaduct, consideration should be given by the bidders to mitigating visual impacts at this point and integrating the station into the existing urban fabric.

The ARP development is planned in the area to the west of the N3 Freeway between the highway and the Jukskei River and lies immediately south of Marlboro Drive. There is to be a buffer strip (undeveloped) of about 80 metres between the freeway and the new development. A major access route, Far East Bank Road, that links Marlboro Drive to the developed section of northern Alexandra passes through the area.

The noise climate of the area of the ARP development is already severely degraded. This is due particularly to the traffic noise generation from the N3 Freeway and Marlboro Drive. The existing noise levels close to these roads vary from about 80dBA (at 15 metre offset) to 65-67dBA (at 100 metre offset). The situation is slightly worse near the interchange. The area is not ideal for residential development and a noise impact assessment of the ARP should have been undertaken by the developers in this area to check this potential problem issue.

Criteria for maximum noise and vibration levels that are to be met at the railway reserve boundary have been specified for the Gautrain project and, in addition, further appropriate mitigating measures are to be taken in noise sensitive areas, such as schools, in order to ensure that the requirements of SABS 0103:1997 are met.

An analysis of the impact of the Gautrain generated noise on the area up to 400 metres west of the N3 and 200 metres south of the railway, indicates that the Gautrain noise levels are less than the existing ambient levels from the road traffic.

The proposed crossing of the wetland in close proximity to the proposed Marlboro Station site has been assessed in Volume 4, Chapter 22 of the draft EIA report, as Crossing No. 8. The relevant specialist did not raise concerns about the crossing of this particular watercourse, since the system forms an artificially modified watercourse largely directing stormwater off the freeway. Despite the site having some marginally wet habitats, these are not of ecological significance due to past impacts and modification of the system. The site has therefore been classified as a disturbed watercourse. The proposal to locate the station here has, however, raised the issue of mitigation of the impacts, mainly due to the likely hydrological impacts of increased runoff, changed flow patterns and sedimentation during and after construction. Standard mitigation measures as proposed in the draft EIA report will apply, as they will also in terms of crossing No. 7 (the Jukskei River) and Crossing No. 6 (to the west of the Jukskei River).

The proposed vertical alignment of the Gautrain is such that it crosses the Jukskei River high enough as to have no effect on the floodplain.

The proposed Gautrain alignment goes over the N3 highway. In order to accomplish this it was necessary to have a high vertical alignment across the Jukskei Valley. The proposed Marlboro station is approximately 21 metres above natural ground level. This will also assist the designers to manage the impact the station and its supporting structures will have on the identified watercourses.

The Concessionaire's design team will be required to develop specific mitigation measures to deal with the impacts of the proposed Marlboro Station location on the watercourse in the Planning and Design section of the draft Environmental Management Plan (EMP).

The Heritage Impact Assessment (HIA) completed as part of the EIA process has indicated that there will be no impacts on heritage resources along this section of the route.

2.7 Synthesis of Environmental Impacts : Marlboro Station – Midrand Station

The draft EIA report recommended that alternative route 3 be followed on this section of the route. This alternative skirts the north-western corner of Linbro Park before approaching Midrand via the Modderfonteinspruit valley to the north-east of Buccleuch. This alternative has been endorsed by the residents associations in the area.

Attention must be given by the bidders in their design proposals to noise mitigation (e.g. earth berms and walls) where the line passes close to residential properties, and to integrating their proposals in this regard with measures (e.g. screening) to reduce potential visual impacts where the route crosses an exposed slope and the Modderfonteinspruit valley.

It will also be important to prevent the development of land use remainders or isolated pockets of land lying fallow, which may attract informal settlement or other abuses to the detriment of existing land uses in the vicinity. Active intervention on the part of the local authority, in collaboration with the provincial authorities and local developers, will prevent sterilisation of land where the Johannesburg to Pretoria and Sandton to JIA lines diverge.

The Heritage Impact Assessment (HIA) completed as part of the EIA process has indicated that there will be no impacts on heritage resources along this section of the route.

2.8 Synthesis of Environmental Impacts : Midrand Station – Centurion Station

The draft EIA report recommended that the refined reference route closer to the K101 road should be followed through Midrand and that alternative route 4 be followed on the approach to the proposed Centurion Station

The rail alignment has been moved as close as possible to the K101, and where possible, the rail reserve has been moved to be directly adjacent to the future road reserve required for the upgrading of the K101. The two boundaries i.e. Gautrain and K101, coincide as far as it is practical. The maximum difference between the two boundaries is 2,5m. The slight difference between the alignments is as a result of the different standards used. In all likelihood this strip of land will be incorporated into the final rail reserve. The shift westward, of the rail reserve, from the original reference route alignment is the result of submissions put forward initially by the residents of Glen Austin Agricultural Holdings.

The proposed Midrand station should be designed to blend in with its setting as it is situated at an elevated position, highly visible from the south. The Gautrain Technical Team has had several discussions with the developers of the proposed Zonk'izizwe Development at the proposed Midrand Station site. Plans of the development have been amended to accommodate the Gautrain station at the access to the shopping centre. These plans would, however, require that the Gautrain alignment and station be constructed underground. We are advised that Gautrans would be willing to consider the necessary local adjustments to the Gautrain alignment that primarily affect only the Zonki'zizwe terrain on condition that it should not

have an adverse cost implication for the rail project. The recommended alignment, however, disregards the current proposed Zonk'izizwe plans because there is no guarantee that the development will be constructed in the near future, and a green fields station, away from any access or development, is not preferred by either the Gautrain Technical Team or the planning officials from the City of Johannesburg Municipality. The issue of integration of the Gautrain and Zonk'izizwe can only be resolved when there is more finality regarding the construction of the two projects.

The rail alignment has again been moved as close as possible to the K101 in the vicinity of the proposed Samrand Park and Ride station, but this station is not recommended for implementation during the first phase of the Gautrain project. The design, however, provides for the station at a later date and is supported by the findings of the EIA. The proposed Samrand Park and Ride Station has the potential to improve ridership on the train, particularly in the light of development proposals in the area, and would prevent the need for car users having to leave the N1 Highway to access Centurion Station. The proposed Samrand Park and Ride Station will be situated on the border of the Johannesburg and Tshwane municipalities – the station will be largely within the Tshwane border, but all access will be from the Johannesburg side. The rail alignment has been adjusted to accommodate, as far as possible, the requests from land owners and developers in the vicinity of the station. The refinement closer to the K101 on the approach to the Samrand Park and Ride Station is the recommended alignment for this area.

The "kink" in the recommended route alignment mentioned in correspondence from the Glen Austin Agricultural Holdings is in actual fact an S-curve comprising of a 4000m radius curve followed by a 5000m radius curve, separated by a 1000m straight section. These design standards are well within the guidelines adopted for the Gautrain alignment. The reason for the S-curve is to minimise "wasted" land and to follow the alignment of the provincial road K101 as closely as possible. In general the eastern boundary of the K101 road reserve coincides with the western boundary of the Gautrain reserve. With this common reserve boundary being shared by the road and rail, unauthorised entry onto other neighbouring properties is unlikely.

Several smallholdings and other land parcels will be expropriated to accommodate the Gautrain reserve along the K101 through Midrand. This may result in remnant parcels of land, under threat of being invaded or abused to the detriment of existing land uses in the vicinity. Proper mitigation by pro-active planning is required to prevent this potential impact. Active intervention on the part of the project proponent and the local authority, in

collaboration with the provincial authorities and local developers, will prevent sterilisation of land, whilst land remainders could be proactively used as mitigation to shield the rail reserve from neighbouring properties.

The local authority responsible for the Randjesfontein and Glen Austin areas could impose policy guidelines dealing with a maximum permissible density along the rail reserve in collaboration with the affected residential communities and should consider earmarking land remainders for land uses and developments which can act as a means of buffering adjacent residents from the rail reserve.

The areas of Glen Austin and Randjesfontein immediately east of the K101, and in the proximity of Olifantsfontein Road already have a degraded noise climate (mainly from the road traffic noise). There is also an infiltration of traffic noise from the N1 Freeway, and the sporadic over-flights of aircraft from Grand Central Airport also affect the existing noise levels. The situation can be expected to worsen as traffic volumes in Midrand increase. The areas some distance from the main roads are still relatively quiet but the ambient noise levels in the road proximate zones are in the upper range and even exceed at times the levels that are desirable for an agricultural holding residential area.

Vibration and ground-borne noise levels induced by the passing of a train through the area will not generally exceed the impact criteria. Special anti-vibration measures may need to be incorporated into the track, however, on the viaduct structure (if not on fill) crossing the Rietspruit (Olifantsfontein Road) valley.

The typical noise mitigating measure for the area will be the installation of a noise attenuation wall or earth berm along the eastern side of the track. The required height of the wall will be dependant on certain features of the train. However, it could be up to 4 metres high. A properly designed barrier would reduce the train generated noise heard beyond the wall by at least 10dBA to 12dBA (barrier insertion loss). It is also recommended that the construction across the Rietspruit valley be on earth fill rather than structure (viaduct) for as long a distance as possible. Noise generated from fill sections is slightly quieter than from structure sections. The fill will have the added benefit of reducing the noise impact of traffic from the K101 (and to some extent from the N1 Freeway) on the areas east of the track as it will operate as an earth berm.

In order to mitigate visual impacts over the Rietspruit valley it is suggested that for the viaduct, materials of the same colour and texture finishes be used that matches the visual

environment. Planting of indigenous tree species at the base of a viaduct to reduce the scale of the viaduct within the landscape can also be considered. A trade off between mitigation measures to address noise (construction on fill) and loss of views will need to be balanced.

In the Randjesfontein area, impacts on the bridle trails, the sense of place, as well as the sense of community may be disrupted and Gautrans has provided an undertaking to engage with the community in an attempt to minimise impacts and restore or compensate for the loss of sections of the bridle paths.

Screening of noise would also need to be considered in order to avoid horses being frightened by passing trains in the Randjesfontein area.

A landscaping policy, including screening mechanisms to soften the interface between the closest residential properties and the Gautrain rail reserve, should be implemented in collaboration with the affected communities. Particular attention needs to be given to screening, in association with noise mitigation measures, to prevent horses and horse riders from being surprised by passing trains in Randjesfontein.

Crime is a major concern to the residents of both Glen Austin and Randjesfontein and sufficient attention needs to be given to re-establishing the security wall, and other measures implemented in the areas for security reasons, prior to construction. The refined alignment closer to the K101 will lessen the impact on these communities although residual impacts will still occur and require attention. The comments of the Randjesfontein residents have been taken into account in the drafting of the EMP and provisions have been included to address most of their concerns which will also apply to the other sections of the route.

The lane of trees next to the K101 has historical importance to the local community. It will be important therefore, once the final alignment is decided, to establish exactly whether any of these trees will be directly affected. Mitigation measures would need to be developed regarding issues of safety on the rail line, and in terms of heritage, should any of the trees be lost.

The large trees in this peri-urban area, whilst predominantly exotic, also provide sanctuary to birdlife and the impact of the Gautrain on birdkills (especially owls) will require monitoring.

A wetland crossing omitted from the draft EIA report has been assessed and included in Appendix A to this Addendum (See pages 4-5 of the "Updated Surface Water and Wetlands

Study"). The bidding consortia should pay careful attention to environmental management in the design stage to reduce impacts at this crossing in the Rietspruit valley.

Careful management of impacts on a small wetland crossing near the SA Mint will also be necessary once the precise alignment is finalised. The bidders are referred to pages 22-36 to 22-37 of Chapter 22, Volume 4 of the draft EIA report for background in this regard.

The alternative route alignment 4 that passes through the sports fields on the approach to Centurion Station reduces the impact on the local community compared to the reference alignment, although this would result in a loss of recreational facilities. These can however be more easily replaced than physical infrastructure.

The sports fields in Centurion should be replaced in a suitable area prior to construction to ensure that these recreation facilities are still available to the public. Consultations with the local authority and the users should take place in this regard.

On the approach to the proposed Centurion Station, the recommended route 4 crosses the Hennops River valley where a number of large trees are found on the river banks. From an ecological perspective, detailed attention will need to be given in the final design phase to avoiding or damaging the large indigenous trees in the vicinity at the crossing point of the river (See also pages 22-39 to 22-40 of Chapter 22, Volume 4 of the draft EIA report).

The proposed Centurion station should be designed to blend in with the surrounding urban fabric.

2.9 Synthesis of Environmental Impacts : Centurion Station – Pretoria Station

The draft EIA report recommended that alternative route 5a be followed on this section of the route.

Other than route alignment 5a, all the other route options between Centurion and Pretoria create more isolated enclaves of land by the functional division of suburbs and agricultural holdings. Alternative 5a is preferred from a town planning perspective as it follows the existing Ben Schoeman Highway transport corridor into Pretoria and does not result in extensive land division.

Alignment 5a also affects the least amount of residences and business properties and only skirts the edge of the large military landholdings in Centurion. Alignment 5a to the west of the Ben Schoeman Highway is thus preferred from a social viewpoint.

Of the three route alternatives investigated in Centurion from a noise perspective, alternative 5a that is routed west of the Ben Schoeman Highway has the least impact on the residential areas of northern Centurion. However, noise mitigation measures are still required in the vicinity of the Jean Avenue interchange. . This has been investigated further since the release of the draft EIA report (See Appendix A of the Addendum; "Noise and Vibration Study") and recommended mitigation measures proposed.

As a result of further consultations with the Clubview residents in Centurion, route 5a has been refined to pass underneath the Jean Avenue interchange further to the east and thereby reduce social and land use impacts on this community. The Gautrain Technical Team has also refined the rail lines' descent of Snake valley into Pretoria, as a result of recommendations in the draft EIA report, to more closely hug the Ben Schoeman highway (See Appendix A to the Addendum; "Recommended Route Alignment Refinement Drawings").

Screening mechanisms (eg vegetation) should be used to soften the visual impact of the rail/Ben Schoeman transport corridor through the Snake valley. The entrance to the tunnel under Salvokop should also be carefully designed and landscaped to screen the site from the top of Salvokop, which will form part of the planned Freedom Park development.

The Gautrain route over the dolomites in the Centurion area will be above ground or through shallow cuttings. The main perceived risks to the dolomitic aquifer during construction and operation, is an impact on the groundwater quality, from any accidents or accidental spillages, and an impact on groundwater bearing structures from blasting and excavation. The bidding consortia should include appropriate mitigation measures in their design and construction plans to address potential impacts.

The Fountains valley and Zwartkops areas (Snake valley) are identified as higher potential risk areas, due to the large volumes of groundwater abstracted for domestic use for Pretoria and Centurion. As such any pollution of these sources may have an impact on urban domestic supplies. Care must be taken during construction, to limit blasting in these areas, as it may interfere with existing groundwater pathways in the dolomites, which may impact upon the springs and boreholes used for domestic supply. The use of explosives in the dolomites may

also add additional nitrate concentrations to the groundwater, which may impact upon the fitness for use of this aquifer.

In terms of groundwater, the stability of the dolomites, and the potential development of sinkholes or shallow subsidence, is enhanced in areas of groundwater abstraction and the associated drop in groundwater levels. As such, areas of large scale groundwater abstraction, in proximity to the recommended route, should be further investigated in the final design phase for potential stability risks. It is also essential that groundwater dewatering in the dolomites, during construction, be restricted where possible and monitored to ensure that sinkhole formation is not promoted

By routing alternative 5a under Salvokop, instead of the Fountains valley, a number of localised impacts on the biophysical environment, including multiple crossings of the Apies River, loss of mature trees and localised impacts on the adjacent Fountains Valley recreation resort are avoided. An entrance to Pretoria beneath Salvokop is thus preferred.

It should also be noted that a maintenance depot for the Gautrain is no longer planned for the Centurion area, since a planned site was never linked to alternative route 5a. Since this is problematic for this route alternative and because the bidding consortia have indicated that a site close to where the Johannesburg-Tshwane and Sandton-JIA lines diverge would be preferable, potential sites in the Modderfontein area will be investigated. This will be the subject of a separate EIA.

2.10 Synthesis of Environmental Impacts : Pretoria Station – Hatfield Station

The draft EIA report recommended that alternative route 6fd be followed on this section of the route.

A number of route permutations were developed during the public participation process of the EIA for the section of the line through Tshwane. In essence, however, all the routes either run via the central city beneath Park Street (Arcadia/Sunnyside) to Hatfield, or alongside the existing Metrorail reserve (Muckleneuk) to Hatfield.

An underground alternative would clearly result in the least environmental impact for this section of the line.

Gautrans has indicated, however, that the costs of an underground alignment in Tshwane will be prohibitive for this section of the line. Poor geohydrological conditions beneath the city of Pretoria and the presence of a high water table, which some authors have associated with the efficient propagations of ground-borne noise and vibration, inflate construction costs considerably (latest estimates exceed R400m).

There is no question that the tunnelled options in Tshwane are more expensive than the recommended route via Muckleneuk. Tunnelling is the lowest cost option for the section of the Gautrain route in Johannesburg, as a result of both the topography of the area, the extremely high value of development along this section of the route and the fact that no existing railway reserve exists in that part of Johannesburg where the Gautrain route is planned. In Tshwane, in contrast, an existing rail corridor exists between Pretoria and Hatfield Stations that makes the consideration of a surface alignment a feasible and viable alternative. The refined Muckleneuk alignment also considerably reduces the environmental impacts along this section of the route when compared to the original reference alignment via Muckleneuk. Fewer properties will be expropriated and the Gautrain lines will be accommodated within the existing South African Rail Commuter Corporation's (SARCC's) rail reserve for most of the route. This affords a number of opportunities to implement more practical environmental mitigation measures than if the reference route were followed.

Gautrans has approached the SARCC with a request to utilise the northern portion of the existing Metro Rail reserve from Muckleneuk to Hatfield. The existing rail reserve is intended for the future expansion of the Metro Rail capacity, but this is not expected in the foreseeable future. The SARCC has thus approved Gautrans' request, which entails shifting the Metro Rail services to the southern portion of the rail reserve.

Gautrans' position regarding the costs of the project in Tshwane is explained as follows. The Public Finance Management Act of 1999 places a responsibility on Gautrans to spend government (taxpayer's) funds in a cost effective manner and that value for money spent is derived on capital intensive projects such as the Gautrain. An affordability limit has been set for this PPP project by National Treasury in terms of the applicable regulations for PPP projects, although this will be evaluated ultimately in terms of the cost proposals submitted by the bidding consortia.

Most of the EIA team, whilst recognising that there will be significant environmental impacts on certain parts of the refined Muckleneuk alignment, believe that with careful and creative attention to possible route refinements and to the introduction of appropriate mitigation

measures, that the route is environmentally feasible. Since an underground option is not achievable for cost reasons, the refined Muckleneuk alignment 6fd is recommended, because it will be largely located in an existing rail reserve which has been part of the urban fabric in Pretoria for a considerable time (over 100 years) and because a rail reserve is not a totally foreign concept to the adjacent landowners.

In response to concerns expressed by I&APs along this section of the route, it was agreed by Gautrans to carry out a further Environmental Resource Economics (ERE) study (See Supplementary Volume 1 to the Addendum) so that the full environmental (or external welfare) costs of this section of the route could be established.

In order to compute these costs, the ERE team consulted with many of the specialists who had conducted work for the draft EIA report, in particular the noise and vibration, land use and town planning, social, heritage and visual specialists. Additional work was undertaken by some of these specialists to feed into the ERE study.

The results of the ERE study indicated that the welfare losses without additional mitigation for route alignment 6fd fall within a confidence range of R19 to R57 million. By increasing the mitigation budget for this section of the line by at least R20 million, the welfare losses can be addressed.

The revised capital costs (including the updated mitigation costs for the refined Muckleneuk route calculated from the further ERE study) are shown for route 6fd in Table 2.2 overleaf and are compared with the tunnelled route via Park Street (route 6b) as well as route 6c via Nelson Mandela Drive.

Table 2.2: Summary of Capital Costs for Alternative Routes in Tshwane from Eeufees Road to Hatfield Station

Description	Andries Street, Park Street Tunnel (route 6b)	N/Mandela Viaduct, Park Street Tunnel (route 6c)	Muckleneuk Refined (route 6fd)
1. Land procurement costs	**63,000,000**	**70,000,000**	**150,000,000**
2. Earthworks	**16,788,000**	**7,840,000**	**32,700,000**
3. Bridges and viaducts	**4,200,000**	**123,611,100**	**67,051,000**
4. C&C and tunnel			
Cut and Cover	103,425,000	0	99,375,000
Tunnel	530,700,000	354,380,000	63,220,000
CBD Stabilisation	150,000,000	0	0
Ventilation shaft in tunnel and C&C	20,000,000	8,000,000	2,000,000
Sub Total	**804,125,000**	**362,380,000**	**164,595,000**
5. Other			
Services/Equipment in C&C	8,500,000	0	13,250,000
Retaining walls	2,075,000	6,575,000	36,386,000
Reinstate roads and crossings	26,670,000	16,345,000	15,000,000
Accommodation of traffic	10,000,000	10,000,000	4,000,000
Sub Total	**47,245,000**	**32,920,000**	**68,636,000**
6. Trackwork			
Trackwork	39,590,000	41,125,000	28,000,000
Relocation of SARCC line	0	0	43,110,000
Overhead traction equipment	12,041,000	12,170,000	11,760,000
Sub Total	**51,631,000**	**53,295,000**	**82,870,000**
7. Stations			
Pretoria Station			
Station operational area	24,716,000	26,016,000	26,016,000
Station precinct	41,170,000	46,270,000	46,270,000
Access roads to station	9,100,000	6,800,000	6,800,000
Sub Total	74,986,000	79,086,000	79,086,000
Hatfield Station			
Station operational area	17,979,000	17,979,000	17,979,000
Station precinct	126,817,000	126,817,000	126,817,000
Access roads to station	17,130,000	17,130,000	17,130,000
Sub Total	161,926,000	161,926,000	161,926,000
Sub Total	**236,912,000**	**241,012,000**	**241,012,000**
8. Mitigating measures costs			
Mitigating measures in tunnels	43,448,000	20,602,000	35,130,000
Property loss	1,300,000	(2)	7,300,000
Noise mitigation (10dBA reduction)	150,000	(2)	15,800,000
Residual loss after 10dBA mitigation	0	(2)	1,600,000
Visual mitigation	0	(2)	5,100,000
Heritage and social	670,000	(2)	9,800,000
Flat and building modifications(1)	1,000,000	(2)	8,000,000
Sub Total	**46,568,000**	**20,602,000**	**82,730,000**
TOTAL	**1,270,469,000**	**911,660,100**	**889,594,000**
Difference between Park Street Tunnel and alternatives		**358,808,900**	**380,875,000**

(1) Taken as 50% of 10dBA reduction costs
(2)These items were not quantified and are thus not included but could range between R25m and R40m

The route alignments have been refined to the level required for comparative purposes and further optimisation may be possible by the bidders during the final design stage. It should be noted that a conservative approach was adopted for the Andries Street Tunnel alternative (i.e. route 6b - this was the route preference of the EIA team without taking into consideration

technical and financial issues) with regard to the costs related to the geotechnical conditions and that these costs could even be higher than has been allowed for.

Even if one argues about the details of these cost estimates, the conclusion that can be drawn is that the magnitude of the differences in costs are such that a tunnelled option does not represent a cost effective solution.

It must be noted that the Phase 2 Heritage Impact Assessment concluded that the impacts on heritage resources along the refined Muckleneuk route will be significant without introducing refinements to the alignment and that the impacts will be difficult to mitigate and therefore that the route should be avoided.

Nevertheless, after considering all of the specialist reports and considering the overall socio-economic benefits of the project, the EIA team has concluded that, with the application of "state of the art" mitigation measures and the utmost care in the detailed design phase to reduce impacts wherever possible, the refined Muckleneuk alignment (6fd) remains feasible from an environmental perspective, although this will be at the loss of some conservation worthy buildings and will entail infringements into the integrity of other heritage resources.

Gautrans has indicated it is prepared to assist Muckleneuk in the declaration of the balance of the suburb as a declared Heritage Area, although it is recognised that this can not be construed as a mitigation measure.

Gautrans has engaged with most of the stakeholders along the route and possible solutions to the identified impacts have been suggested. It is recommended that this process continue with the aim of finding an acceptable solutions in regard to route refinements in this area that are within the bounds of affordability.

Since some of the affected stakeholders (e.g. Freedom Park Trust, Propnet, the City of Tshwane Metropolitan Municipality, Unisa) are themselves involved in development initiatives adjacent to the recommended route, opportunities exist to amend development proposals in the interests of all the various parties concerned. Draft Mitigation Development Guidelines for the Freedom Park and Salvokop areas in relation to the Gautrain project have been tabled by the developers of these projects (See Appendix I, Appendices Book 3 of the HIA). This could provide a focus for further discussions on the subject.

Possible solutions include extending the tunnel portals at Salvokop, adjusting the vertical alignment of the route, where practical, use of cut and cover construction, road realignments, landscaping etc. Where relevant, the EIA specialists have proposed possible mitigation measures in their various fields (See the draft EIA report references listed on pages 2-23 to 2-15 of the Addendum, the ERE and HIA reports and the updated EMP).

Particular attention needs to be given to urban design of the proposed Gautrain Pretoria Station in order to blend in with the existing historic station precinct. Linkages to the historic Berea Club area could be designed to revitalise this degraded area, whilst pedestrian linkages to the Unisa campus can also be integrated into the design to facilitate student/lecturer access to the Gautrain.

The Hatfield Station also needs to be designed to blend in with the existing urban fabric. Street trees lost to cut and cover construction operations at the station site should be replaced with suitable indigenous trees as part of landscaping the station site at the surface after construction is completed

The only area on the Pretoria-Hatfield line that may be of some concern in terms of vibration is at the entrance of the tunnel beneath Salvokop (55 km) where the geological formation consists of iron quartzite that could efficiently conduct the vibration. However, this could be mitigated if required after verification. The telecommunication equipment at the top of this hill can easily be isolated from the vibration should it become a concern. Verification of whether any mitigation measures are required for vibration in terms of the Jacaranda Hospital in Muckleneuk and laboratories at the University of Pretoria should also be checked at the final design stage.

More specific mitigation measures relevant to this section of the route will need to be discussed with the affected communities along the refined 6fd alignment including the Muckleneuk and Lukasrand Property Owners and Residents Association (MLPORA) and the institutions making up the educational precinct on the approach to Hatfield Station.

Noise acoustic barriers will be required next to the line for most of its length through Muckleneuk, the educational precinct, and near the Jacaranda Hospital. These would need to be considered and integrated together with the mitigation measures proposed to address visual impacts.

The impacts on the biophysical environment will largely be limited to the loss of existing trees and the implications of this for vistas in the area of the line. It will be necessary to give attention to replacing the lost trees with appropriate vegetation that will also soften the other impacts of the development.

Possible impacts that the route alignment may have on the loss of vegetation, particularly jacaranda trees, should be addressed by a landscaping plan. It is recommended that indigenous trees be planted along the line, if jacarandas are not favoured in terms of recently introduced exotic species regulations.

The proposed Proefplaas (Hatfield East) Park and Ride Station in Hatfield is supported by the EIA, although this station is not recommended for implementation during the first phase of the Gautrain project. Should the Proefplaas Park and Ride station be implemented at a later stage, it is recommended in Chapter 22, Volume 4 of the draft EIA report that the station be located away from the watercourse near the site to prevent impacts on the watercourse and potential secondary impacts on the Colbyn wetland complex downstream.

2.11 Synthesis of Environmental Impacts : Marlboro Station – JIA Station

The draft EIA report recommended that alternative alignment 7 be followed through the Modderfontein valley between Marlboro and Spartan, and that alternative alignment 8 be followed at Rhodesfield on the approach to the tunnelled section into JIA.

Three areas were considered in terms of route alternatives on the rail corridor between Marlboro and JIA. Firstly, past Linbro Park, an alternative (route 7) to the reference route avoids passing through many of the agricultural smallholdings in the area. Further up the valley, next to the Modderfontein factory, the reference route, a refined golf course alignment and a continuation of the route 7 alignment were evaluated in terms of avoiding an explosives storage area at Modderfontein, properties on the edge of the old Modderfontein village and the open space area (with sensitive vegetation) adjacent to Esther Park. In Rhodesfield, an alternative alignment (route 8) and station position to the reference route was evaluated in terms of its impact on the suburb and a preferred approach into JIA.

Alternative route alignment 7 was recommended in the draft EIA report as a result of the public consultation process in the Modderfontein area and in order to reduce impacts on the Linbro Park community, as well as to avoid the explosives storage safety circles at the Modderfontein factory. The EIA carried out by Bohlweki Environmental indicated that route

alternative 7 has a lower overall environmental impact than the refined golf course alignment, as well as the original reference alignment, and does not impact on the Public Licence Circles (see below).

The explosives factory at Modderfontein, north of Centenary Way, has what are known as Public Licence Circles around their manufacturing and storage facilities. The boundaries placed around these types of facilities, act as safety measures enforced by legislation. The legislation prevents road or rail reserves being located inside these safety circles. The reference route alignment rail reserve is placed very close to one of these circles and this prompted investigations into alternative route alignments in the Modderfontein area during the EIA process. An alignment further to the north will result in the storage facilities having to move, which would be a very costly exercise.

East of the Marlboro Station on the Sandton – JIA route, the recommended route alignment is partially in cut and partially on fill. Further east, the proposal is that the alignment will go over Centenary Way and Modderfontein Road. At these locations the alignment is on fill that will facilitate a rail over road crossing. A planning team has been established with Heartland Properties (the main developer in the area) to ensure that the design of the railway line is compatible with the proposed land development proposals, and to amend their development framework to optimally integrate it with the railway system.

After discussions with other stakeholders during the comment period of the draft EIA report, it has become evident that it may be necessary for Gautrans, land owners and the City of Johannesburg to discuss the possibility of amending some proposed K-route road alignments in the Linbro Park and Modderfontein areas, in order to ensure optimum accessibility to existing properties and possible future developments if the proposed Gautrain Rapid Rail Link project is implemented.

After receiving further comments from Interested and Affected Parties (I&APs) in the Modderfontein area during the comment period on the draft EIA report, certain refinements to the recommended route alignment have been proposed in order to further reduce the impacts of the route 7 alignment in Modderfontein. The refinements largely entail a marginal shift in the alignment and the movement of the rail lines to the north by up to about 30 metres, away from the Founders' View industrial area, and this information is detailed in Appendix A to the Addendum.

Alternative route 7 does not affect the Linbro Park smallholding area as severely as the reference alignment as it does not create an isolated enclave. The refined route 7 alignment is preferred through the Modderfontein area as it does not impact on the existing golf course, nor does it isolate the Founders View commercial area. The refined route 7 alignment, however, still runs very close to buildings with heritage value in the old Modderfontein village and the alignment needs to be checked in the final design stage to try and avoid this historic area. Refined route alternative 7 is thus the preferred alignment, although it does pass (as do the other alternatives) through the open space area next to Esther Park.

A healthy population of a Red Data plant specie is found in the open space area near Esther Park. Alternative alignment 7 is preferred in this area , but only if this route can be aligned as far away as possible from the drainage line and if GDACEL decides that this area can be preserved as a sanctuary for flora (perhaps as part of a buffer zone around the rail reserve). The reference route can not be considered in this area as it impacts on Modderfontein's explosive storage areas further down the valley and therefore cannot link back to the original reference alignment at this point. However, alternative alignment 7 could be shifted to the north slightly to limit impacts on the open space area.

Earth berms/walls must be implemented, where required, to reduce noise impacts next to the Linbro Park, Esther Park, Cresslawn and Rhodesfield residential areas.

The area of Founders View, immediately east of Modderfontein Road (Route R25) and in the proximity of Centenary Road, already experiences a degraded noise climate (mainly from the road traffic noise). The situation can be expected to worsen as traffic volumes increase.

The typical mitigating measure for airborne noise in the area will be the installation of a noise attenuation wall along the southern side of the track. The required height of the wall will be dependent on certain features of the train, but it could be up to a maximum of 4 metres high. A properly designed barrier would reduce the train generated noise heard beyond the wall by at least 10dBA to 12dBA (barrier insertion loss). It is also recommended that the construction across the Modderfontein Road Valley be on earth fill rather than structure (viaduct) for long a distance as possible, as noise generated from fill sections is slightly quieter than from structure sections.

The unmitigated noise levels (airborne noise) predicted near the north-eastern corner of Founders View are calculated at approximately 58dBA. This is considered an acceptable outdoor ambient noise level in industrial areas of the type of Founders View.

At 25m from the centreline the vibration level will also be below the average human threshold to detect vibration, taken as 90 dB(V) in the study. The noise levels from ground-borne vibration are well below the impact criteria set at 30dB(A) for "Critical working areas." It therefore is predicted that the ground-borne noise and vibration levels should not adversely impact on either the staff working in the area or any vibration sensitive equipment.

The visual impact of the recommended rail line from the areas of Lakeside, Thornhill and Founders View will need attention to screen the line from their viewshed across the valley.

The Gautrain Technical Team is aware of the fact that the Spartan electrical sub-station may be affected by the recommended route alignment. The Technical Team has been involved in consultations with the local authority, the Ekurhuleni Metropolitan Municipality, and relevant service providers since August 2002 regarding this matter. Design work, as well as cost estimates have been done to minimise or eliminate the impact on the sub-station and the end users. It is envisaged that a replacement sub-station for the Spartan sub-station will be built. It is possible that short interruptions in electricity supply may occur during the switchover. Reasonable measures will be taken to prevent unnecessary and lengthy interruptions and to inform consumers of possible interruptions in service.

In Rhodesfield, alternative 8 is preferred from a town planning perspective, as the functional division of the suburb is less severe. An existing school will also be less affected. The alignment has been slightly refined since the release of the draft EIA report (See Appendix A to the Addendum) to accommodate engineering and geometric requirements on the tunnelled approach to JIA. These adjustments however do not affect the EIA recommendations.

The Heritage Impact Assessment (HIA) completed as part of the EIA process has indicated that there will be no impacts on heritage resources along this last section of the recommended route.

Careful placement and design of tunnel ventilation shafts, for the last tunnelled section of the line to JIA, will mitigate the localised (noise and visual) impacts of these facilities and it is recommended that these be located on commercial properties or within road reserves, where possible, and not on residential properties or quiet suburban streets.

Although there is no evidence from the literature to suggest there may be a problem, air quality monitoring at the ventilation shaft flue outlets could be considered, once the rail system is commissioned, to establish whether there are any air quality issues associated with the air movement through the rail tunnels and shafts which require mitigation.

Since the recommended alignment is in tunnel, between Rhodesfield and JIA, no significant impacts will occur in terms of the biophysical environment. Attempts should be made, however, to retain any old established trees at the ventilation shaft sites where construction to the tunnel will be from the surface.

The proposed Rhodesfield Station should be designed to blend in with the existing urban fabric and should be planned in co-ordination with the Ekuruheleni Metropolitan Municipality in terms of redevelopment plans for the area.

3. CONCLUSIONS AND RECOMMENDATIONS

Based on the findings of the environmental impact assessment of the proposed Gautrain project, including the thorough and extensive public participation process that was conducted over 15 months as part of the EIA, it is concluded that the project may proceed, subject to the required financial approvals, and the implementation of the mitigation measures proposed in the specialist reports in the draft EIA and the updated EMP in this Addendum.

The recommended route alignment is as follows:

Johannesburg Park Station - Sandton	**The Reference Alignment**
Sandton Station - Marlboro Station	**Route Alternative 2b**
Marlboro Station - Midrand Station	**Route Alternative 3**
Midrand Station - Centurion Station	**Refined Reference Alignment closer to the K101 and Route Alternative 4 on the approach to the proposed Centurion Station**
Centurion Station - Pretoria Station	**Refined Route Alternative 5a via Salvokop**
Pretoria Station - Hatfield Station	**Route Alternative 6fd**
Marlboro Station - Rhodesfield	**Refined Route Alternative 7**
Rhodesfield - JIA	**Refined Route Alternative 8**

It can be seen from the above that the originally published reference alignment has been substantially amended and refined during the EIA process to accommodate the concerns of I&APs and to address potential environmental impacts.

The bidding consortia should incorporate the proposed mitigation measures contained in the draft EIA report, and the updated draft EMP that follows this section of the Addendum, into their final designs for the Gautrain system.

Should GDACEL issue a favourable Record of Decision for the project, any conditions attached to their decision that might affect the design, construction and operation and maintenance phases, will also need to be addressed by the bidders and will be incorporated into the final EMP.