



Traffic Baseline Study

Richards Bay Port Expansion Programme

April 2013

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TRAFFIC BASELINE STUDY

Richards Bay Port Expansion Programme

Draft Report

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Traffic Baseline Study: Richards Bay Port Expansion Programme

1 Background

The Richards Bay Transnet Port Terminals have been identified as an area where major demand for growth is expected in bulk and break bulk products. It is predicted that the demand for freight transported to the harbour will grow from 23 Million tonnes per annum (Mtpa) in 2012 to more than 59 Mtpa in 2040. Many of the terminal facilities and machinery are operating close to capacity and nearing the end of their operational life. Numerous assets require refurbishment and/or replacement. As a result Transnet needs to increase capacity and recapitalise facilities (Freimond, 2013).

The main export commodity of the Richards Bay port is thermal coal. Owing to the high international demand, there is a need for the establishment of new mines and for the existing mines to increase coal production and exports. The port capacity appears adequate in the short term; however, all the current capacity is already assigned to shareholders such as Transnet, Richards Bay Coal Terminal shareholders and Navitrade. There is thus no space for new shareholders or new entrants. Transnet wants to provide capacity for the existing and emerging mines in South Africa and thus requires a new competitive port terminal (Pienaar, 2013).

To provide for the anticipated increase demand in throughput at the port of Richards Bay, two proposed projects are being evaluated:

- The expansion of the existing Transnet's port capacity; and
- The construction of a new Transnet coal terminal.

The AECOM SA transportation planning division conducted a baseline study to evaluate the status of the existing road network.

2 Road Network

2.1 External Road Network

The road network providing access to the port, see *Figure 1*, is summarised as follows (Mpumalanga Provincial Government, 2010):

- **The National Route 2 (N2):** The N2 is a national route functioning as a north-south link in KwaZulu-Natal providing access to Richards Bay.
- **John Ross Parkway (R34):** John Ross Parkway is a provincial road that connects the port (and surrounding industries) to the N2. The road is a dual carriageway and functions as the main link between Richards Bay and Empangeni (a neighbouring town of Richards Bay). There are currently two road-over-rail bridge structures in John Ross Parkway. The design speed of the road is 100km/h and the speed limit is 80 km/h.
- **West Central Arterial:** The road provides access to the western entrance of the port, linking with the port internal road, Urania Road. The West Central Arterial is the main access road to the discard coal and liquid bulk terminals. The arterial also provides access to the Richards Bay Central Business District (CBD).



Figure 1: External Road Network

- **Harbour Arterial:** The road provides access to the Alusaf Bayside smelters. To the eastern end of the road, it becomes Ferro Close and connects to the John Ross Parkway.
- **Medway Road:** Medway Road provides access to the eastern entrance of the port. It also provides a link to the Multi-Purpose Terminals (MPT) series 7 and the Ferro and Timber storage areas.
- **Bayview Boulevard:** Bayview Boulevard, together with Bridgetown Road, provides access to the eastern section of the port, i.e. The Village (referring to the Richards Bay Waterfront, small crafts harbour, Naval Island and the commercial developments).

2.2 Internal Road Network

The internal road network provides access to a number of berths and developments – see *Figure 2*. The main internal routes according to the Mpumalanga Provincial Government (2010) and Kehagias and Otto (2013), are:

- **Newark Road:** Forms the main east-west collector/distributor. The road provides access to the MPT, Dry Bulk Terminal (DBT) and the port's administration complex. The road is divided into two sections:
 - West of the eastern access: The main access road to the DBT.
 - East of the eastern access: A public road that provides access to The Village.
- **Urania Road / Duine Road:** Provides access to the South Dunes area, where the privately owned Richards Bay Coal Terminal and the Island View bulk liquid storage areas are situated. Urania Road is also the main public road in the port.
- **Medway Road:** The road functions as a link between Newark Road and John Ross Parkway. Parts of the road are outside the port boundary and thus, both port and public vehicles use this road.
- **Bridgetown Road:** Bridgetown Road in conjunction with Pioneer Road, Mendoza Road and the eastern part of Newark Road serve The Village at the eastern end of the port.
- **Silver Ocean Road:** The road connects with Newark Road and provides access to the Shincel operation.
- **Ventura Road:** The road links with Newark Road and is the main road to the port's administration complex.
- **Octopus Road:** The road provides access to the PMT series 6 and connects with Newark Road.
- **Wayfarer Road:** Connects Newark Road with Minerva Road.
- **Peningo Road:** The road provides access to the western side of the PMT series 7 and the staging area and connects with Newark Road.
- **Chaldane Road:** The road provides access to the eastern side of the PMT series 7 and the staging area and connects with Newark Road.
- **Other Internal Roads:** There are a number of additional roads providing access to the developments in the port operational area. These roads include: San Thom Road, Gordon Road, Colombo Road, Northmoor Road, Dumra Road, Active Road, and Tugela Road.

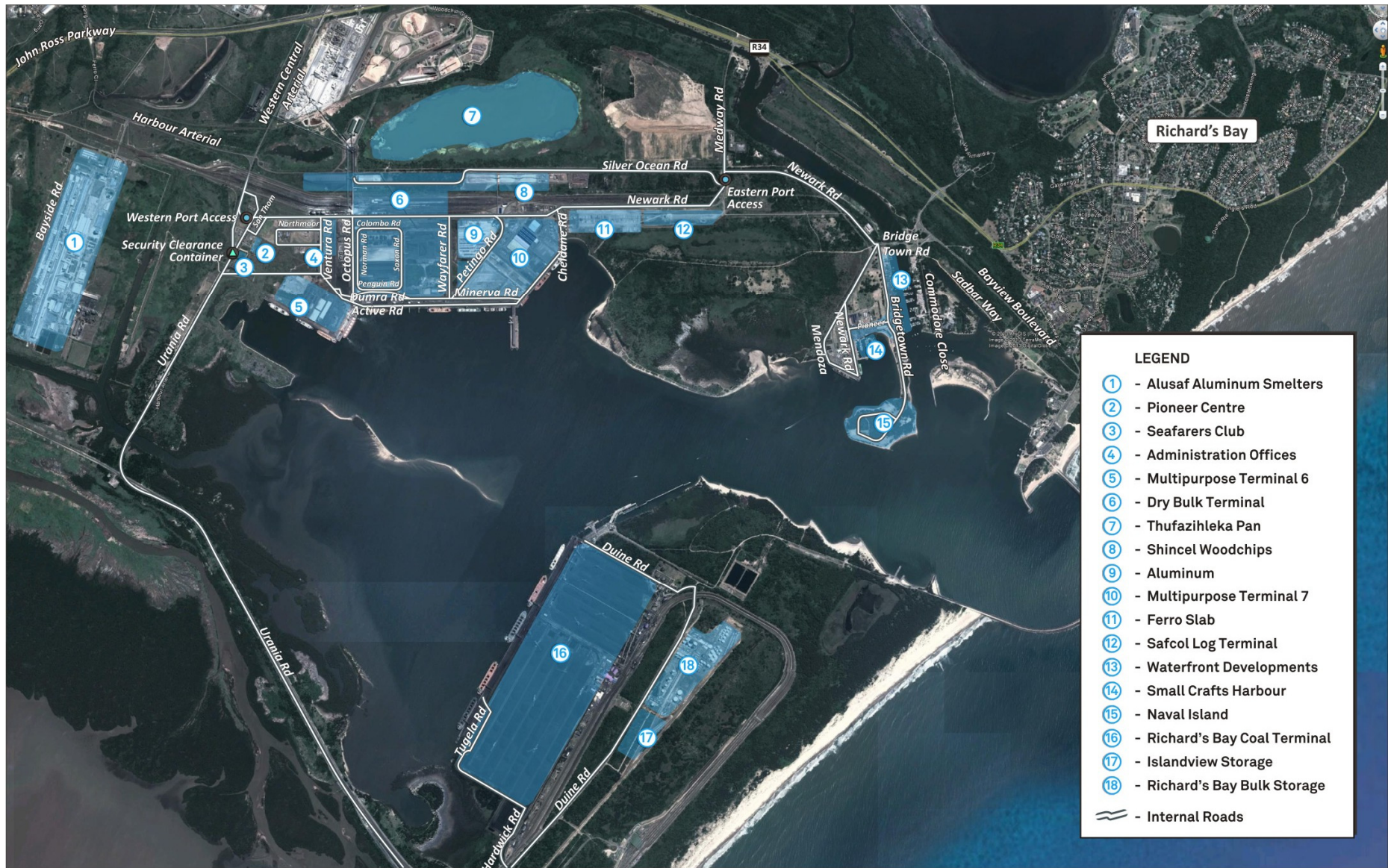


Figure 2: Internal Road Network

3 Access Arrangements

There are two main gates providing access to the industrial operations at the port of Richards Bay – see *Figure 1*. These gates are manned and security clearance is required before access is granted. These are:

- **The western port access:** This access is situated on the western end of Newark Road where it meets with Western Central Arterial. The gate operates with two entry lanes and two exit lanes.
- **The eastern port access:** The eastern access is on Medway Road, just south of the intersection with the eastern part of Newark Road. The gate operates with one entry and one exit lane.

The Village is open to the public and can be accessed through the following roads (see *Figure 2*):

- **Newark Road East:** The road can be accessed from Medway Road, just north of the eastern access.
- **Bridgetown Bridge Road:** The bridge in Bridgetown Road consists of only one lane and therefore operates with priority control, allowing one-way flow at a time on a first-come-first-served basis.

Table 1 shows a summary of the main commodities utilising the different access gates (or the purpose for entering).

Table 1: Access Utilisation (Moodley, 2011)

Access	Commodity / Purpose
Western Gate	MPT 6 series - Manganese, Granite, Coal, Containers and Silicon Carbide DBT - Coking Coal, Salt, Sulphur, Rock, Phosphate, Metcoke, Anthracite, Chrome Ore and Manganese Richards Bay Coal Terminal
Eastern Gate	DBT - Sulphate MPT 7 series - Manganese Ore, Chrome Ore, Granite and Pig Iron Ferro Slab
Bridgetown Road and Newark Road East	Public vehicles can access The Village developments on the eastern section of the port

Vehicles that do not have prearranged permission to enter the port operations area need to obtain security clearance south of the western gate (close to the Pioneer Centre) – see *Figure 2*. It is recommended that the layout be evaluated to assure that the security clearance process is streamlined. Specific attention should be given to the heavy vehicle turning movements in front of the security container.

4 Parking

The parking provision at the port of Richards Bay was evaluated by ARUP (Pty) Ltd (hereafter referred to as ARUP), through a visual inspection and feedback from the port's tenants. It was found that sufficient parking is available for light vehicles. However, there is a lack of parking provided for heavy vehicles. As a result, the heavy vehicles park along road verges in and around the port area. The truck drivers' parking on the road edges and driving over it, leads to excess wear on roads. To improve this, ARUP recommended that non-mountable curbs be constructed and that Transnet's proposed Trucking Facility is developed (Moodley, 2011).

5 Traffic

5.1 Introduction

Direct rail and road links have been developed between the major South African cities and the port of Richards Bay to enable the transportation of goods to and from the port. The port handled approximately 22 million tonnes of cargo in 2011. Over the years, the volume of trucks accessing the port has increased, resulting in higher levels of congestion. In January 2012, more than 3 900 trucks accessed the port terminal (Taylor, 2012 and Wepener *et al*, 2012).

5.2 Road-Rail Competition

According to the KwaZulu-Natal Department of Transport (2004), when cargo is transported over a short distance, road transport is the preferred mode. At the Richards Bay port, the haulage of bulk commodities is over long distances; however, more than 80% of the freight is transported by rail.

5.3 Road Traffic Volumes

ARUP conducted a traffic study in 2011, but limited data is available and thus not adequate for further modelling and capacity analyses. It is recommended that traffic surveys be conducted at critical intersections during the weekday morning and afternoon peak periods to establish the existing peak hour traffic volumes within the study area. In addition, traffic information regarding the vehicles accessing the port should be obtained from the gates.

5.4 Intersection Analysis

Capacity analyses were conducted by ARUP by using Aimsun to evaluate the road network performance. The following intersection/access gates in Newark Road were evaluated (Moodley, 2011) – see *Figure 2*:

- The Western Gate;
- San Thom Road;
- Ventura Road;
- Octopus Road;
- Wayfarer Road;
- Petingo Road;
- Chelane Road; and
- The Eastern Gate.

The delays experienced at the intersections were evaluated in terms of Level of Service (LOS), see *Table 2*. If an intersection is operating at a LOS A-D, sufficient capacity is available for the volumes using the intersection and the delays experienced are acceptable. If a LOS E/F is calculated for an intersection, the intersection is seen as operating at/close to capacity and road users are experiencing excessive delays (Moodley, 2011).

Table 2: Level of Service Definitions (Moodley, 2011)

Delay (sec)	Level of Service (LOS)	Acceptable/Not acceptable
< 10	A	Acceptable
> 10 and < 15	B	Acceptable
> 15 and < 25	C	Acceptable
> 25 and < 35	D	Acceptable
> 35 and < 50	E	Not acceptable
> 50	F	Not acceptable

The existing operating conditions (2011) at the intersections mentioned above were evaluated. The results are summarised in *Table 3*. The results are provided per critical movement and for the intersection as a whole (Moodley, 2011).

Table 3: Capacity Analyses Results (Moodley, 2011)

Intersection with Newark Road	Critical Movement	Delay (sec)	LOS
West Gate	North Left	141.47	F
	East Left	55.68	F
	East Right	88.04	F
	Intersection	109.65	F
San Thom Road	South Left	74.32	F
	West Straight	134.56	F
	West Right	147.19	F
	Intersection	131.98	F
Ventura Road	West Right	7.53	A
	Intersection	0.57	A
Octopus Road	West Right	7.53	A
	Intersection	0.57	A
Wayfarer Road	West Straight	0.58	A
	Intersection	0.58	A
Pentingo Road	North Left	5.02	A
	South Right	9.59	A
	West Straight	131.94	F
	Intersection	49.26	E
Cheldane Road	South Right	18.57	C
	Intersection	15.49	C
East Gate	North Straight	116.58	F
	South Straight	228.38	F
	Intersection	184.42	F

According to the analyses conducted by ARUP and the available information at that time, the following improvements were recommended:

- Right turn lanes of 50 m should be provided at all the intersections where not currently available, to accommodate a queue of two trucks. This is to improve safety and delays experienced at the intersections;
- The intersection of Newark Road with Pertingo Road should be reconstructed to allow that the roads cross perpendicular;
- A U-turn facility should be introduced close to the Western Access Gate; and
- Ventura Road should be closed and a new access provided to the MPT 6 series and coal terminal.

5.5 Abnormal Vehicles and Super Loads

Abnormal vehicles that have been accommodated by the Richards Bay port in the past are as large as 60 m in length, 11 m in width and height with a mass of 480 t (Kehagias and Otto, 2013).

6 Existing Roads Condition

The road condition was evaluated per road type. The road type is dependent on the function of the road – see description in *Table 4* below.

Table 4: Road Types (Conradie and Van Rensburg, 2013)

Road Type	Road Function	Applicable Roads
Main	Carry through-traffic to serve all commodities	Newark (within port boundary), Ventura, Active, Minerva, Cheldane, Urania
Collector	Connects to main roads and contain junctions which lead to service roads	Octopus, Wayfarer, Petingo
Surfaced Service Road	Connects to Collector roads and serve specific commodities such as stockpile areas, workshops and offices	Norman, Penguin, Dumra, Saxon, Colombo
Un-surfaced Service Road	Low volume roads for service to dedicated end-of journey areas	

6.1 Main Roads

The main roads carry through-traffic to serve all commodities. The condition of the main roads in the port was investigated by Steenkamp (2013) and two main roads are discussed below:

6.1.1 Newark Road

The road is currently surfaced with asphalt and visual evidence of distress includes rutting, crocodile cracking, surfacing failures, patching and longitudinal and transverse cracks (Steenkamp, 2013).

In May 2011, six test pits were excavated by Transnet which indicated that at the western access gate (between km 0 and km 2.5) the asphalt surfacing is thicker than at the eastern access gate

(between km 2.5 and km 4). This 1.5 km road section requires an asphalt overlay. However, no immediate repairs are required, but should not be postponed beyond the year 2017. Newark Road is a 4 km road of which 46% (1.85km) requires rehabilitation. A summary of the required rehabilitation actions is provided in the *Table 5* (Steenkamp, 2013).

Table 5: Rehabilitation Actions for Newark Road (Steenkamp, 2013)

Action Required	% of total road length
Milling of surfacing 50 mm deep	46
Crack repair & patching	20
Strengthening by means of "Sealgrid 50/50"	2.5
Rework base 150 mm deep and stabilize with cement and compact to 97% of Modified AASHTO density (C3)	2.5

6.1.2 Ventura Road Section

Please note that according to Steenkamp (2013), the road condition of Ventura Road, a 3 km road section, was evaluated. However, Ventura Road is only approximately 500 m long. It was therefore assumed that the road condition of Ventura Road, together with Durma Road, Minerva Road, and Cheldane Road (see *Figure 2*) was evaluated, forming the 3 km road section. The combination of these roads will be referred to as the Ventura Road Section.

The existing road is made up of a combination of asphalt surfacing, concrete paving blocks and reinforced concrete slabs. According to Steenkamp (2013), visual evidence of distress per section is:

- Asphalt surfacing: Few potholes and traverse cracks;
- Paving blocks: Good condition; and
- Concrete slabs: Limited longitudinal cracks and edge-spalling but structurally sound.

The road section evaluated is 3 km of which 2.7 km requires immediate attention. The rehabilitation actions required is given in the *Table 6* (Steenkamp, 2013).

Table 6: Rehabilitation Action for Ventura Road Section (Steenkamp, 2013)

Action Required	% of total road length
Crack sealing	57
Crack sealing of concrete	4
Pothole repairs & cleaning of drainage structures	30

6.2 Collector Roads

The collector roads connect to the main roads and contain junctions that link to service roads. Examples of connector roads in the port are Octopus Road, Wayfarer Road and Petingo Road (see *Figure 2*). The total length of the collector roads is 14 km of which 4.42 km requires rehabilitation – see summary in *Table 7* (Steenkamp, 2013).

Table 7: Rehabilitation Action for Collector Roads (Steenkamp, 2013)

Action Required	Length (m)
Crack sealing, patching, edge breaks repairs, structures cleaning	4000
Remove paving blocks	420
Rework 300 mm layer in-situ and stabilize with cement. Compact to 97% of Mod. AASHTO density (C3)	
Re-lay the paving blocks	

6.3 Current Design Traffic

The design traffic is estimated to evaluate the load imposed on a road, from which the pavement design can be determined. The load of heavy vehicles is measured in E80s (an E80 is defined as a unit of road damage caused by a single 80 kiloNewton (kN) axle load). To determine the load on the roads, the following is required: the average truck size, the load per truck and the expected traffic volumes.

Conradie and Van Rensburg (2013) conducted a traffic investigation to determine the required design traffic and pavement design for the roads of the Richards Bay Port. Please note that limited information was available and that a traffic study is required to verify the assumptions made by Conradie and Van Rensburg. The results from the study are as follows:

The traffic volume on the main and collector roads is assumed to be between 10 million and 30 million E80s over a period of 20 years. The traffic volume for the surfaced service roads is assumed to be between 1 million and 3 million over a period of 20 years. According to the Department of Roads and Transport (1996), this is equivalent to an ES 30 traffic class for the main and collector roads and an ES 3 traffic class for surfaced service roads (Conradie and Van Rensburg, 2013).

7 Conclusions and Recommendations

7.1 Conclusions

It is concluded that:

- There is an anticipated increase demand in throughput at the port of Richards Bay and to provide for this demand two proposed projects are being evaluated:
 - The expansion of the Transnet’s port capacity; and
 - The constructions of a new Transnet coal terminal.
- Good internal and external road networks provide access to the port and the terminals.
- There are two main accesses to the industrial operations at the Richards Bay port:
 - The western port access; and
 - The eastern port access.
- Sufficient parking are available for light vehicles, however, there is a lack of parking provided for heavy vehicles, which could be relieved by the proposed development of the Trucking Facility.
- In January 2012, more than 3 900 trucks accessed the port terminal.

- Limited traffic counts have been conducted in the past providing no indication of the current traffic volumes or patterns.
- At the Port of Richards Bay, for the haulage of bulk commodities, over 80% of the freight is transported by rail.
- Rehabilitation is required on the following roads:
 - Newark Road: 46% (1.85km) of the total 4 km road;
 - Ventura Road Section: 90% (2.7km) of the total 3 km section; and
 - Collector roads: 32% (4.42 km) of the total 14 km.

7.2 Recommendations

It is recommended that a Traffic Impact Study be conducted to determine the expected traffic volumes and to assess the *status quo* road conditions and the expected road traffic impact of the proposed developments associated with the Richards Bay Port Expansion Programme.

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