

# LAGOS RED LINE URBAN RAIL CONCESSION

PROJECT BRIEFING DOCUMENT



*LAGOS STATE GOVERNMENT*



NOVEMBER 2008

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# Table of Contents

<b>1</b>	<b>Introduction</b>	<b>5</b>
1.1	Overview of Project	5
1.2	Project Stakeholders	6
1.2.1	Lagos State Government	6
1.2.2	LAMATA	6
1.2.3	Ministry of Works & Infrastructure	6
1.2.4	Nigeria Railways Corporation	6
1.2.5	CPCS Transcom	6
1.2.6	The Dar Group	<b>Error! Bookmark not defined.</b>
1.2.7	Steer Davies Gleave / AEC	7
1.3	Overview of Project Briefing Document	7
<b>2</b>	<b>Country Background</b>	<b>8</b>
2.1	Nigeria Overview	8
2.2	Lagos Economic Overview	8
2.3	Historical Development of Lagos	8
2.4	Current Urban Form of Lagos	10
<b>3</b>	<b>Overview of Red Line Development</b>	<b>12</b>
3.1	Background on NRC Corridor	12
3.2	Red Line Station Overview	12
3.3	Blue Line LRT Project Overview	14
3.4	Project Coordination	14
<b>4</b>	<b>Red Line Demand Analysis</b>	<b>15</b>
4.1	Approach to Demand Analysis	15
4.2	Key Findings	15
<b>5</b>	<b>Overview of Red Line Infrastructure</b>	<b>16</b>
5.1	Infrastructure to be Provided by Design Build Contractor	16
5.2	Major Structures	17
5.3	Description of Stations	18
5.4	Description of Depot	20
5.5	Infrastructure to be Provided by Concessionaire	20
5.6	Overview of the Operations	21

## Glossary

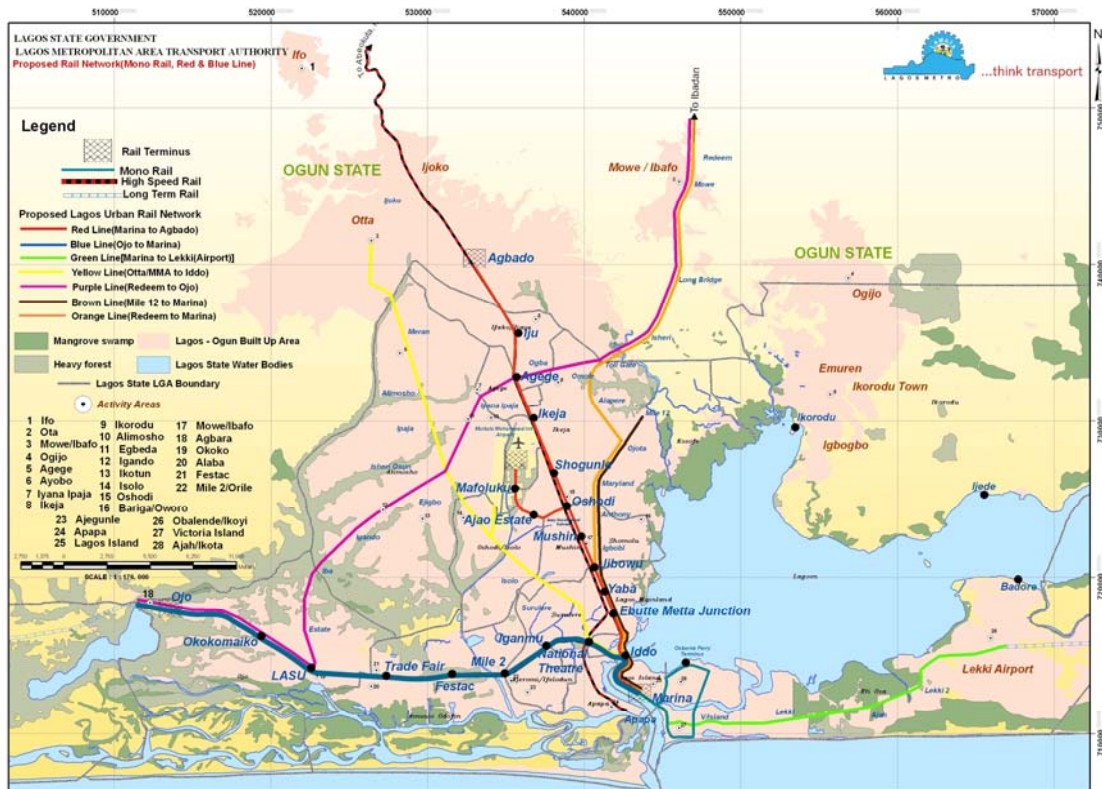
BOT	Build Operate Transfer
BRT	Bus Rapid Transit
CPCS	CPCS Transcom
Dar	The Dar Group
DB	Design Build
DBFO	Design Build Finance Operate
DBOM	Design Build Operate Maintain
DMU	Diesel Multiple Units
ECA	Export Credit Agency
EMU	Electric Multiple Units
FGN	Federal Government of Nigeria
LAMATA	Lagos Metropolitan Area Transit Authority
LGA	Local Government Area
LRT	Lagos Rail Transit
LSG	Lagos State Government
MWI	Ministry of Works & Infrastructure
NPC	National Population Commission
NRC	Nigeria Railways Corporation
O&M	Operate and maintain
PPP	Public Private Partnership
RFEOI	Request for Expression of Interest
RFP	Request for Proposal
SDG	Steer Davies Gleave

# 1 Introduction

## 1.1 Overview of Project

The Lagos State Government (“LSG”), as part of its effort to relieve chronic congestion in this city of over 15 million people, has mandated the Lagos Metropolitan Area Transit Authority (“LAMATA”) to develop an urban rail system. LAMATA and the LSG have decided to develop the urban rail system as a public private partnership (“PPP”), a structure that they have successfully used in the past for bus and road transport projects in Lagos. The following figure depicts the proposed urban rail system:

Figure 1.1: Proposed Urban Rail System



LAMATA has commenced development of the first two urban rail lines for the LRT system:

- The Okokomaiko – Marina Line (“Blue Line”)
- The Agbado – Marina Line and MMA Link (“Red Line”)

Both projects are being undertaken as PPPs. The LSG has decided to enter into two separate contracts for each rail line, a design build contract for the rail infrastructure and stations, and a concession contract covering operations, maintenance and rolling stock:

- **Contract 1: Detailed Design & Construction.** This will include the design and construction of Red Line infrastructure including track roadbed and structures, passenger stations, depot site preparation and access tracks.
- **Contract 2: Operations & Maintenance Concession.** The main focus of this contract will be the operations and maintenance of the Red Line for a 25 year period. Further, the responsibility for design and construction of some infrastructure will rest with the concessionaire. This includes depot facilities and workshop structures; railway systems and equipment; and equipping and furnishing stations, workshop and other facilities. In addition, the concession contract will also include the procurement of rolling stock and maintenance equipment.

The LSG has committed to financing all costs related to the detailed design and construction contract.

The Red Line will run South-North along a 30km corridor starting at Marina and finishing at Agbado. Ikeja, which is 19km from Marina, is linked to the MMIA International Terminal by a 6km line and to the Domestic Terminal by a 4km line. The current design accommodates 13 stations along the line, including the International and Domestic Terminal stations. The Red Line will utilize the existing Nigerian Railways Corporation (“NRC”) rail corridor from Agbado to Iddo and then continue over the lagoon to Marina, adjacent to the Blue Line. The alignments will split/converge at Iddo station. LAMATA envisions a common ticketing system so that commuters can move seamlessly between the two lines.

## 1.2 Project Stakeholders

### 1.2.1 Lagos State Government

Lagos State came into existence on May 27, 1967 through Decree No. 14 promulgated by the Federal Military Government. Lagos is the commercial capital of Nigeria and is led by the Governor, His Excellency, Mr. Babatunde Raji Fashola (SAN). His Excellency is the visionary behind the proposed Lagos urban rail system.

### 1.2.2 LAMATA

LAMATA has been established by the LSG to be the main instrument for transforming the state transport network and facilitating the development of a sustainable and effective integrated transport system. The authority to implement the mass transit system including construction of fixed infrastructure rests with LAMATA.

### 1.2.3 Ministry of Works & Infrastructure

The Ministry of Works & Infrastructure (“MWI”) is a State level ministry that reports to the Governor. The MWI is responsible for the Badagry Expressway Project.

### 1.2.4 Nigeria Railways Corporation

Nigeria Railways Corporation (“NRC”) is a federal state owned enterprise responsible for infrastructure and operations for Nigeria’s Eastern and Western Railways.

### 1.2.5 CPCS Transcom

CPCS is an international consulting firm specializing in private sector participation in the transport sector. CPCS as LAMATA’s transaction advisor for the Blue Line project was responsible for the feasibility study and conceptual design work.

### **1.2.6 The Dar Group**

The Dar Group (“Dar”) is an international engineering firm. Dar is LAMATA’s transaction advisor for the Red Line project and was responsible for the feasibility study and conceptual design work.

### **1.2.7 Steer Davies Gleave / AEC**

Steer Davies Gleave (“SDG”) is an international transport consulting firm. AEC is a Nigerian consulting engineering firm. SDG and AEC are partnered on the Badagry Expressway Project and are advising the MWI.

## **1.3 Overview of Project Briefing Document**

This Project Briefing Document is designed to provide pre-qualified parties with an overview of the following key areas:

- Overview of Lagos
- Project stakeholders
- Demand for rail transit in Lagos
- Overview of Red Line, including route and infrastructure

The information provided in this Project Briefing document is intended to provide background information only and it is not a substitute for interested parties’ own independent due diligence.

## 2 Country Background

### 2.1 Nigeria Overview

Nigeria is a democratic West African country with a nominal GDP of USD 136 billion (2007). The country is a major oil and gas exporter and has a population of 146 million people. S&P & Fitch have rated Nigeria BB-. The following figure provides an overview of key economic statistics and forecasts developed by Export Development Canada (EDC).

Figure 2.1: Nigeria Economic Indicators

Economic Indicators				
	2002-2006 avg	2007	2008	2009
GDP (% growth, real)	6.5	5.8	7.0	6.5
Inflation (% Chg, pa avg)	13.6	5.4	7.4	7.9
Fiscal Balance (% of GDP)	-2.5	-1.5	-1.2	-1.8
Exports (% comp. Annual growth)	23.9	7.2	27.9	-1.3
Imports (% comp. Annual growth)	20.1	21.2	14.8	5.2
Current Account (% of GDP)	2.3	5.0	9.2	6.2
Reserves (months of curr. Debits)	5.5	9.5	10.8	12.1
External Debt (% of GDP)	41.6	6.3	5.9	5.6
Debt Service Ratio (due)	12.1	1.7	0.6	0.3
Exchange Rate (to USD)	130.5	121.7	119.3	122.5

Source: EDC Economics

### 2.2 Lagos Economic Overview

Lagos is an historically important city in West Africa with an economic history extending from pre-colonial days. From a small fishing settlement in the 17<sup>th</sup> century, Lagos grew into an important port city during the slave trade of the 18<sup>th</sup> and 19<sup>th</sup> century.

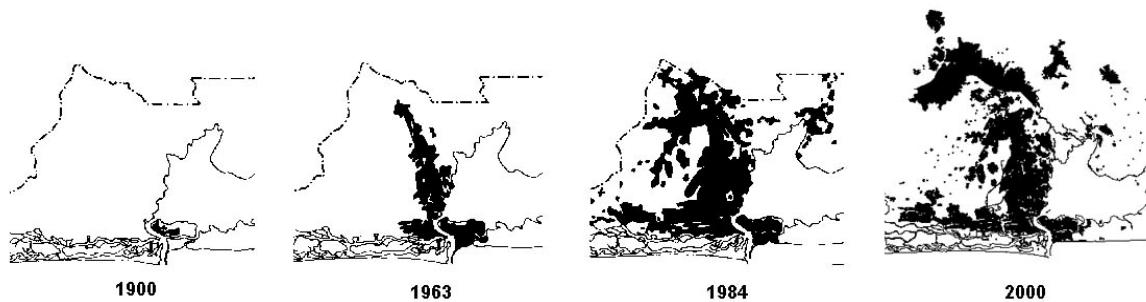
Lagos is now Nigeria's most prosperous city and much of the nation's wealth and economic activity are concentrated there. The commercial, financial and business centre of Lagos and of Nigeria remains the business district of Lagos Island, where most of the country's largest banks and financial institutions are located. More than half of Nigeria's industrial capacity is located in Lagos's mainland suburbs, particularly in the Ikeja industrial estate. A wide range of manufactured goods are produced in the city, including machinery, motor vehicles, electronic equipment, chemicals, beer, processed food, and textiles.

### 2.3 Historical Development of Lagos

Lagos grew throughout the 20th century due to a variety of factors such as natural population growth and urban migration. The city quickly developed into the economic, political, social, financial and administrative hub of Nigeria. In addition to being a governmental hub, it also became a centre for manufacturing industries and of commercial activities, with the headquarters of major national and international manufacturing, business,

and financial institutions. Additionally, it possesses one of the best harbours in West Africa and has port facilities at Apapa and Tin Can Island. The employment generated by these activities and its opportunities for the supporting service sector have attracted both domestic and international migrants to Lagos and have continually fuelled the growth of the city. The city continued to grow throughout the twentieth century. By the end of colonial occupation in the 1960's the population was around 665,000 and by the 1991 census, the population had grown to around 5.3 Million.

**Figure 2.2: Time Series Growth of Lagos (1900 – 2000)**



Source: Ministry of Physical Planning/Environment (1900,1963, 1984); LAMATA GIS Database (2000)

In terms of land coverage, the city has also grown dramatically in the last century. From the historic centers around Lagos Island and Ikoyi, the city began to expand northwards along the railway corridor under colonial occupation from 1900 to the 1950's. Settlements such as Ebute Metta (the national headquarters of the Nigerian Railway Corporation) as well as other communities including Mushin, Yaba, and Agege grew up during this time. The national seat of government was located in Ikeja in 1914, consolidating the territorial administration roles into one area. Lagos remained the national capital after independence in 1960. When 12 federal states were created in 1967, the seat of administration remained in the Ikeja area of Lagos State.

Through the 1960s and 1970s, urban growth occurred laterally on suitable lands to the west of the corridor including what is now Alimosho (west of the airport), as well as along the western axis towards Amuwo Odofin. Settlements also grew to the east of the city in what is now Kosofe and Ikorodu, on the north side of the lagoon.

In the last 20 years, explosive urban growth has continued but has primarily occurred in the southern parts of the city including westward into Ojo; eastward in Eti-Osa (also called the Lekki Peninsula); and increasingly now into Ogun State north of the city and to the northwest of the airport. Expansion of the metropolitan area today appears as a patchwork as the city is constrained by numerous physical barriers including wetlands and dense forests.

In the future, it is predicted that the major growth axes will be to east and the west of the southern parts of the city especially in what are now remote areas like Ojo, Badagry, Ibeju-Lekki, and Epe. Growth has already begun to occur on the East side towards Lekki with the introduction of the Lekki Expressway.

## 2.4 Current Urban Form of Lagos

The last master plan developed for Lagos State was completed in 1980 and expired in 2000. In 2005, the Report on the Review to the 1980-2000 Lagos State Regional Plan was undertaken by the firm John Asiyanbi Associates. An updated Lagos State Transport Master Plan is being created by ROM Engineering Transportation Ltd and Phoenix Engineering and Research Ltd.

In the 1980-2000 master plan, one of the principle strategies for the city's development was to promote decentralization of the city's activities in order to promote balanced regional growth and decongestion of the urban core. To this end, the Federal Government of Nigeria (FGN) and the LSG have taken numerous steps in an attempt to decentralize the city's population. The main initiatives they have undertaken include:

- Relocation of the Federal Government to Abuja: The seat of the federal government was moved from Lagos to Abuja in 1991 in an attempt to decentralize the economic and political power base of the country and alleviate in-migration to Lagos.
- Increase in the number of Local Government Areas ("LGAs"): Since the 1970s LSG has been increasingly divulging power to the LGAs. From the original four administrative divisions, the LGAs in Lagos have been subdivided to the present day number of 20 LGAs. The division of LGAs has been undertaken with the intention of promoting more balanced development and access to services throughout the city.
- Creation of Industrial Estates: 22 industrial estates were created inside the city of Lagos and an additional group have been proposed for the rural LGA's including Badagry, Epe and Ikorodu.
- Construction of Housing Estates: In an effort to decentralize areas with high population densities housing estates have been constructed in various parts of the city.
- Improved infrastructure provision: Infrastructure has been improved in outlying communities surrounding Lagos including microwater, rural electrification and community health centres.
- Improved road infrastructure: Roads connecting the remote communities were improved to encourage decentralized development including numerous road dualization projects and expressway links between Apapa-Oshodi-Oworoskoki and the Third Mainland Bridge link between Lagos Island and the Mainland
- Lekki Toll Road: The Lekki Concession Company has recently completed a major section of the Lekki Toll Road, one of the first PPP transportation projects in the city. The project is a landmark as it has revitalized development on the Lekki peninsula with many Lagosians wanting to take advantage of the increased accessibility on the peninsula through this welcomed new form of public and private sector cooperation.
- Introduction of further public-private partnerships (PPP) to aid further development, particularly in transportation, water, waste management, and infrastructure.

Despite these efforts, Lagos has continued to suffer from inadequate infrastructure. The pressure of urban growth has limited the benefits of various attempts by the Government to

reduce congestion. The actual growth rates as reported by the LSG and National Population Commission (“NPC”) are displayed in the following figure.

**Figure 2:3: LGA Population Growth Rates**

Local Government Area	1991 Population Census	LSG 2006	Annual Growth Rate	NPC 2006	Annual Growth Rate
Agege	417,966	1,033,064	6.22%	459,939	0.64%
Ajeromi/Ifelodun	575,454	1,435,295	6.28%	684,105	1.16%
Alimosho	430,890	2,047,026	10.95%	1,277,714	7.52%
Amuwo/Odofin	164,586	524,971	8.04%	318,166	4.49%
Apapa	163,775	522,384	8.04%	217,362	1.91%
Badagry	119,267	380,420	8.04%	241,093	4.80%
Epe	101,464	323,634	8.04%	181,409	3.95%
Eti-Osa	151,589	983,515	13.28%	287,785	4.37%
Ibeju-Lekki	24,937	99,540	9.67%	117,481	10.89%
Ifako/Ijaiye	233,356	744,323	8.04%	427,878	4.12%
Ikeja	203,383	648,720	8.04%	313,196	2.92%
Ikorodu	184,674	689,045	9.17%	535,619	7.36%
Kosofe	418,452	934,614	5.50%	665,393	3.14%
Lagos/Island	269,575	859,849	8.04%	209,437	-1.67%
Lagos/Mainland	165,996	629,469	9.29%	317,720	4.42%
Mushin	539,783	1,321,517	6.15%	633,009	1.07%
Ojo	295,181	941,523	8.04%	598,071	4.82%
Oshodi/Isolo	449,781	1,134,548	6.36%	621,509	2.18%
Shomolu	352,742	1,025,123	7.37%	402,673	0.89%
Surulere	462,265	1,274,362	6.99%	503,975	0.58%
<b>TOTAL</b>	<b>5,725,116</b>	<b>17,552,942</b>	<b>7.76%</b>	<b>9,013,534</b>	<b>3.07%</b>

Source: Lagos State Transport Master Plan Progress Report (LSTMP) / Lagos State Government

A Lagos Strategic Master Plan is currently under preparation by ROM Transportation Engineering and Phoenix Engineering and Research Ltd. Preliminary guidance from the consultants identifies four main problems with the current state of transit in Lagos:

- Absence of a mass transit system
- No formalized transportation infrastructure linking low-income areas to the activity and employment centers
- Excess supply of vehicles for the current arterial road system
- Lack of formal traffic management

Many issues exist in Lagos due to the aforementioned state of transit. Traffic congestion levels are very high which also contributes to high levels of pollution. Unlike many other major cities, where traffic congestion is only an issue during certain hours, Lagos has congestion issues during peak and off-peak times.

## 3 Overview of Red Line Development

As previously mentioned, the proposed Red Line is a 30km urban rail line running from Agbado to Marina, plus a link from Ikeja to MMIA's International and Domestic Terminals. This particular corridor was chosen due to its high population density and strong traffic flows, as well as the opportunity for the Red Line to run inside the existing Nigeria Railways Corporation ("NRC") corridor. The Red Line will run adjacent to the NRC tracks and will be accessible by passengers via overhead walkways.

### 3.1 Background on NRC Corridor

Traffic congestion along the NRC corridor is an ongoing and ever increasing problem. The NRC will rehabilitate the existing railway line into a double standard gauge, high speed freight line. NRC regional passenger services from the North will terminate at the Agbado commuter interchange station. Commuters from North of Abado will continue southward on the Red Line. The corridor is 30 meters wide allowing a 15 meter reserve along the Eastern half for the Red Line LRT development. The NRC double line and the Red Line, which will also be double, standard gauge track, will share the corridor but be completely independent in terms of operations and maintenance.

The usage of the full 30m width of the corridor by NRC and the Red Line will necessitate the relocation of a large number of people currently commercially active in the corridor and potentially also residing within the corridor. The drainage along the entire corridor needs to be upgraded and the whole corridor requires rail formation rebuild and strengthening. Existing station structures are unsuitable, and in some cases non-existent, and will need to be demolished and rebuilt along the Red Line alignment. During construction of the Red Line, any short-term interruptions to NRC operations will be carefully programmed to deviate the existing NRC lines where they encroach on the Eastern half of the corridor.

### 3.2 Red Line Station Overview

The following are the proposed Red Line stations:

#### **Marina (0.7km)**

Marina station will be elevated (5.5m above ground level) and positioned next to the bus terminus area on a straight section of track. Both the Red Line and the Blue Line are positioned on the available piece of land between the double causeway and the ocean. Island style platforms will provide passenger access. A passenger walkway will connect the parking area from across the causeway to the Station complex. The elevation is essential to allow access to the quayside. A shunting leg extends beyond Marina to facilitate the turn back of Multiple Units at the terminal. The Blue Line follows a route immediately West of the Red Line alignment.

#### **Ebute Ero (2.5km)**

This station is at an elevation of 16m above sea level on a curve tightly fit between the double causeway and the ocean. Island type platforms with escalator access from beneath

will provide access for passengers. A walkway will link the parking area from across the causeway to the Station complex.

#### **Iddo (4.3 km)**

From Ebute Ero the line runs via an S-curve with a maximum radius of 200m and clearing the road bridge with a height of 6m above the roadway and 18m above the sea level. The combined Red Line and Blue Line elevated station is just North West of the current Iddo station. The island platforms of the two Lines will be positioned in the form of a 'Y' at the same level providing commuter interchange between the Red Line and the Blue Line. An elevation of 10m at the new Iddo station is required to clear the road system immediately South of the current Iddo station building. Both platforms will be on a curve. The current Iddo station at grade will be utilised as refuelling and staging yard for Multiple Units.

#### **Iddo to Ebute Metta (5.9 km)**

From Iddo the Red Line runs via a reverse curve in a Northerly direction. The right of way is also the most constricted here. After the reverse curve the route immediately enters the Ebute Metta station. The station will be located at grade on straight track. At the North side of the station the Head Office and Maintenance workshop approach line branches off. The Head office and maintenance area occupies a 1000m long by 100m wide area between Ebute Metta and Ebute Metta Junction.

#### **Ebute Metta to Yaba (9.0 km)**

The Red Line from Ebute Metta runs straight to Yaba passing Ebute Metta Junction, the existing NRC Head office. Yaba Station will have a centre island style platform with track both sides.

#### **Yaba to Mushin (12.1 km)**

From Yaba the Red Line continues as a double line on a straight track to Mushin station. The NRC line is a double line on the West side of the Red Line. Mushin Station will have a centre island style platform with track both sides.

#### **Mushin to Oshodi (13.7 km)**

From Mushin the Red Line continues as a straight double line to Oshodi station. The gradient, rising to the North, is rather steeper here. Oshodi is currently a major trading node. Oshodi Station will have a centre island style platform with track both sides.

#### **Oshodi to Ikeja (18.9 km)**

From Oshodi the Red Line continues as a double line to Ikeja passing the former Shogunle station. At Ikeja the link line from the MMIA and domestic Airport Terminal links to the Red Line. Two island style terminals are positioned next to each other with overhead walkways providing commuter interchange between the airport link and the South-North Red Line. The link line from MMIA crosses the 30m wide NRC and Red Line rail corridor with a rail over rail grade separated structure.

#### **Ikeja to MMIA International Terminal (5.9 km) and Domestic Terminal (3.9 km)**

Single lines link the International Terminal and Domestic Terminal to Ikeja. Both Terminal Station platforms will be shorter than the station platforms on the rest of the Red Line as shorter trains will operate on the MMIA link.

#### **Ikeja to Agege (22.3 km)**

From Ikeja the Red Line continues as a double line to Agege station with the NRC freight double line continuing in parallel on the West of the Red Line. Agege currently is a major trading node. Agege Station will have a centre island style platform with track both sides.

#### **Agege to Iju (27.0 km)**

From Agege the Red Line continues as a double line to Iju Station. The alignment follows two large radii curves (S curve). Iju Station will have a centre island style platform with tracks both sides.

#### **Iju to Agbado (30.0 km)**

From Iju the Red Line continues as a straight double line to Agbado station. This station is the Northern terminal of the Red Line. Beyond the Agbado station three lines continue for 1750m to provide staging area for the Multiple Units. Agbado station has two island style platforms and overhead walkways facilitating the transfer of commuters from the NRC network to the Red Line and vice versa. This facility will be the only commuter interface between the operations of the LRMT and the NRC regional passenger service to the North of Agbado.

### **3.3 Blue Line LRT Project Overview**

The Blue Line is a light rail transit line being developed concurrently with the Red Line. The Blue Line project is also being developed by LAMATA using a PPP structure. The Blue Line will run from Okokomaiko to Iddo and then follow the alignment of the Red Line from Iddo over Osa Lagoon to Marina Station. Thus, the right of way from Iddo Station to Marina will be shared with the Blue Line including three eastern stations. The shared infrastructure (roadbed, structures and stations) will be designed and constructed as part of the Red Line project. The Red Line Concessionaire will be expected to liaise with Blue Line stakeholders to ensure that ticketing and the ability for passengers to easily transfer is coordinated. More details about the Blue Line Project are available at [www.lagosrail.com](http://www.lagosrail.com)

### **3.4 Project Coordination**

Coordination between the Red Line project and the NRC project will be required. In this regard a Memorandum of Understanding has been concluded between the NRC and LAMATA.

In the case of the Blue Line LRT Project, there will need to be coordination with both the design-construct contractor and the concessionaire. The Blue Line design-construct contractor will construct the Blue Line track from Iddo to Marina after completion of structures and roadbed by the Red Line contractor. The Blue Line concessionaire will also need to access the alignment to install signaling, train control and communications equipment for the Blue Line, and will finish and equip the three joint stations.

Coordination will be required between the design build contractor and the concessionaire to ensure that all infrastructure/equipment interfaces are correct.

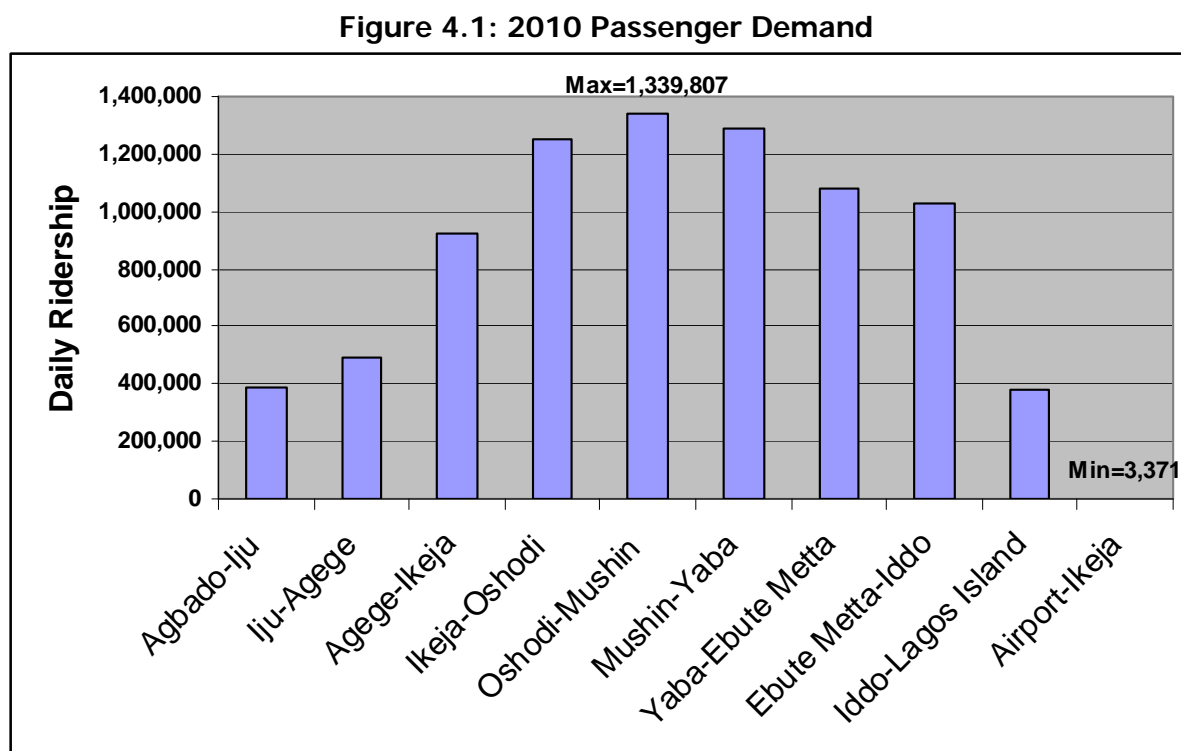
## 4 Red Line Demand Analysis

### 4.1 Approach to Demand Analysis

In 2008, The Dar Group conducted a review and update of previous demand studies, amongst others, a CPCS Transcom study completed in 2006. The updated study projected demand for the Red Line up until 2025, including the link over Osa Lagoon and the MMIA link. The complete study will be made available to prequalified bidders. The key findings are summarized in Section 4.2 below:

### 4.2 Key Findings

Figure 4.1 below shows the expected 2010 demand. These numbers represent the number of one way trips anticipated on any given weekday for the year 2010.



The predicted demand growths on the Red Line, using the 2010 numbers as a base, are:

- 2010 to 2015: +7.2%
- 2010 to 2020: +20.2%
- 2010 to 2025: +39.4%

## 5 Overview of Red Line Infrastructure

As previously mentioned, the design build contractor will be responsible for the majority of the fixed infrastructure, including:

- Track, drainage and enclosing barrier walls
- Structural elements including bridges, viaducts, and retaining walls
- Utilities design and construction
- Track works including all mainline tracks, cross-over tracks and access into the depot
- Site preparation of the depot facility
- 13 Stations including site work, structures, interior and exterior finished, utilities and mechanical/electrical systems

The Preliminary Design Report and Drawings will be made available to shortlisted parties. The requirements are summarized in the following sections.

### 5.1 Infrastructure to be Provided by Design Build Contractor

The current NRC line's geometry is in conflict with a large portion of the proposed Red Line 15-metre wide corridor on the East side of the 30m corridor. This necessitates that the NRC alignment will need to be deviated towards the West of the 30m corridor. The alignment for the Red Line will follow the eastern border of the measured current corridor. The cross section of the NRC portion is conceptual and for illustrative purposes only and shown alongside the Red Line cross section in Figure 5.1.

Topographical surveys and geotechnical investigations have been completed for specification purposes, but the successful contractor will be required to repeat such studies as part of the detailed design.

The total enclosure of the Red Line corridor necessitates the construction of a number of road rail grade separated structures and passenger grade separation structures along the alignment from Iddo to Agbado. There are sections of the track elevated above ground between Marina and Iddo and on the MMIA link. The Red Line Contractor will be responsible for building the bridge over Osa Lagoon and the elevated structure on Lagos Island to carry the Red Line and the Blue Line.

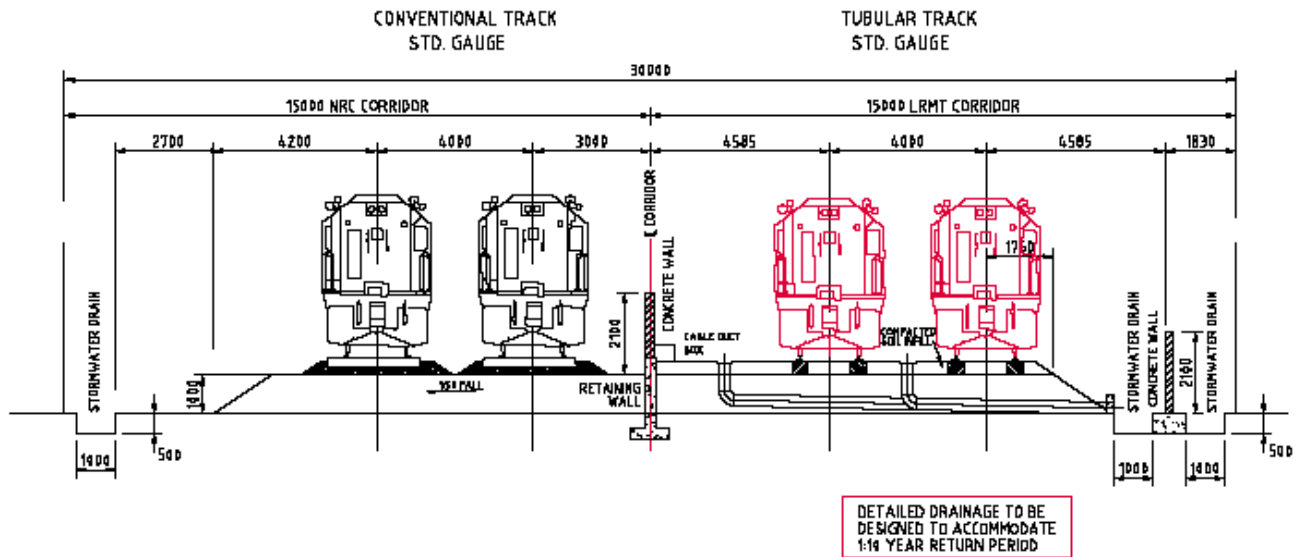
The track infrastructure must be designed with the objectives of simplicity, very limited maintenance involvement and long term sustainability. With these outputs in mind, and given the 15 metre width restriction, a track slab rail super structure was proposed by the Dar Group.

On the 15 metre wide Red Line side of the corridor, a double standard gauge (1435mm) track, a drainage system and two walls 2.1 metres high must be provided. A cable duct and walkway must be provided on the East side of the wall between the NRC and the Red Line systems (See Figure 5.1).

Station track layout drawings and a description of station positions and design are included in the Preliminary Design Report. The station geometric design needs to make provision for a

train set of 16 Multiple Unit cars (352m) although the platform will initially only be constructed for a train set of 12 cars (264m).

**Figure 5.1: Typical Cross Section through 30-Metre Corridor**



## 5.2 Major Structures

The major grade separation structure on the corridor is the combined 5 km viaduct rail over road and Cable Stay Bridge linking both the Red Line and the Blue Line from Marina to Iddo Stations. The elevated structure starts at Marina (0.0km) and is essential to allow access to the quay side on the route from Marina through to Ebute Ero at 2.493km. The elevation carries the Red and Blue Lines over the road causeway and crosses Osa Lagoon via a cable stay bridge 18m above the water. The elevation crosses Bridge Street immediately South of Iddo terminal then continues to the elevated Iddo Station and ends on the Northern side of Iddo Station, South of Ebute Metta Station.

The single line track linking MMIA to Ikeja Station has a 7-meter high elevation in places. The rail over rail grade separating structure South of Ikeja will intersect with the Red Line at an angle of 30°, with a minimum horizontal curve radius along this section is 200m. The MMIA International Terminal is at grade and positioned to the East of the current parking area at MMIA. The elevated track structure is required to cross a road and marshy area to the South of the airport. The Domestic Terminal is also at grade, but the track will need to be elevated to cross the road South of the Domestic Terminal.

In addition to these elevated track sections, there are also numerous over rail crossings of elevated road structures to be designed and built by the Red Line Contractor. These structures are positioned as shown in Table 5.1.

There are 35 pedestrian bridges to be built over the railway corridor. These crossings should be designed as commercial interaction areas where purpose designed shelters are made available on the overpass walkway.

**Table 5.1: Road over Rail Separation Structures**

	Distance from Marina (km)	Road interface	Reasoning	Existing / New	No of Lanes
1	5,342	Moshood Abiola Way	Important for access to NRC offices	New	2
2	8.631	Ojuelegba Road	Link between Western Ave. and Ikorodu Rd.	New	4
3	9.792	Ikorodu Road		Existing	
4	12,238	Just North of Mushin station	Essential to service nodal development at Mushin station	New	2
5	14,154	Apapa Oworonsoki		Existing	
6	18.319	Mobolaji Bank Anthony		Existing	
7	21,072	Akanni Doherty	Links Agege Rd to an Industrial area east of railway	New	2
8	22.758	Agunbiade	Links Agunbiade street with the intersection of Ikeja-Agege Rd and Oba Ogunji Rd.	New	4
9	26,102	Jonathan Coker	Main access from Iju Rd to large residential area west of the railway	New	4
10		Iddi-Oro between yaba and Mushin stations		New	4

The design of road overpasses should not provide any opportunity for access to the Red Line, and should be screened at the sides to prevent the throwing of objects onto the Red Line.

### 5.3 Description of Stations

The line will be served by 13 stations designed with a unifying theme. The three southern stations will also serve the Blue Line and one (Agbado) will allow NRC passengers to transfer to the Red Line and vice versa. The stations will be of one of three design types, namely typical intermediate stations, terminal stations and commuter interchange stations.

The typical intermediate stations are: Ebute Ero, Ebute Metta, Yaba, Mushin, Oshodi, Agege and Iju.

The terminal stations are: Agbado, MMIA International Terminal and Domestic Terminal and Marina.

The commuter interchange stations are: Agbado, Ikeja and Iddo.

The station layout for a typical intermediate station is given in Figure 5.2 below. The general design of such a station is shown in Figure 5.3 below.

Figure 5.2: Typical Layout of Intermediate Stations

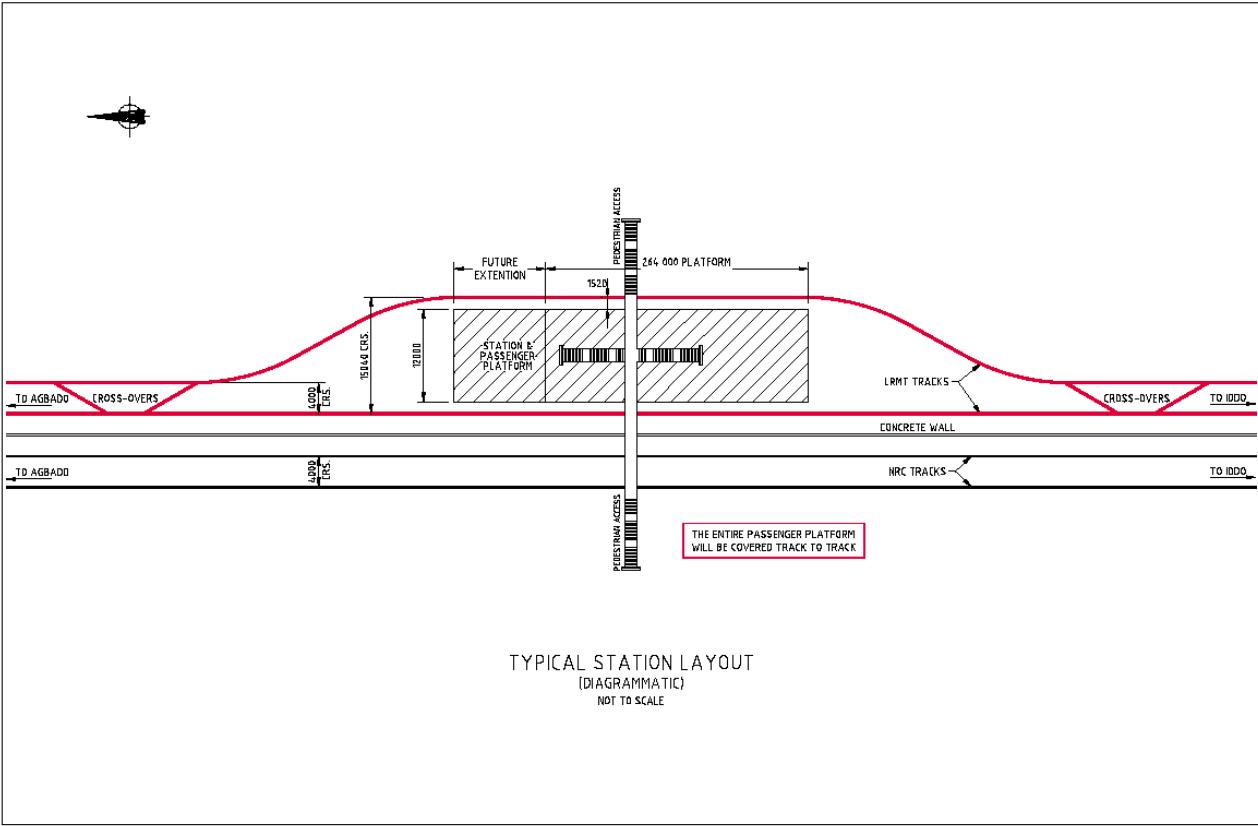
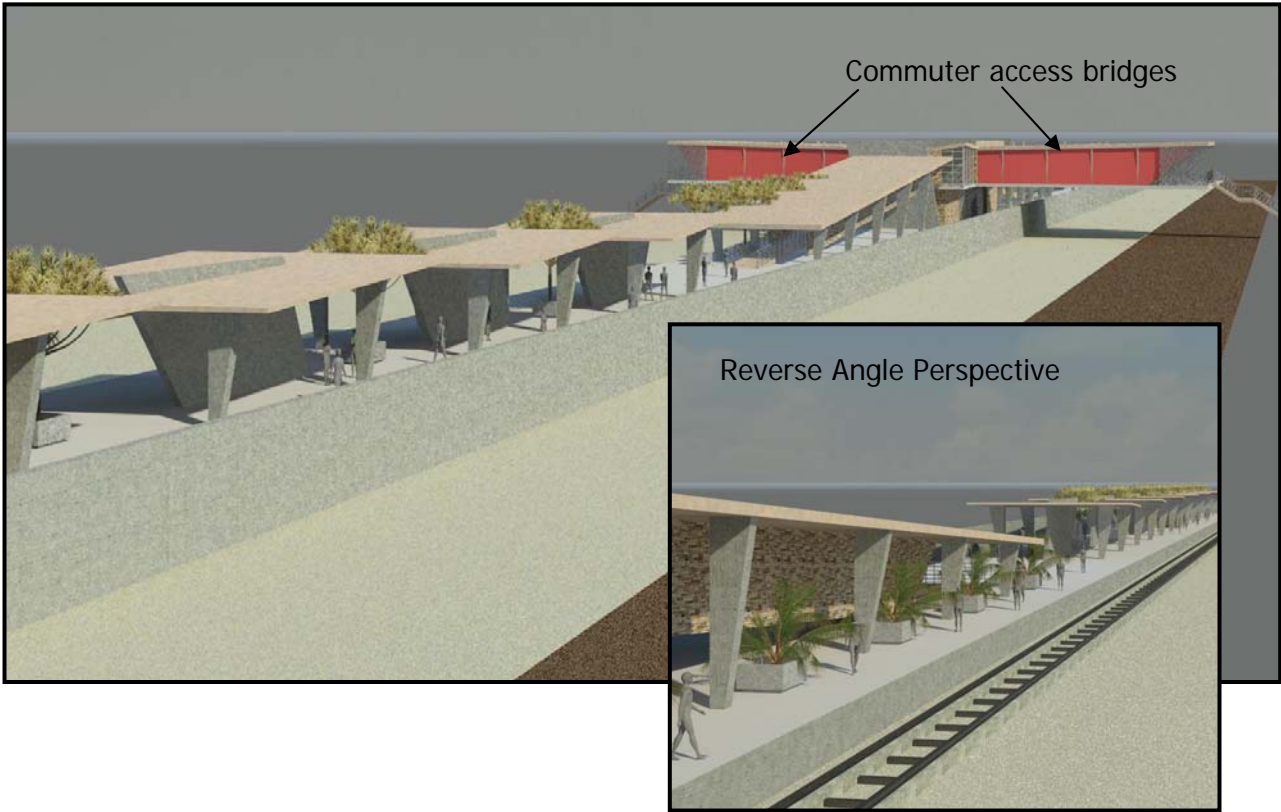


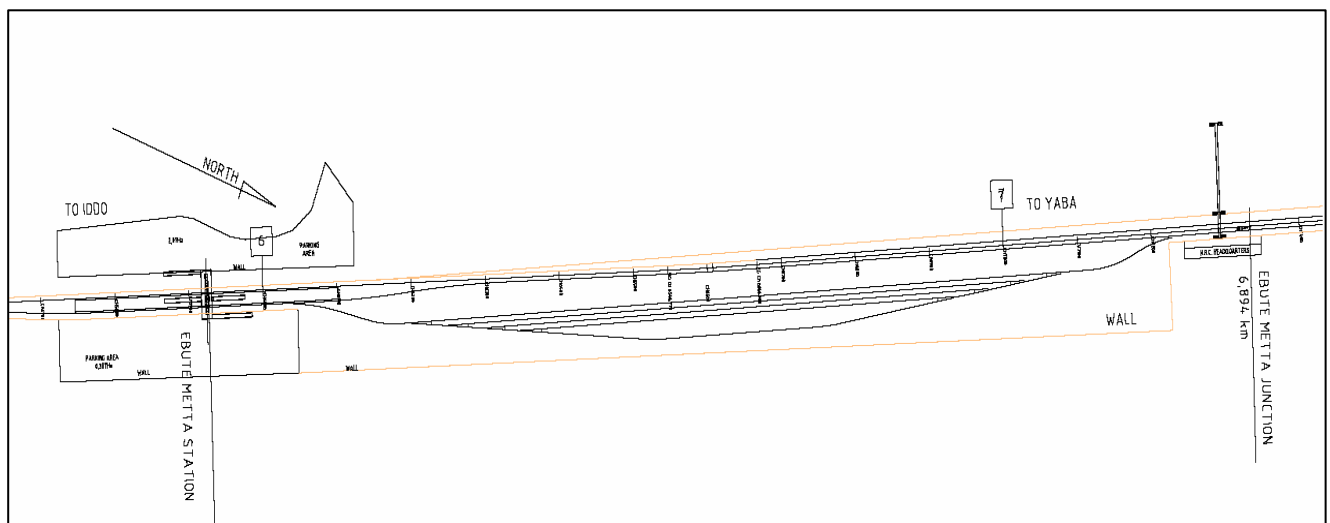
Figure 5.3: Design of Intermediate Stations



## 5.4 Description of Depot

The site proposed for the Maintenance Depot and Administration buildings is situated on the Eastern side of the existing railway alignment between Ebute Metta station and Ebute Metta Junction as shown in Figure 5.3 below. The depot site will include stabling tracks, rolling stock maintenance workshops, fuelling and cleaning facilities, infrastructure maintenance facilities, driver training facilities and the operations control and administration facility.

**Figure 5.3: Maintenance Depot Site**



## 5.5 Infrastructure to be Provided by Concessionaire

Infrastructure that will be designed, manufactured/constructed, and financed by the Concessionaire includes the following:

- Rolling Stock
- Power supply if electrically powered rolling stock
- Signalling, Control and Communications (SC&C) and SCADA Systems
- Depot and Workshop facilities
- Operations Control Center and Train Driver Training Facility
- Completion of Passenger Stations, including commuter payment systems, public address and electronic information screens

The design requirements will be outlined in the RFP. It should be noted that these are the minimum requirements, and that the Concessionaire is responsible for ensuring that all works designed and constructed by him, specifications followed and material procured meet the basic requirements for efficient and safe operation of the Red Line. The concessionaire is also required to ensure that all works execution, maintenance activities, materials, etc. meet the national requirements and standards for Nigeria.

The concessionaire should also review the design build contract for the fixed infrastructure thoroughly as it will be the responsibility of the concessionaire to design, build and finance all works or equipment not covered by the design build contract but that is necessary for the

operation of the Red Line. Of critical importance is the coordination of work between the contractor and the concessionaire, for instance the concessionaire will have to ensure all track work by the Contractor meets with the concessionaire's rolling stock specifications.

## 5.6 Overview of the Operations

In order to meet the expected commuter demand, the Marina – Agbado line will be operated with a train headway of 3 minutes and run from 03:00 to 22:00 daily. It is envisaged that the trains will be 12-cars long to meet the demand from 2010 to 2015. Thereafter the trains will be increased in length to a maximum of 16-car trains to meet the 2025 demand. Each car will be designed to carry up to 300 passengers, mostly standing, with about 10% seated.

The airport service will consist of two 2-car trains running between Ikeja and the airport. Each train will alternate between the domestic terminal and the international terminal. A train will depart for the domestic terminal every twenty minutes. A train will also depart for the international terminal every twenty minutes.

To cater for the high demand, and to allow train length flexibility, Multiple Unit Train technology will be required, either Diesel Multiple Units or Electric Multiple Units. Electric Multiple Units have not been excluded as an option from the RFP because of their superior acceleration, however the concessionaire will have to design/construct the overhead electrification, transmission system and power generation system.

Benefits of the latest train authorisation systems that are being developed world wide will be deployed on the Red Line. In-cab signaling with minimal wayside equipment is envisaged with automatic train protection (ATP), which ensures that train drivers exceed neither movement authorities, nor permanent- and temporary speed restrictions. Further, the concessionaire will have to ensure the continued competence of train drivers by means of, inter alia, a full mission train simulator housed in the training facility.

The train movement control system design must facilitate efficient field servicing without the risk of interruption to the traffic. The backup power system must ensure 99.99% availability of the signalling. Reliability and safety are top priorities.

End of Document