ENVIRONMENTAL IMPACT ASSESSMENT FOR THE PROPOSED NUCLEAR POWER STATION ('NUCLEAR-1') AND ASSOCIATED INFRASTRUCTURE

Transport Specialist Study
Impact Assessment Phase

Volume 2
Impact Assessments




Prepared by: Arcus GIBB (Pty) Ltd

Prepared for: Arcus GIBB (Pty) Ltd

On behalf of: Eskom Holdings Ltd

Version 12
August 2012

NUCLEAR-1 ENVIRONMENTAL IMPACT ASSESSMENT AND ENVIRONMENTAL MANAGEMENT PLAN

TRANSPORTATION SPECIALIST STUDY
ASSESSMENT PHASE

VOLUME 2
IMPACT ASSESSMENT

TABLE OF CONTENTS

ABBREVIATIONS

AADT	Average Annual Daily Traffic
AFB	Air Force Base
AIS	Automatic Identification System
CPTR	Current Public Transport Record
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EPZ	Emergency Protective Zone
IRT	Integrated Rapid Transport
ITP	Integrated Transport Plan
KNPS	Koeberg Nuclear Power Station
LOS	Level of Service (*See p. 23 for definition*)
NDoT	National Department of Transport
NM	Nautical Miles
NMT	Non-motorist Transport
NNR	National Nuclear Regulator
NSIP	Nuclear Siting Investigation Programme
PE	Port Elizabeth
PGWC	Provincial Government of the Western Cape
SAMSA	South African Maritime Safety Authority
SDF	Spatial Development Framework
SID	Standard Instrument Departure
SPMT	Self Propelled Modular Transporter
STAR	Standard Instrument Arrival
TCA	Terminal Control Area
TIA	Transport Impact Assessment
TFTC	Test Flight and Development Centre
TSS	Traffic Separation Schemes

7 DUYNEFONTEIN CONSTRUCTION PHASE IMPACT ASSESSMENT

7.1 Access

Construction vehicle access is proposed to be via the existing R27 / Emergency Access Road intersection (Access 2) to isolate the Nuclear-1 construction vehicle impact from the normal traffic operations of the Koeberg Nuclear Power Station as shown in **Figure 7.1**.

7.2 Traffic Analysis

7.2.1 Description

During the nine years of construction, year six, estimated to be 2019, is considered the peak year where maximum traffic volumes will be experienced. The 2019 scenario has therefore been analysed in order to determine the impact of the worst case scenario.

7.2.2 Trip Generation

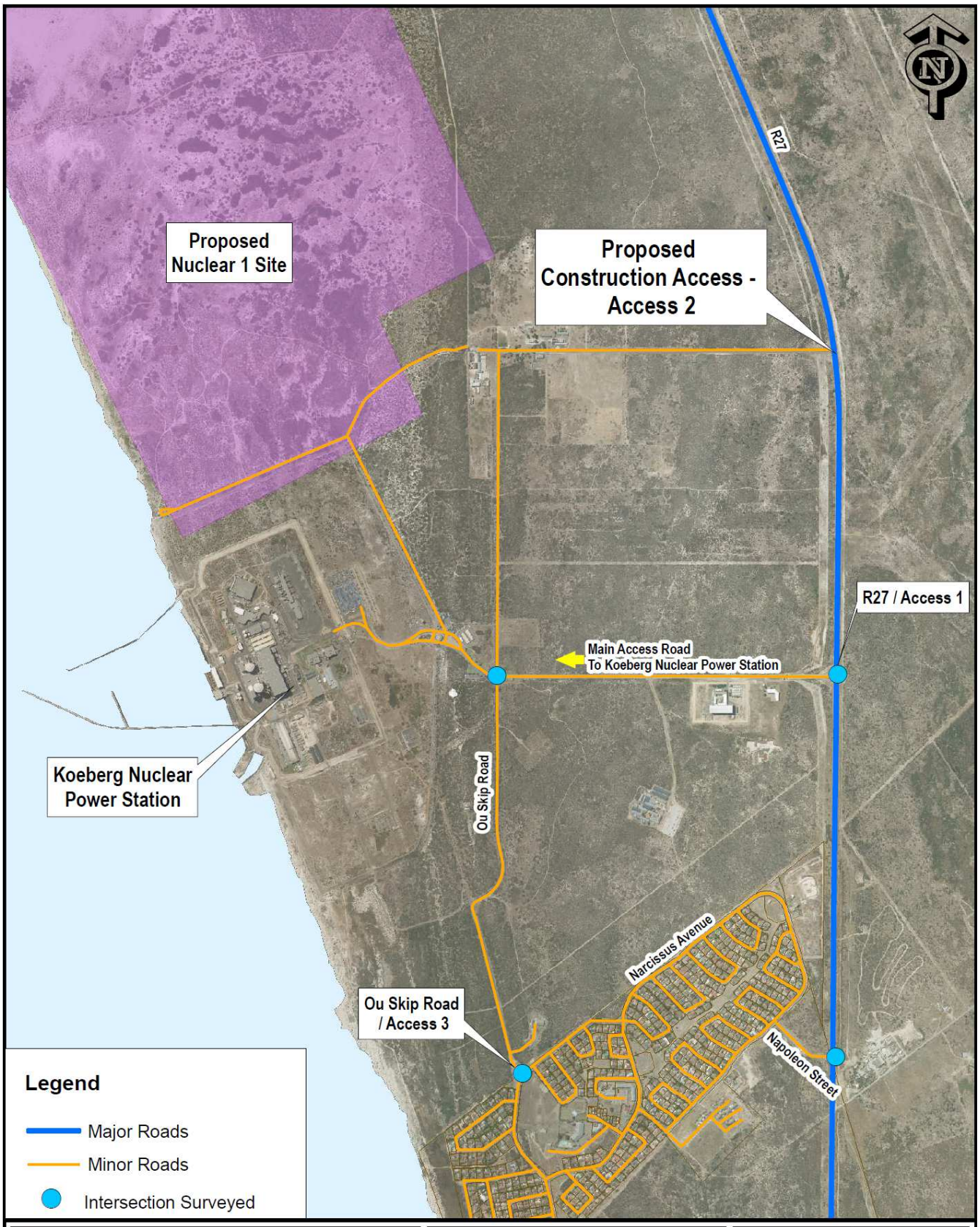
Eskom has provided a detailed schedule of estimated construction phase trips for each year of the nine year construction phase period, as shown in **Annexure A9**.

The traffic during the construction phase is mainly generated by construction workers, Eskom staff and construction deliveries. Construction workers will be working in shifts and certain construction vehicles will operate over a 24 hours period, while Eskom staff will be on site during normal office hours. The shifts and normal office hours are as follows:

- Morning shift: 06:00 – 14:00
- Afternoon shift: 14:00 – 22:00
- Night shift: 22:00 – 06:00
- Normal office hours: 07:30 – 16:30

Graph 7.1 shows the traffic distribution of an average day during year six of construction. It shows that the peak hours of construction occur at 06:30 – 07:30 and 16:00 – 17:00, which is similar to the AM and PM background traffic peak hours of 07:00 – 08:00 and 16:30 – 17:30.

Although these times do not coincide exactly, the traffic volumes expected in these times have been combined to create a worst-case scenario for analysis purposes.



PROJECT: Nuclear 1 : Enviromental Impact Assessment	ARCUS GIBB ENGINEERING & SCIENCE	Drawn By: R.Adams	Checked By: S.Chow
DETAIL: Duynefontein Traffic Count Location and Access Spacing		Reviewed By: A.Bulman	Approved By: A.Bulman
	Scale: 1 : 20 000	Date: January 2012	Project No.: J27035 / Drg No.: Figure 7.1 / Rev:

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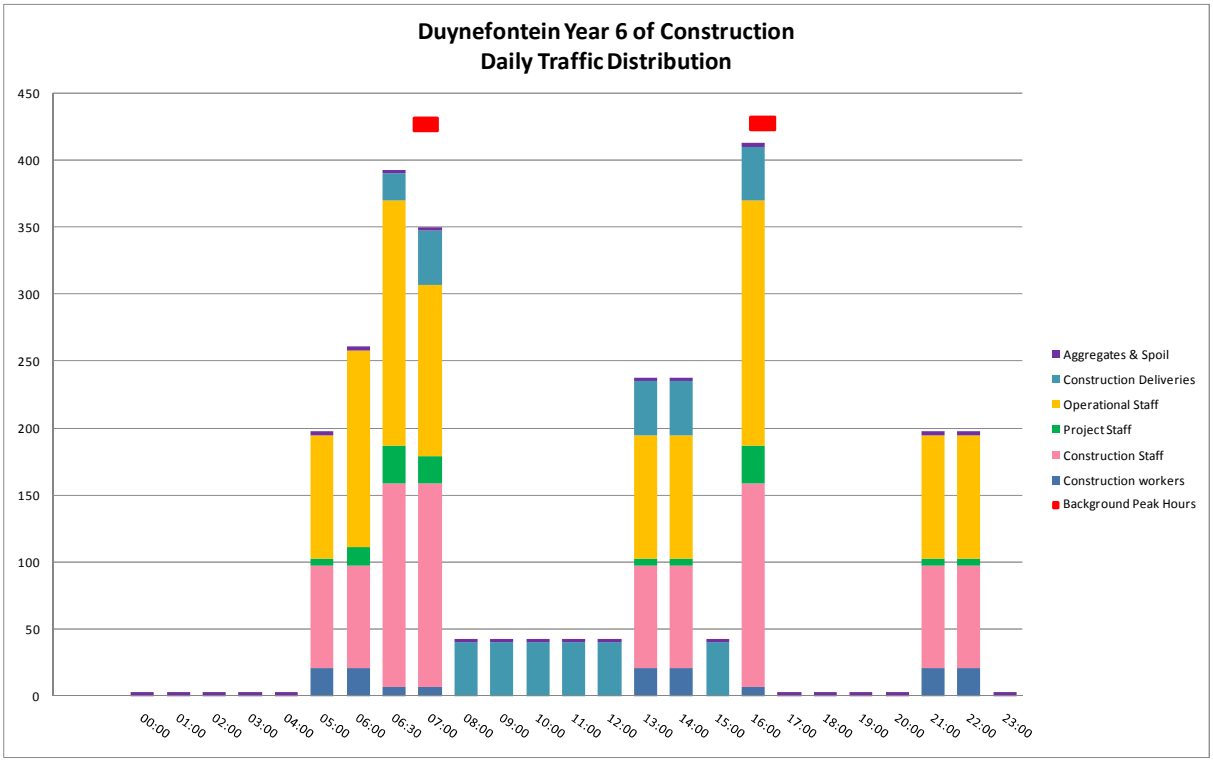

Graph 7.1 – Daily Traffic Distribution in Year 6 of Construction

The total trip generation by the proposed Nuclear-1 site during year six of the construction phase is shown in **Table 7.1**.

Table 7.1 – Trip Generation of Year 6 of Construction Phase

Types of Traffic	AM (06:30 - 07:30)		PM (16:00 - 17:00)	
	In	Out	In	Out
Construction workers	7	0	0	7
Construction Staff	152	0	0	152
Project Staff	28	0	0	28
Operational Staff	183	0	0	183
Construction Deliveries	10	10	20	20
Aggregates & Spoil	1	1	1	1
Total	**381**	**11**	**21**	**391**

7.2.3 Trip Assignment and Distribution

To determine the traffic impact of Nuclear-1's construction phase on the surrounding road network, the generated trips were distributed onto the existing road network.

The directional distribution of the generated trips for both the AM and PM peak hours is based on the origin of the staff and construction materials. It is estimated that fifty percent of the trips originate from the south (Cape Town, Milnerton etc.), thirty percent

originate from north of Duynefontein (Atlantis, Saldanha, etc) and twenty percent originate from Van Riebeeck and Duynefontein area.

The percentage distribution, for the AM and PM peak hours, is shown in **Annexure A10** and **A11,** respectively.

The distribution of Nuclear-1's generated traffic and total traffic for both the AM and PM peak periods are shown in **Annexure A12** – **A15,** respectively.

7.2.4 Intersection Capacity Analysis

Intersection analysis was performed using the SIDRA 3.2 Computer Programme for the following main intersections:

- R27 / Main Access Road (Access 1);
- R27 / Napoleon Street;
- Ou Skip Road / Narcissus Avenue (Access 3);
- Ou Skip Road / Main Access Road;
- R27 / Access 2; and
- Ou Skip / Access 2.

The 2019 Construction Total Traffic scenario was analysed during the AM and PM peak hours. The LOS and 95th percentile vehicle queues for this scenario are summarised in **Annexure A16** and **A17**.

The additional traffic will have a medium impact on the existing road network. The impact will become low once the proposed mitigating measures are implemented. The analysis results are summarised hereafter.

(a) R27 / Main Access Road (Access 1)

The 2019 geometry of the R27 / Main Access Road is shown in **Figure 7.2**.

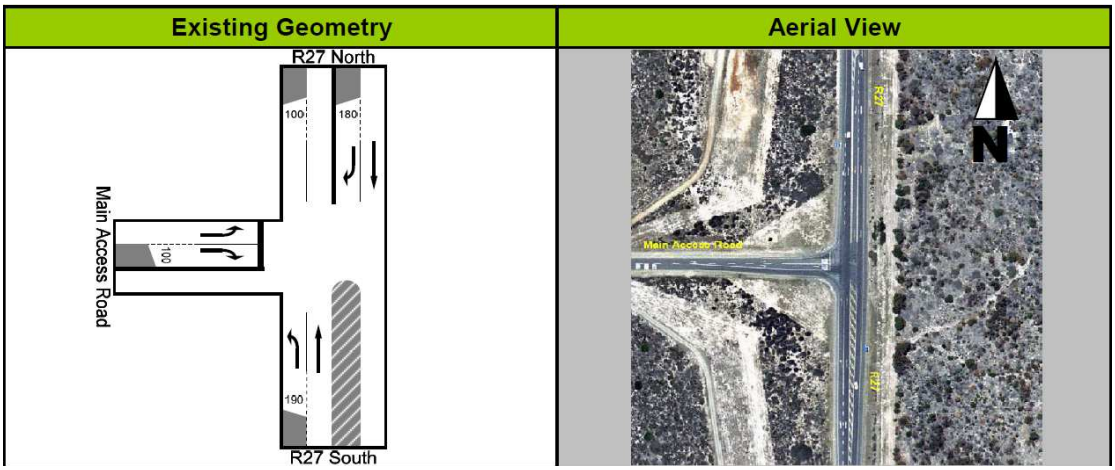

Figure 7.2: R27 / Main Access Road 2019 Intersection Geometry

(i) 2019 Construction Traffic

The through movements of the R27 approaches will operate acceptably at LOS A to LOS C during the AM and PM peak hours with no significant vehicle queues. The right-turning movement of the Main Access Road approach will, however, operate at LOS F with the 95th percentile queue of 36 vehicles during both the AM and PM peak hours.

The upgrade option of signalising this intersection is shown in **Figure 7.3**.

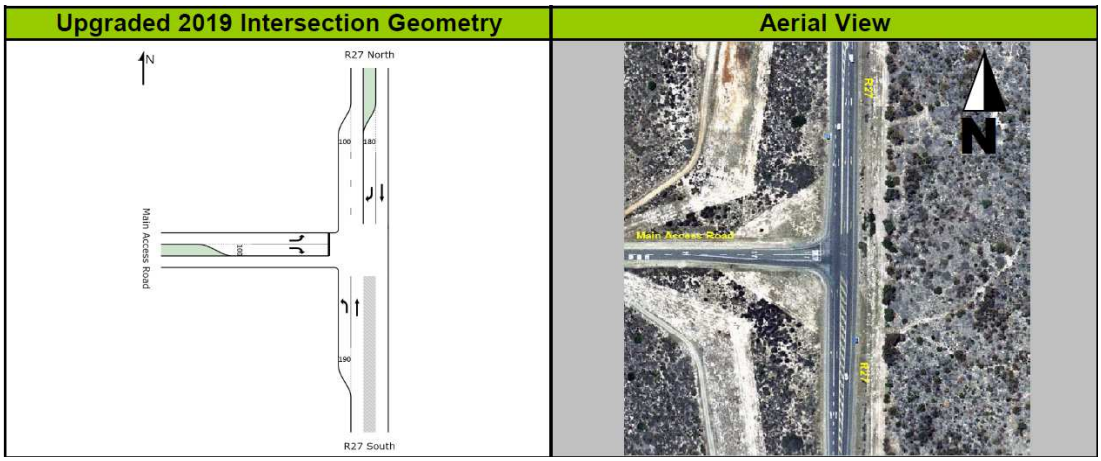

Figure 7.3: R27 / Main Access Road Proposed 2019 Intersection Geometry

When signalised, the right-turning movement of the Main Access Road approach will improve to LOS C and D with 95th percentile queues of 3 and 14 during the AM and PM peak hours respectively.

The PGWC has, however, proposed the construction of a grade separated structure at the R27/ Main Access Road intersection to maintain the high-order status of the R27 as an expressway. This upgrade is not required exclusively for the construction and operation of the nuclear power station and the final upgrade will have to be agreed with the PGWC.

(b) R27 / Napoleon Street

The existing geometry of the R27 / Napoleon Street is shown in **Figure 7.4**.

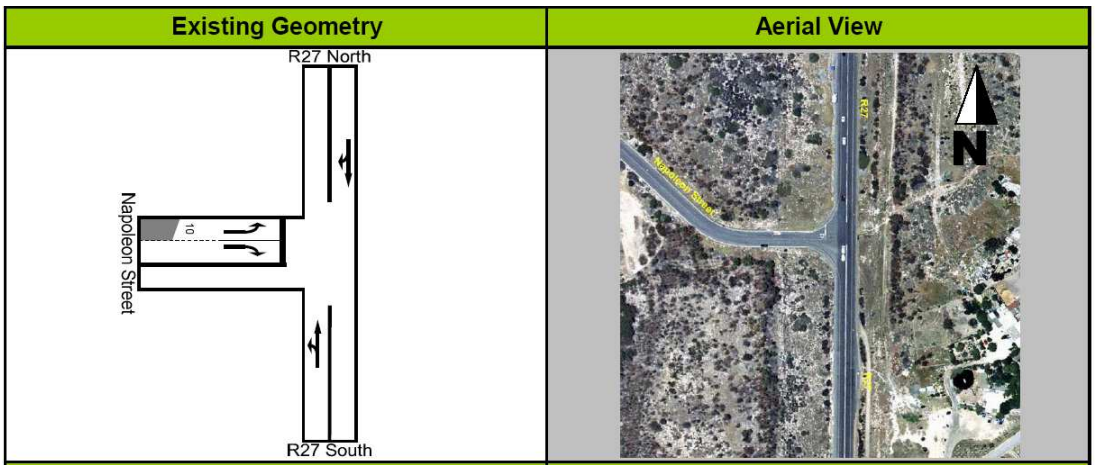

Figure 7.4: R27 / Napoleon Street Existing Intersection Geometry

(i) 2019 Construction Traffic

The southern R27 approach will operate well at LOS A with minimal traffic queues. The northern R27 approach will operate at LOS F with a 95th percentile queue of 11 vehicles during the AM peak hour. The Napoleon Street approach will also operate poorly at LOS F with 95th percentile queues of 40 and 8 vehicles during the AM and PM peak hours respectively. An upgrade of the intersection is therefore required.

(ii) Upgrades Required

This intersection should be upgraded to a signalised intersection. However, if Access 1 is upgraded to a grade separated intersection, all adjacent access upgrades off the R27 will have to be reviewed. These options are to be discussed with the PGWC.

The option to signalise the R27 / Napoleon intersection is discussed below as shown in **Figure 7.5**.

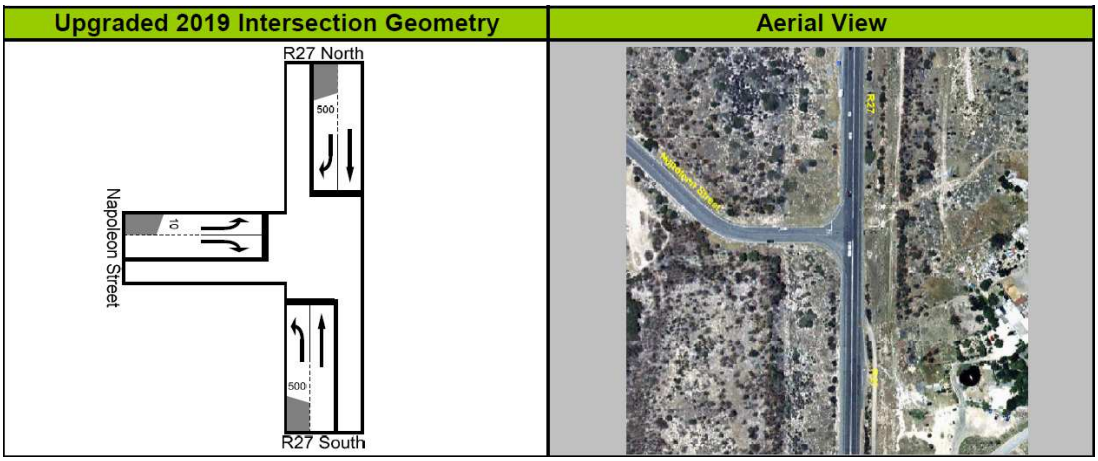

Figure 7.5: R27 / Napoleon Street 2019 Proposed Intersection Geometry

The northern R27 approach will improve from LOS F to LOS A and D with 95th percentile queues of 5 and 23 during the AM and PM peak hours respectively. The Napoleon Street approach will improve from LOS F to LOS E with 95th percentile queues of 6 and 4 vehicles during the AM and PM peak hours respectively.

(c) Ou Skip Road / Narcissus Avenue (Access 3)

The existing geometry of the Ou Skip Road / Narcissus Avenue intersection is shown in **Figure 7.6**.

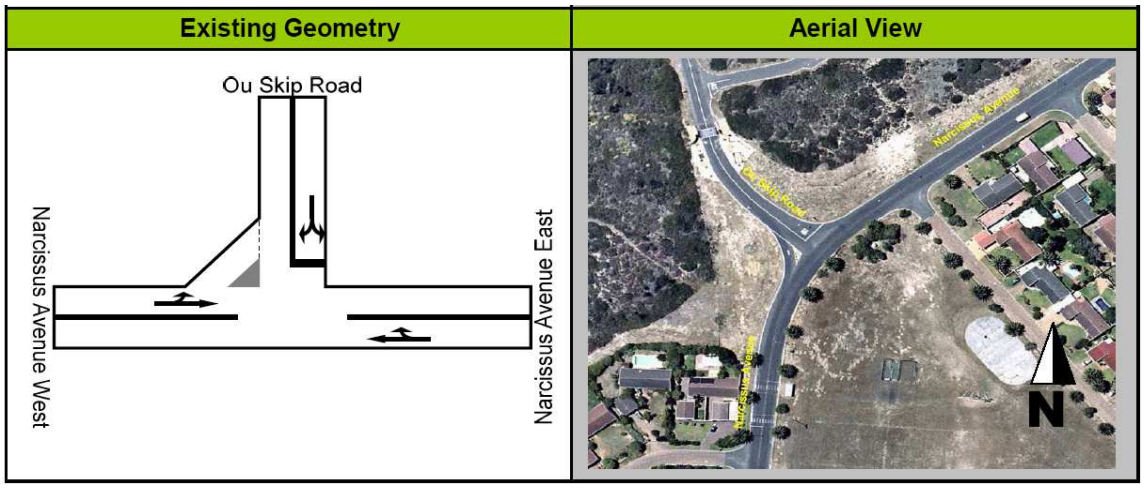

Figure 7.6: Ou Skip Road / Narcissus Avenue 2019 Existing Intersection Geometry

(i) 2019 Construction Traffic

All intersection approaches will operate acceptably with LOS A and LOS B during the AM and PM peak hours with no significant vehicle queues. No upgrades are therefore required.

(d) Ou Skip Road / Main Access Road

The existing geometry of the Ou Skip Road / Main Access Road intersection is shown in **Figure 7.7(a)**.

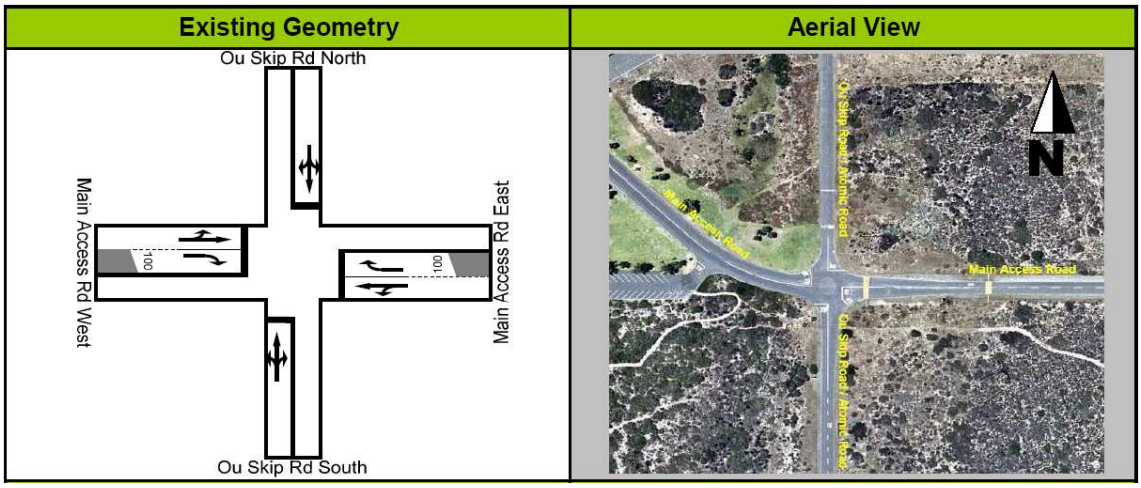

Figure 7.7(a): Ou Skip Road / Main Access Road Existing Intersection Geometry

(i) 2019 Construction Traffic

The southern Ou Skip Road approach will operate poorly at LOS E with 95th percentile queues of 6 and 1 vehicles during the AM and PM peak hours respectively. The eastern Main Access Road approach will also operate poorly at LOS F with a 95th percentile queue of 8 during the AM peak hours. An upgrade is therefore required.

(ii) Upgrades Required

The Main Access Road will experience slightly higher volumes than the Ou Skip Road and the conversion of the all-way stop-controlled intersection into a two-way stop-controlled intersection is recommended, as shown below in **Figure 7.7(b)**.

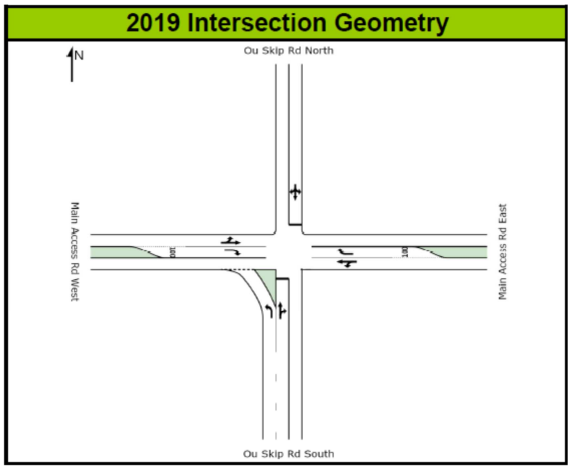

Figure 7.7(b): Ou Skip Road / Main Access Road Proposed Intersection Geometry

The southern Ou Skip Road approach will improve to LOS C and B during the AM and PM peak hours respectively. The eastern Main Access Road approach will also improve from LOS F to LOS A with minimal traffic queue during the AM peak hour.

(e) R27 / Access 2

The existing geometry of the R27 / Access 2 is shown in **Figure 7.8**.

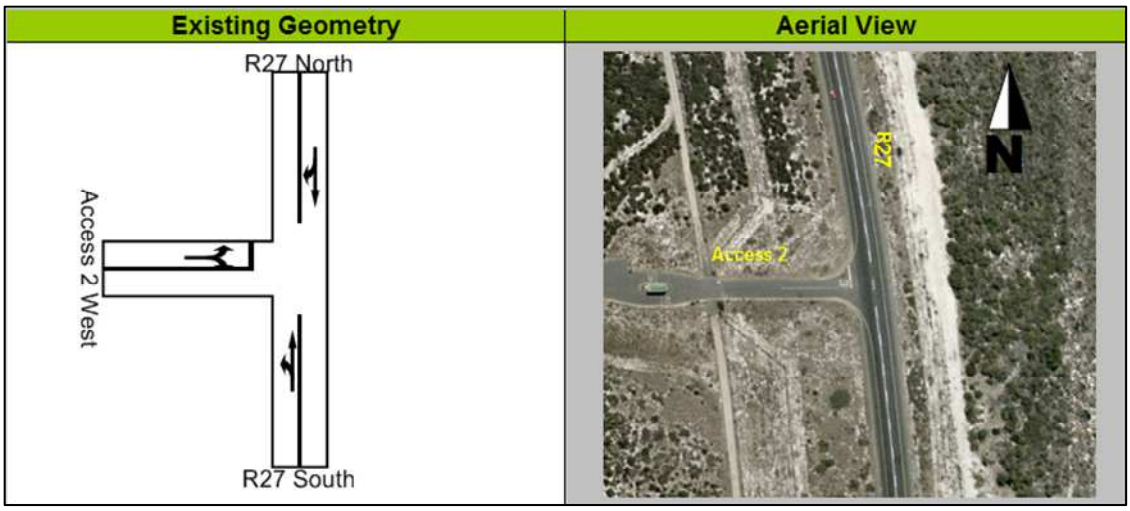

Figure 7.8: R27 / Access 2 Existing Intersection Geometry

(i) 2019 Construction Traffic

The Access Road 2 approach will operate at LOS E and F with 95th percentile queues of 6 and 36 vehicles during the AM and PM peak hours respectively.

An upgrade is therefore required, as a high volume of construction vehicles will utilise this access on a daily basis for the duration of the nine year construction period.

(ii) Upgrades Required

This intersection should be upgraded to a temporary signalised intersection for the duration of the construction period. However if Access 1 is grade separated, the upgrade / operation of this intersection should be reviewed further. These options are to be discussed with the PGWC.

The option to signalise the R27 / Access 2 intersection is discussed below as shown in **Figure 7.9**.

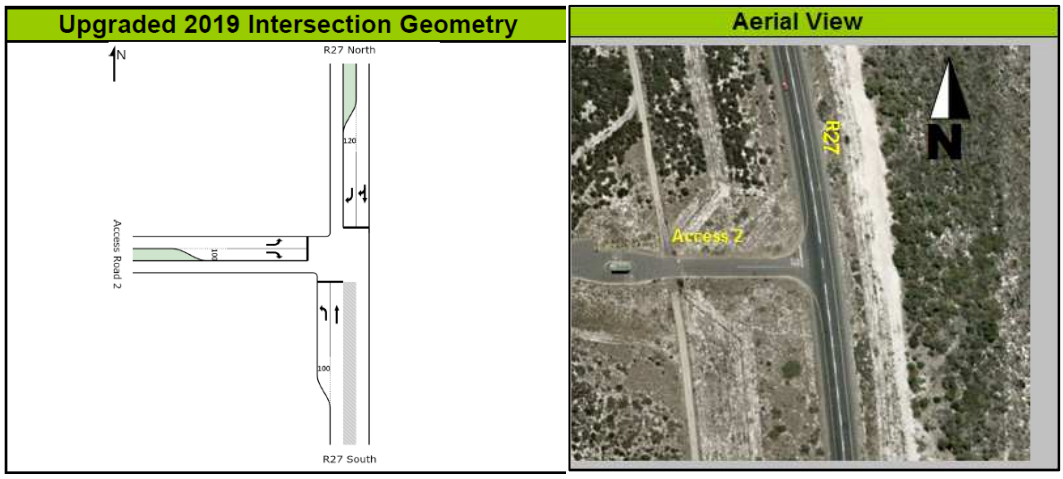

Figure 7.9: R27 / Access Road 2 2019 Proposed Intersection Geometry

The Access Road 2 approach will operate at LOS E and LOS C with 95th percentile queues of 1 and 6 vehicles during the AM and PM peak hours respectively. There will only be low volumes of construction vehicles exiting at the intersection during the AM peak, so it is considered acceptable for the approach to experience LOS E.

(f) Ou Skip Road / Access 2

The proposed geometry of the Ou Skip Road / Access 2 intersection is shown in **Figure 7.10**.

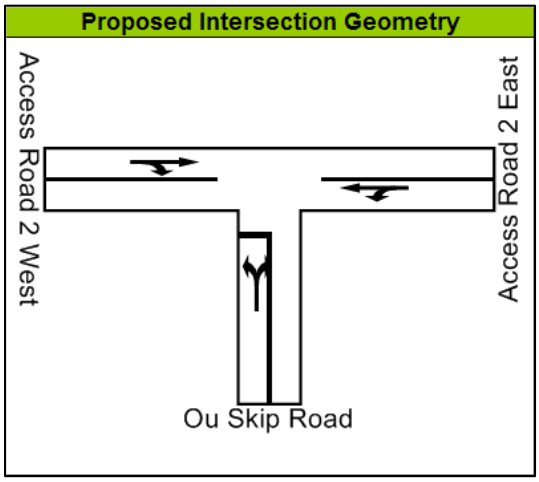

Figure 7.10: Ou Skip Road / Access Road 2 Proposed Intersection Geometry

(i) 2019 Construction Traffic

The intersection will operate well at LOS A to LOS B during the AM and PM peak hours with no significant vehicle queues. No upgrade will therefore be required.

7.2.5 Alternative Road Upgrade

As discussed in **Volume 1, Chapter 4.2.2**, the PGWC has stated a preference for a grade separated intersection at the R27 / Main Access Road intersection rather than signalisation.

Depending on the outcome of the negotiation with the PGWC, an alternative upgrade scenario that comprises a grade-separated interchange at this intersection and the closure of Access 2 should be analysed in detail.

The Napoleon Street access would remain a stop-controlled access. The internal road network including the Main Access Road / Ou Skip Road / Atomic Road intersection would then require upgrading to a signalised intersection or a roundabout.

7.3 Abnormal Loads

7.3.1 Description

According to the *Nuclear Siting Investigation Programme (NSIP): West Coast Summary report (Eskom, 1994)* several bridges between Cape Town Harbour and the Nuclear-1 site cannot accommodate abnormal loads. Therefore utilising Cape Town Harbour for abnormal loads was dismissed as an option.

Saldanha Bay is the closest harbour, which has the infrastructure capabilities to load and offload abnormal loads. It is therefore envisaged that Saldanha Bay Harbour will be utilised in transporting abnormal loads to the Duynefontein site via the R27.

A variety of abnormal loads will be transported to and from the Nuclear-1 site during the construction period, with the heaviest load being transported via a Self Propelled Modular Transporter (SPMT) as shown in **Figure 7.11.**

A study entitled *Transport Study from Saldanha Harbour to Koeberg Power Station for the Abnormal SSC (Mammoet, 2005)* was undertaken in June 2005. The assessment below is based on the findings of this study.

The SPMT's dimensions are approximately 42 m in length and can be either 5.33 m (two trailer wide) or 8.23 m (three trailers wide) in width. The abnormal load will be transferred onto a two trailer wide for short periods to navigate specific roads and will travel the remainder of the route on a three trailer wide SPMT. The transport impacts of the SPMT transporting the abnormal load components are assessed below.

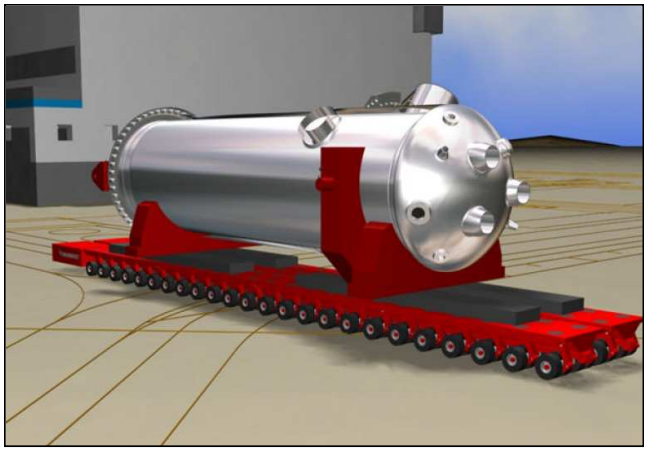

Figure 7.11: Two Trailer Wide Self Propelled Modular Transporter (SPMT)

7.3.2 Abnormal Load Route

The results of the above-mentioned study indicate the preferred abnormal load route from Saldanha to the Nuclear-1 site as shown in **Figure 7.12.**

PROJECT: Nuclear 1 : Envrionmental Impact Assessment	ARCUS GIBB ENGINEERING & SCIENCE	Drawn By: R.Adams	Checked By: S.Chow
		Reviewed By: A.Bulman	Approved By: A.Bulman
DETAIL: Duynefontein Heavy Route Road	Scale: NTS	Date: January 2012	Project No.: J27035 / Drg No.: Figure 7.12 / Rev:

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The preferred route from Saldanha Bay Harbour to the R27 requires the following several minor road upgrades to accommodate the SPMT vehicle as shown in **Figure 7.13**:

- Construct a level crossing over the railway line at Saldanha Harbour;
- Upgrade two unsurfaced road sections;
- Three intersection widening upgrades; and
- Several Eskom and Telkom overhead lines will be required to be removed or replaced or temporarily lifted to allow the heavy load to traverse the route.

The route along the R27 from R27 / R79 intersection to Koeberg's main access is approximately 100 km and a three trailers wide, 8.23 m SPMT will take up the entire width of the R27. Examples are shown in **Figures 7.14 and 7.15**. A comprehensive traffic management plan would have to be implemented with the assistance of the provincial roads authority and local municipal roads authorities to minimise the impacts on normal daily traffic.

Figure 7.14: SPMT traversing an intersection

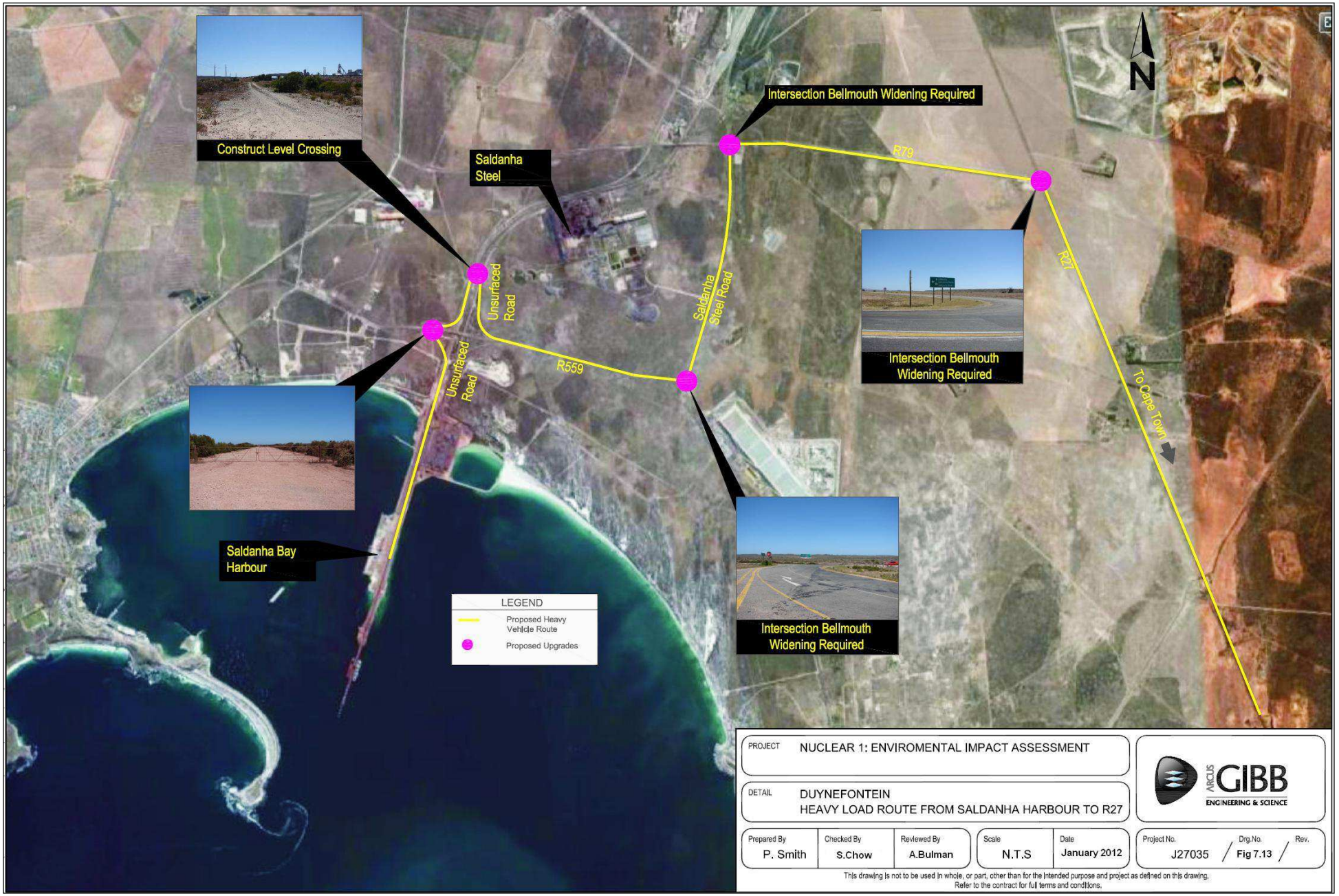
Figure 7.15: SPMT utilising the entire width of road

Due to the low speed (5 km/h) at which the SPMT travels, approximately two stops would have to be constructed along the R27, the first could possibly be at or near the Engen One Stop approximately 10 km from the R79 / R27 intersection.

Approximately six picnic spots as shown in **Figures 7.16 and 7.17**, spaced approximately 15 km apart, could be used as traffic lay byes during abnormal load transport. These aspects should be investigated in more detail in an Abnormal Load Traffic Management Plan.

Figure 7.16: North View of a possible traffic lay bye

Figure 7.17: South view of a possible traffic lay bye


Construct Level Crossing
Saldanha Steel
Intersection Bellmouth Widening Required
R79
R27
To Cape Town
Unsurfaced Road
Saldanha Steel Road
R559
Unsurfaced Road
Intersection Bellmouth Widening Required
Saldanha Bay Harbour
Intersection Bellmouth Widening Required
LEGEND
Proposed Heavy Vehicle Route
Proposed Upgrades
N
PROJECT NUCLEAR 1: ENVIROMENTAL IMPACT ASSESSMENT
DETAIL DUYNEFONTEIN
HEAVY LOAD ROUTE FROM SALDANHA HARBOUR TO R27
GIBB ENGINEERING & SCIENCE
Prepared By P. Smith
Checked By S.Chow
Reviewed By A.Bulman
Scale N.T.S
Date January 2012
Project No. J27035
Drg.No. Fig 7.13
Rev.
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The Modder River Bridge located approximately 27 km from the R27 / Koeberg Main Access intersection, as shown in **Figure 7.18**, has been preliminarily assessed as part of the *Transport Study from Saldanha Harbour to Koeberg Power Station for the Abnormal SSC (Mammoet, 2005)*, and was found to be structurally inadequate to accommodate the abnormal load being transported by the SPMT.

Figure 7.18: Modder River Bridge along the R27

The construction of a bypass upstream of the bridge should be undertaken to traverse the Modder River. The SPMT is expected to gain access to the site via the main access on the R27.

7.3.3 Traffic Volumes

The AM, midday, PM peak hour and the whole day 2007 background traffic link volumes along the R27 from Saldanha to the Nuclear-1 site, were obtained from the Provincial Government of the Western Cape's (PGWC) (www.wcape.gov.za) website and are shown in **Annexures A18 – A21**. The hourly traffic volumes along the R27 shown in shaded blocks occur during the peak hour and the hourly volumes along the R27 shown in white blocks occur during the non-peak hour.

The R27 can be divided into two traffic profile sections. The boundary of the two sections is roughly the Atlantis turnoff. The northern section of the R27 illustrates a typical daily rural traffic profile, whereby the peak occurs in Midday with no AM and PM defined peaks. The traffic volumes on the northern section of the R27 are noticeably less than the R27 closer to Cape Town. The southern section of R27, closer to Cape Town, however, illustrates an urban daily traffic profile with defined AM and PM peak hours.

7.3.4 Trip Frequency and Time

It is estimated that approximately 60 loads of over 100 tonnes will be transported over a three years period during the construction phase. The impact of the abnormal load transport is expected to have a high impact on traffic congestion during the transport.

It is therefore recommended that the bulk of abnormal loads be transported during the evening (21:00 - 05:00) and in daylight hours over weekends during non-peak periods, which will improve the impact on traffic congestion to low medium. The impact of the increased noise level in the local communities will also be low due to the absence of communities close to the route and infrequent trips.

Detailed traffic detours and logistics should be included in a comprehensive Abnormal Load Route Traffic Management Plan, which should include a specific plan for transporting at night. The frequency of the abnormal load trips is currently unknown.

7.3.5 Access and Internal Road Geometry

The existing Access 2 of Koeberg Nuclear Power Station will be used as the main access to Nuclear-1 to avoid conflict between the construction traffic and the general traffic of Koeberg Power Station.

Typical left and right turning heavy vehicle intersection paths are shown in **Figures 7.19 and 7.20**. Upgrades to the intersection bell-mouths may also be required to accommodate the large turning radii of the vehicles.

7.4 Normal Heavy Load Transport

The transit of **heavy loads** to the Duynefontein site is expected to occur during the construction phase of Nuclear-1.

The current Average Annual Daily Traffic (AADT) and the percentage of heavy vehicles along the R27 are illustrated in **Annexure A21**. The AADT along the R27 is significantly less north of the R27 / Main Access Road intersection, with a higher heavy vehicle percentage of approximately 10% usage to the north.

The R27 can therefore be considered as an existing heavy load road. The expected daily trip frequency of normal heavy loads during the construction period has been estimated in **Table 8.1**. The impact of the additional construction vehicles on the R27 will be low. The remaining life of the pavement of the R27 should, however, be investigated and may result in an upgrading of the pavement in the vicinity of the site to maintain the structural integrity of the R27.

7.5 Parking

The 30% private transport and 70% public transport modal split results in approximately 900 on-site parking bays required for the duration of the Nuclear-1 construction phase.

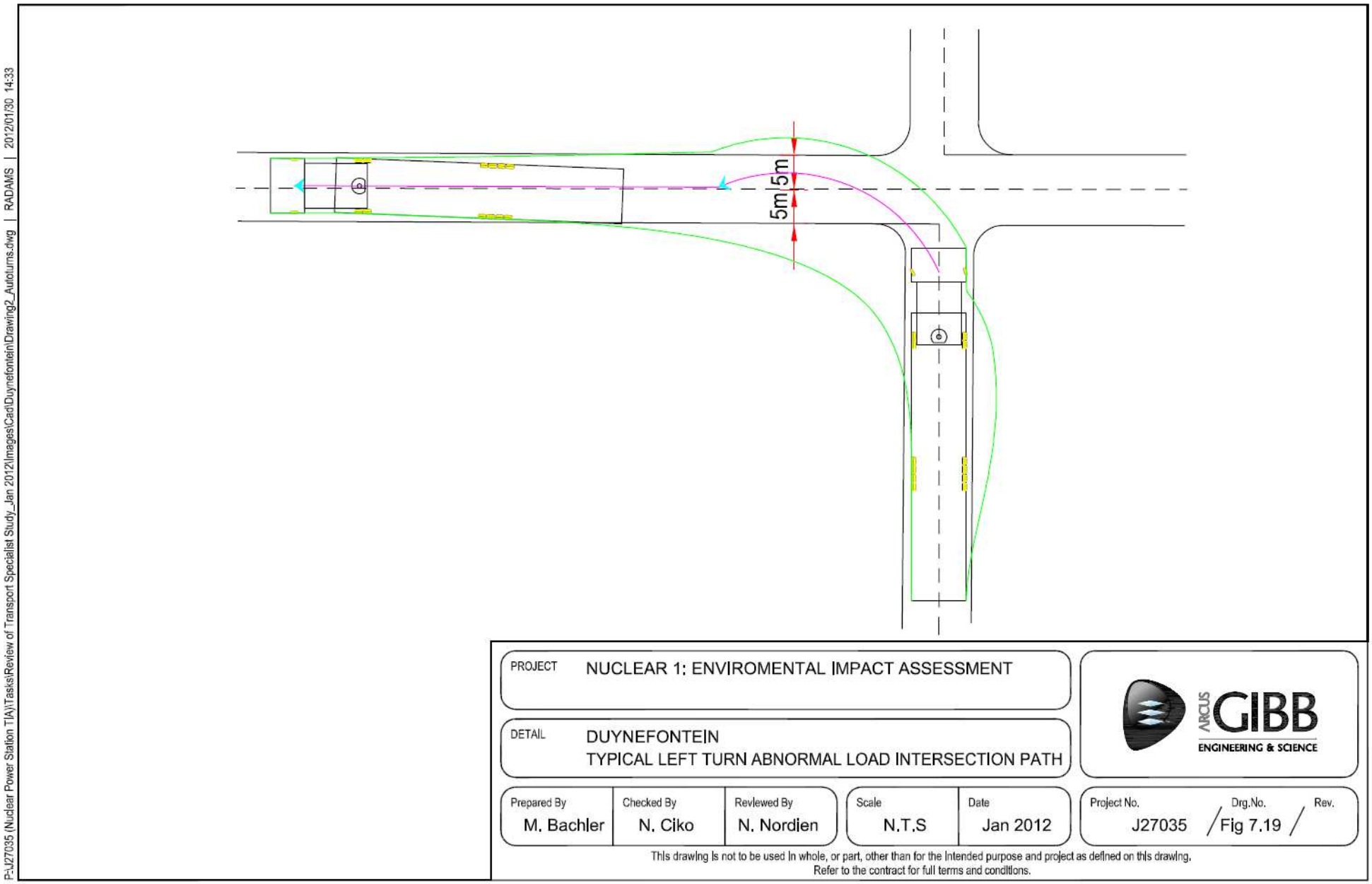
This parking requirement is dependent on the public transport service in operation during the construction phase and the type of special transport shuttle services that Eskom should provide for the construction workers.

Sufficient parking bays should therefore be provided on-site to avoid vehicles parking in the surrounding area. If parking is provided on-site, the impact will reduce from medium to low.

7.6 Public Transport

Although public transport services, i.e. buses and minibus-taxis, are provided in the area, it is recommended that the construction workers are transported by contracted buses and minibus taxis to and from the site.

Public transport facilities for these contracted buses and minibus taxis should be constructed on-site.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PROJECT
NUCLEAR 1: ENVIROMENTAL IMPACT ASSESSMENT
DETAIL
DUYNEFONTEIN
TYPICAL LEFT TURN ABNORMAL LOAD INTERSECTION PATH
ARCUS GIBB
ENGINEERING & SCIENCE
Prepared By
M. Bachler
Checked By
N. Ciko
Reviewed By
N. Nordien
Scale
N.T.S
Date
Jan 2012
Project No.
J27035
Drg.No.
Fig 7.19
Rev.
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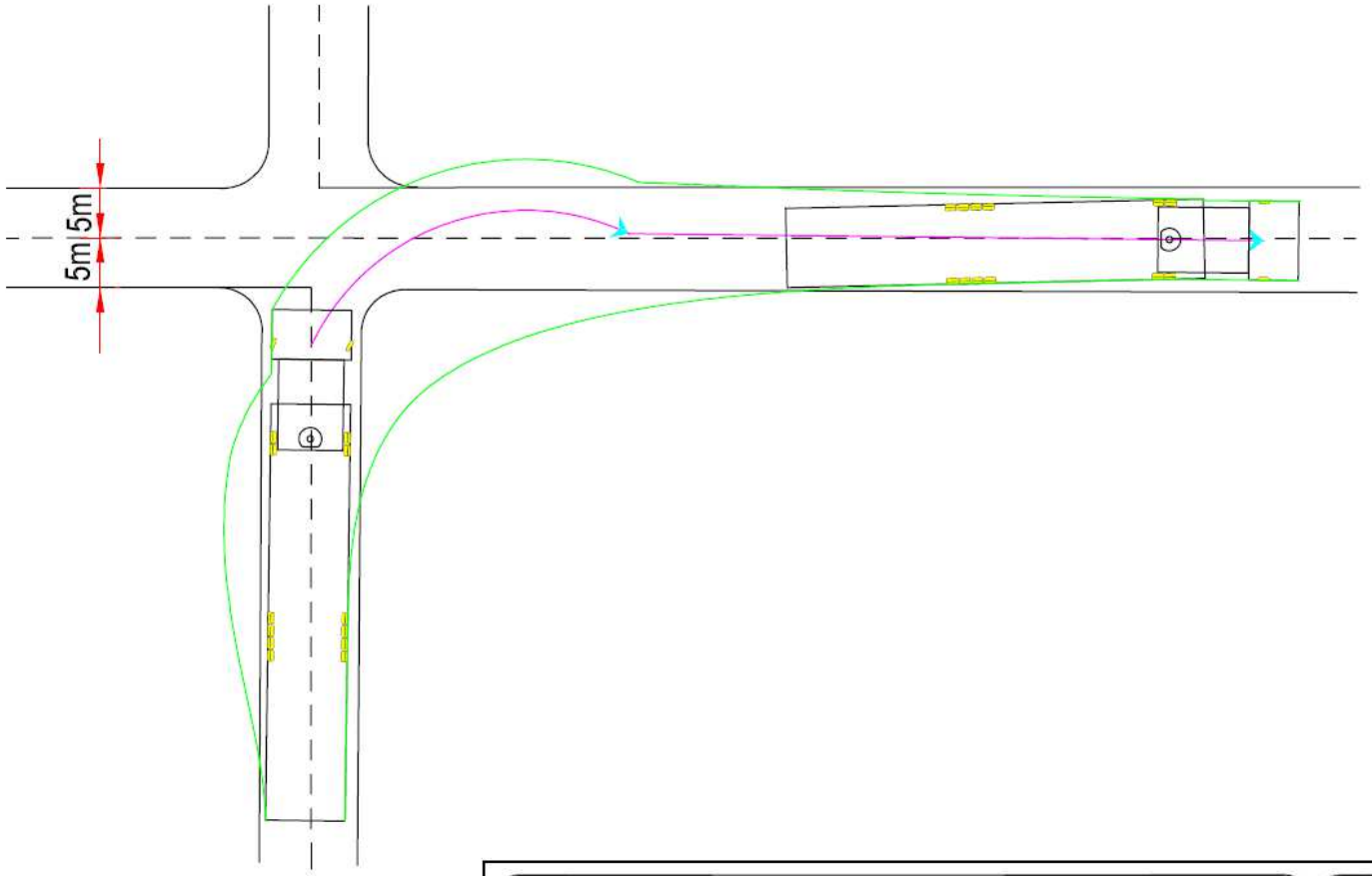

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PROJECT	NUCLEAR 1: ENVIROMENTAL IMPACT ASSESSMENT
DETAIL	DUYNEFONTEIN TYPICAL RIGHT TURN HEAVY LOAD INTERSECTION PATH

ARCUS GIBB ENGINEERING & SCIENCE

Prepared By	Checked By	Reviewed By	Scale	Date	Project No.	Drg.No.	Rev.
M. Bachler	N. Ciko	N. Nordien	N.T.S	Jan 2012	J27035	Fig 7.20	

7.7 Non-Motorised Transport

The safety of the pedestrians on the external road network is expected to be slightly affected by the additional traffic volumes and the internal pedestrian trips are expected to increase during the construction phase. It is, therefore, recommended that low speeds be maintained in the vicinity of the proposed site to ensure safety.

7.8 Emergency Evacuation

The *Koeberg Nuclear Power Station's 2005 Emergency Plan (HHO, 2005)* currently in place will be required to be updated to include the evacuation of the Nuclear-1 workers and personnel. If an emergency evacuation is required, it is expected that a total of 8500 construction workers would have to be evacuated, utilising approximately 130 x 65 seater buses, within four hours.

The Emergency Plan states that "if the capacity of the road system is reduced to 60% of normal capacity the required population evacuation can still be evacuated within acceptable time limits". The transport network road capacity currently available (2005) to accommodate the planned evacuation is approximately 4500 vehicles. One hundred and thirty buses amounts to less than 3% of the current capacity. These 130 buses should be on stand-by for usage during an emergency at Koeberg Nuclear Power Station. The buses and minibus taxis used to transport the commuters during the AM and PM peak could be used as the emergency evacuation vehicles. It is therefore recommended that Eskom acquire these vehicles for the duration of the construction period.

The construction phase of Nuclear-1 is not expected to exceed the maximum allowable evacuation times of 4 hours and 1 week as detailed in the current Koeberg Nuclear Power Station Emergency Plan. The impact of traffic congestion during emergency evacuation is therefore considered to be medium.

7.9 Conclusions

The following can therefore be concluded. The significance of the impacts is summarised in **Table 7.2**:

- Access 2 of the existing Koeberg Power Station will be used for the construction phase of the proposed Nuclear-1 plant;
- The access intersections along the R27 will experience prolonged delays at the minor approaches due to high traffic volumes along the R27 and will require upgrading;
- The abnormal loads should be transported from Saldanha Bay as several bridges between Cape Town Harbour and the Nuclear-1 site cannot accommodate the transportation of abnormal loads;

- The normal heavy loads will be transported to the construction site via the R27, as it already is considered to be a heavy load route;

- 900 parking bays and public transport facilities should be provided on-site;

Table 7.2: Significance of Impacts for Construction phase of Duynefontein

Impact		Intensity	Value	Extent	Value	Duration	Value	Irreplacable resources	Irrep. value	Cons. Value	Prob.	Prob. value	Sign. value	SIGNIFICANCE
1. Traffic congestion and delay at intersections on the external road network.	Unmitigated	Medium	2	Medium	2	Medium	2	Low	1	2	High	3	3	Medium
	Mitigated	Low	1	Medium	2	Medium	2	Low	1	1	Low	1	1	Low
2. Increased noise impact on local communities due to increased traffic.	Unmitigated	Low	1	Medium	2	Medium	2	Low	1	1	Mediun	2	1	Low
	Mitigated	Low	1	Medium	2	Medium	2	Low	1	1	Mediun	2	1	Low
3. Decreased pedestrian safety in local communities due to increased traffic.	Unmitigated	Medium	2	Medium	2	Medium	2	High	3	3	Low	1	3	Medium
	Mitigated	Low	1	Medium	2	Medium	2	High	3	2	Low	1	2	Low Medium
4. Structural damage to road infrastructure along heavy load route.	Unmitigated	Low	1	High	3	Medium	2	Medium	2	1	Low	1	1	Low
	Mitigated	Low	1	High	3	Medium	2	Medium	2	1	Low	1	1	Low
5. Traffic congestion due to transportation of abnormal loads.	Unmitigated	Medium	2	High	3	Medium	2	Low	1	3	High	3	5	High
	Mitigated	Low	1	High	3	Medium	2	Low	1	2	Low	1	2	Low Medium
6. Lack of parking	Unmitigated	Medium	2	Medium	2	Medium	2	Low	1	2	High	3	3	Medium
	Mitigated	Low	1	Low	1	Medium	2	Low	1	1	Low	1	1	Low
7. Congestion during emergency evacuation	Unmitigated	High	3	Medium	2	High	3	High	3	3	Low	1	3	Medium
	Mitigated	High	3	Medium	2	High	3	High	3	3	Low	1	3	Medium

7.10 Mitigation actions required

The following mitigation actions are therefore proposed for the construction phase of Nuclear-1:

Access to the Site

- Construction of an access road to Nuclear-1 at the existing Emergency Access Road to the Koeberg Nuclear Power Plant;

External Road Upgrades

- The R27 pavement to be investigated to determine its remaining life as well as the impact of construction traffic during the construction phase.
- The R27 / Main Access Road intersection should be upgraded to a signalised intersection as shown in **Figure 7.3**. Alternatively, after negotiation with the PGWC, upgraded to a grade-separated interchange.
- The R27 / Napoleon Street intersection should be upgraded to a signalised intersection, as shown in **Figure 7.5.** If the R27 / Main Access Road intersection is grade-separated then the signalisation of this intersection will not be required. These options are to be discussed with the PGWC;
- The R27 / Access 2 intersection should be upgraded to a temporary signalised intersection as shown in **Figure 7.9** for the duration of construction**.** If the R27 / Main Access Road intersection is grade-separated, then the signalisation of this intersection will not be required and may revert to an emergency access only;
- Relevant signage, street lighting and a reduction of the speed limit from 120 km/h to 80 km/h is required to be constructed along the R27 approaching the proposed signalised upgrades of the above-mentioned intersections;

Abnormal Load Route

- Construct a level crossing over the railway line at Saldanha Bay Harbour;
- Upgrade two unsurfaced road sections at Saldanha Bay Harbour;
- Three intersection widening upgrades at Saldanha Bay Harbour;
- Construction of a bypass upstream of the Modder River Bridge to traverse the Modder River;
- Abnormal loads to be transported during off-peak periods particularly during the night (21:00-05:00);

Internal Requirements

- If the R27/Main Access intersection is upgraded, then the internal Ou Skip Road / Main Access Road intersection will require upgrading to either a roundabout or a signalised intersection;
- A total of 900 parking bays should be provided on-site;
- Minibus taxis and buses should be provided to transport construction workers to the site. Public transport facilities should be constructed on-site to facilitate the loading and off-loading of workers;

Further Studies Required

- The *Koeberg Nuclear Power Station Emergency Plan: Transport Modelling and Evacuation Management Plan* should be updated to include the evacuation of the Nuclear-1 construction workers;
- A comprehensive Construction Traffic Management Plan should be completed, in conjunction with the authorities, for the duration of the construction period;
- An abnormal load route traffic management plan should be completed in conjunction with the authorities; and
- The cost of the external road upgrades should be included in the financial feasibility model of this site.

8 BANTAMSKLIP CONSTRUCTION PHASE IMPACT ASSESSMENT

8.1 Access

8.1.1 Access Location

Access points to the Nuclear-1 construction site are expected to be directly off the R43, as shown in **Figure 8.1**. Two new access roads are proposed for the construction phase.

8.1.2 Access Spacing

In accordance with the *PGWC's Road Access Guidelines (2001),* the minimum access spacing requirement for a non-signalised intersection in a rural development environment is as follows:

- Main Road (R43) – Class 2 Primary Arterial: 600 m

The proposed accesses should therefore be located a minimum of 600 m from the R43 / DR01206 and the R43 / DR01211 intersections, as shown in **Figure 8.1**.

8.1.3 Access Design

The proposed access roads will necessitate the construction of two stop-controlled T-junction intersections with the R43. The suggested geometric design of the intersections is shown in **Figure 8.2**.

8.1.4 Sight Distance

According to the *Geometric Design of Rural Roads: TRH 17 (NDoT, 1988)*, the sight distance required by single unit truck and trailer for a design speed of 120 km/h is approximately 450 m. The available sight distance along the R43 in the vicinity of the proposed intersections is in excess of 450 m. Therefore the proposed accesses meet the minimum sight distance requirements.

8.2 Traffic Analysis

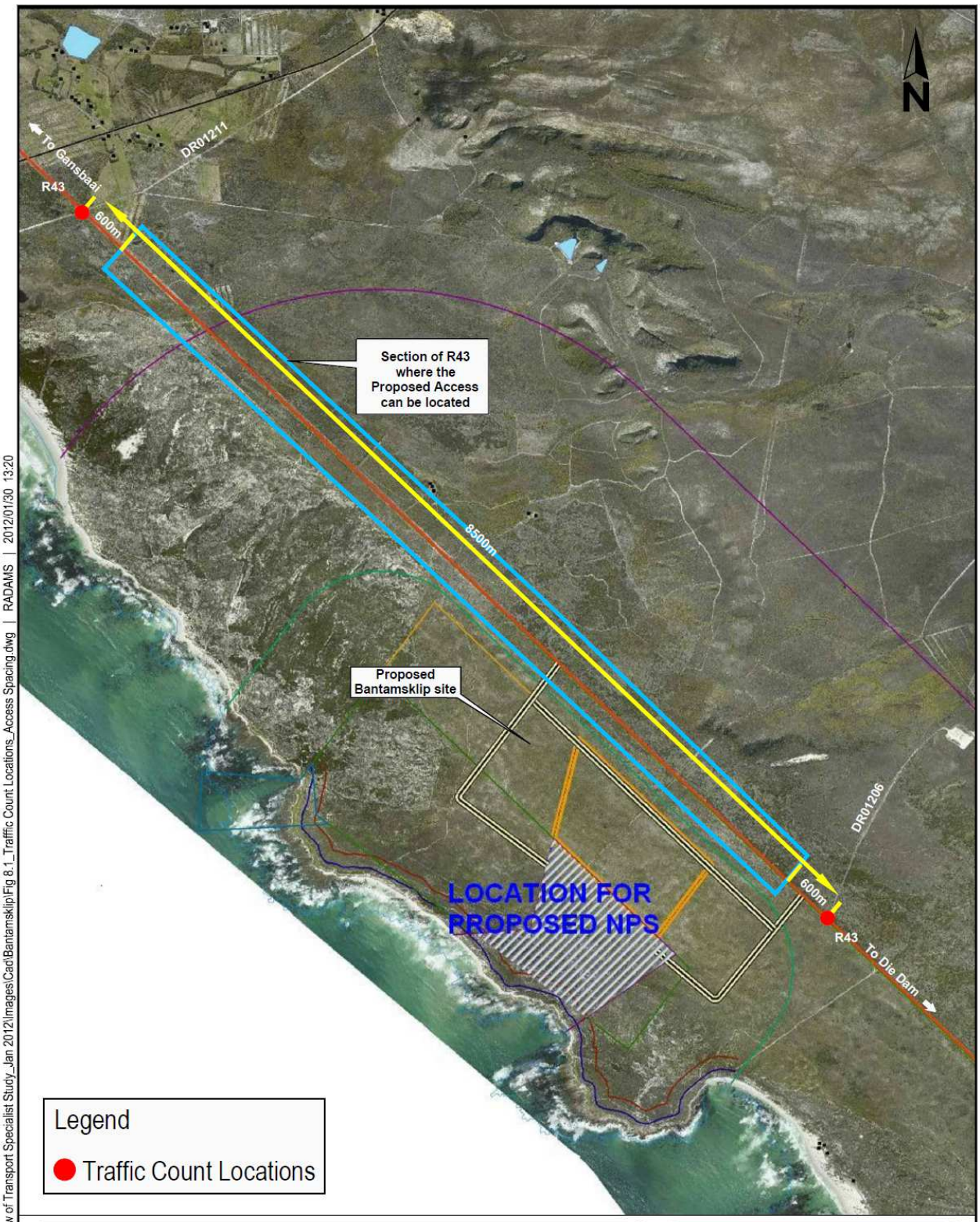
8.2.1 Description

During the nine years of construction, year six, estimated to be 2019, is considered the peak year where maximum traffic volumes will be experienced. The 2019 scenario has therefore been analysed to determine the impact of the worst case scenario.

8.2.2 Trip Generation

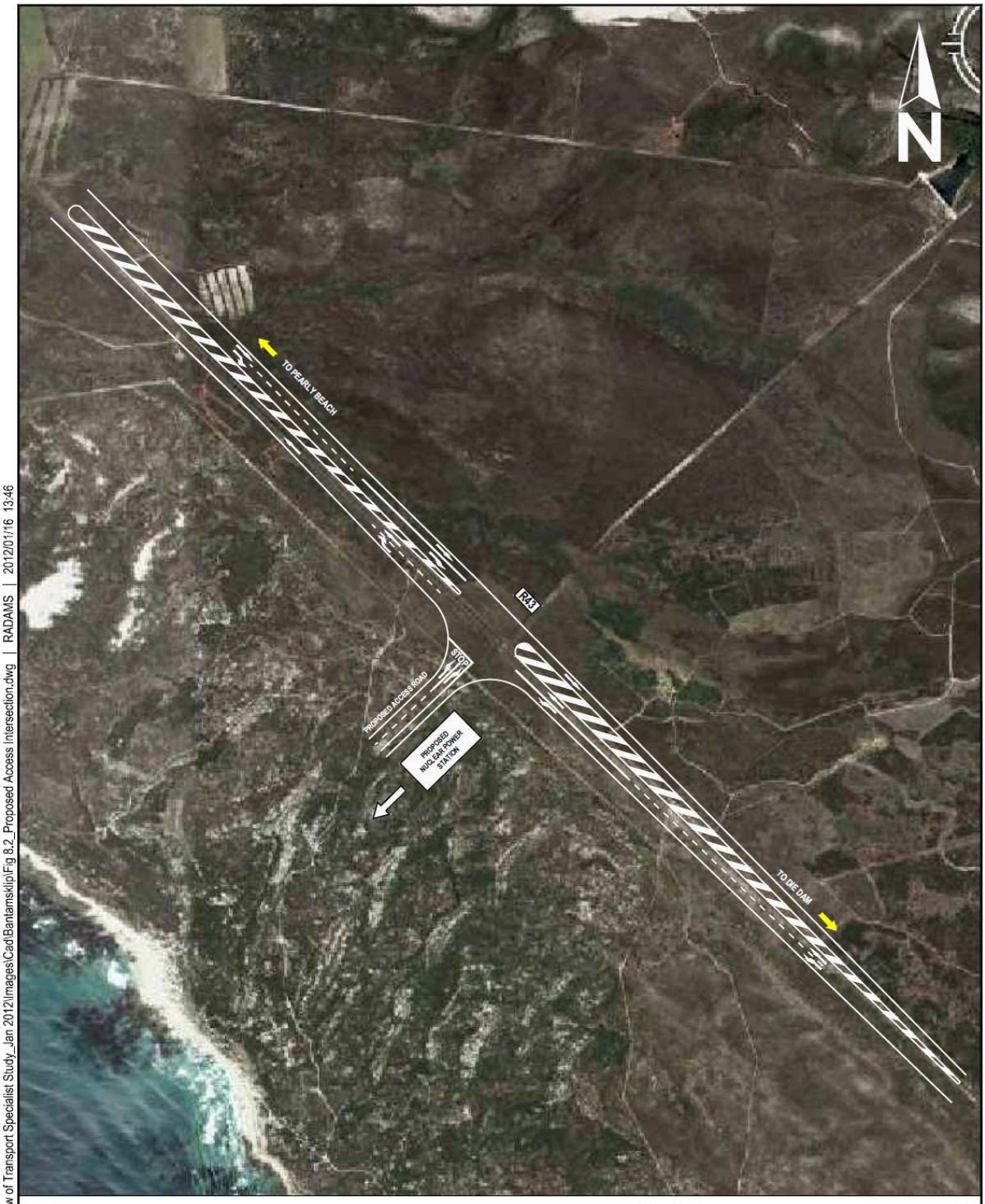
Eskom has provided a detailed schedule of estimated construction phase trips for each year of the nine year construction phase period, as shown in **Annexure B9**.

The traffic during the construction phase will mainly be generated by construction workers, Eskom staff and construction deliveries.



P:\J27035 (Nuclear Power Station TIA)\Tasks\Review of Transport Specialist Study_Jan 2012\Images\Cad\Bantamsklip\Fig 8.1_Traffic Count Locations_Access Spacing.dwg | RADAMS | 2012/01/30 13:20

PROJECT	Nuclear 1: Enviromental Impact Assessment					
DETAIL	Bantamsklip Traffic Count Location and Access Spacing					
Prepared By	Checked By	Reviewed By	Scale	Date	Project No. / Drg.No. / Rev.	
M. Naude	S.Chow	A.Bulman	N.T.S	Jan 2012	J27035 / Fig 8.1 /	



P:\J27035 (Nuclear Power Station TIA)\Tasks\Review of Transport Specialist Study_Jan 2012\Images\Cad\Bantamsklip\Fig 8.2_Proposed Access Intersection.dwg | RADAMS | 2012/01/16 13:46

PROJECT	Nuclear 1: Environmental Impact Assessment
DETAIL	Bantamsklip Proposed Access Intersection Geometry

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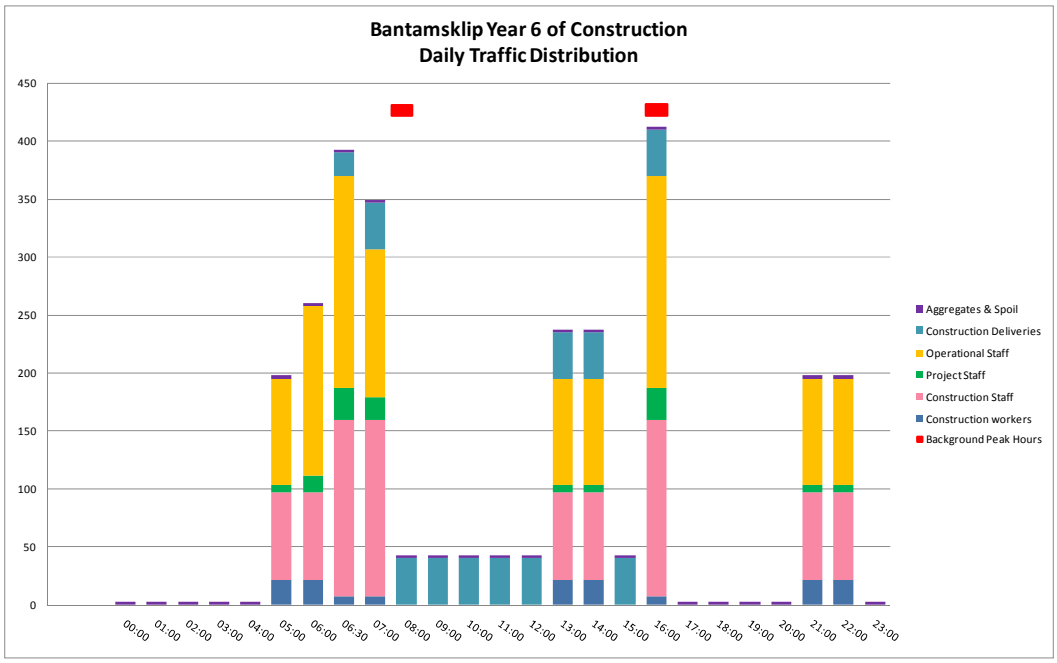
Prepared By	Checked By	Reviewed By	Scale	Date	Project No.	Drg.No.	Rev.
R.Adams	S.Chow	A.Bulman	N.T.S	Jan 2012	J27035	Fig. 8.2	

Construction workers will be working in shifts and certain construction vehicles will operate over a 24 hours period, while Eskom staff will be on site during normal office hours. The shifts and normal office hours, as mentioned in **Chapter 7.2.2**, are as follows:

- Morning shift: 06:00 – 14:00
- Afternoon shift: 14:00 – 22:00
- Night shift: 22:00 – 06:00
- Normal office hours: 07:30 – 16:30

Graph 8.1 shows the traffic distribution of an average day during year 6 of the construction phase. It shows that the peak hours of the construction phase occur at 06:30 – 07:30 and 16:00 – 17:00, while the peak hours of the background traffic occur at 08:00 – 09:00 and 16:00 – 17:00. The AM peak hours of the background traffic and construction periods vary, so the AM construction peak hour has been used for the analysis as the background traffic is relatively insignificant compared to the construction traffic volumes.



Graph 8.1 – Daily Traffic Distribution in Year 6 of Construction

8.2.3 Trip Generation

The trips generated by the proposed Nuclear-1 site at Bantamsklip during the construction phase are shown in **Table 8.1** and the detailed trip generation table is shown in **Annexure B9.** These trips include buses, which will transport construction worker to and from the site from surrounding towns and the workers village (site to be determined).

Table 8.1 –Construction Phase Generated Trips

Types of Traffic	AM (06:30 - 07:30)		PM (16:00 - 17:00)	
	In	Out	In	Out
Construction workers	7	0	0	7
Construction Staff	152	0	0	152
Project Staff	28	0	0	28
Operational Staff	183	0	0	183
Construction Deliveries	10	10	20	20
Aggregates & Spoil	1	1	1	1
Total	**381**	**11**	**21**	**391**

8.2.4 Trip Assignment & Distribution

To determine the traffic impact of Nuclear-1's construction phase on the surrounding road network, the generated trips were distributed onto the existing road network.

The directional distribution of the internal generated trips for both the AM and PM peak hours is based on the estimated origins of the construction workers and staff. Construction workers accommodation is expected to be located to the west of the site in the Gansbaai area. Ninety percent of the trips generated originate from the west (Gansbaai, Pearly Beach etc) and ten percent originate from the eastern, Bredasdorp side of the proposed site.

Little detail is known at this stage about the internal road layout of the site. While it is acknowledged that two separate entrance points are likely to be constructed, this analysis has been undertaken with a single access point as a worst-case scenario.

The percentage distribution, for the AM and PM peak hours is shown in **Annexures B10** and **B11,** respectively.

The distribution of generated traffic by the proposed development for both the AM and PM peak periods are shown in **Annexures B12** and **B13,** respectively.

The 2019 construction phase total traffic (2019 background traffic plus construction generated traffic) for the AM and PM peak periods is shown in **Annexures B14** and **B15,** respectively.

8.2.5 Capacity Analysis

Intersection analysis was performed using the SIDRA 3.2 Computer Programme for the following main intersections:

- R43 / DR01211;
- R43 / DR01206; and
- R43 / Main Access Road.

The **2019 Construction Total Traffic scenario** was analysed during the AM and PM peak hours. The LOS and 95th percentile vehicle queues for this scenario are summarised in **Annexures B16** and **B17**.

The additional traffic is expected to have a low impact on traffic congestion on the existing road network. The analysis results are summarised hereafter.

(a) R43 / DR01211

The existing geometry and aerial view of R43 / DR01211 is shown in **Figure 8.3**.

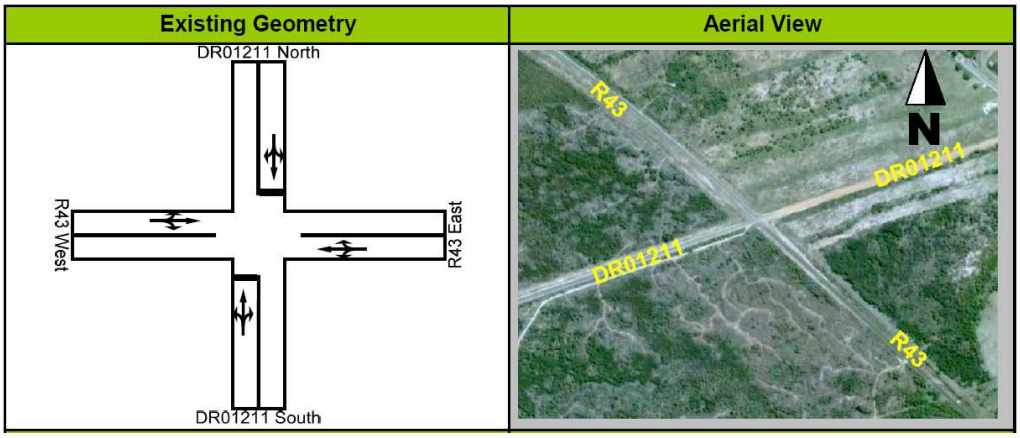


Figure 8.3: R43 / DR01211 Existing Intersection Geometry

(i) 2019 Construction Traffic

All approaches will operate well at LOS A with minimal vehicle queues during both the AM and PM peak hours. No upgrades are therefore required.

(b) R43 / DR01206

The existing geometry and aerial view of R43 / DR01206 is shown in **Figure 8.4**.

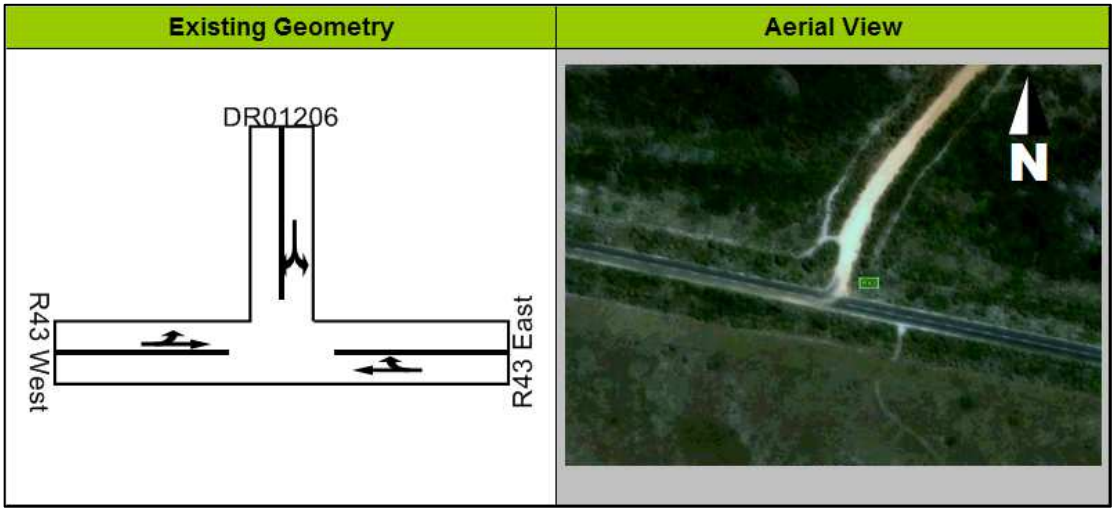


Figure 8.4: R43 / DR01206 Existing Intersection Geometry

(i) 2019 Construction Traffic

All approaches will operate well at LOS A to LOS B with minimal vehicle queues during both the AM and PM peak hours. No upgrades are therefore required.

(c) R43 / Main Access Road

The proposed geometry and aerial view of R43 / Main Access Road is shown in **Figure 8.5**.

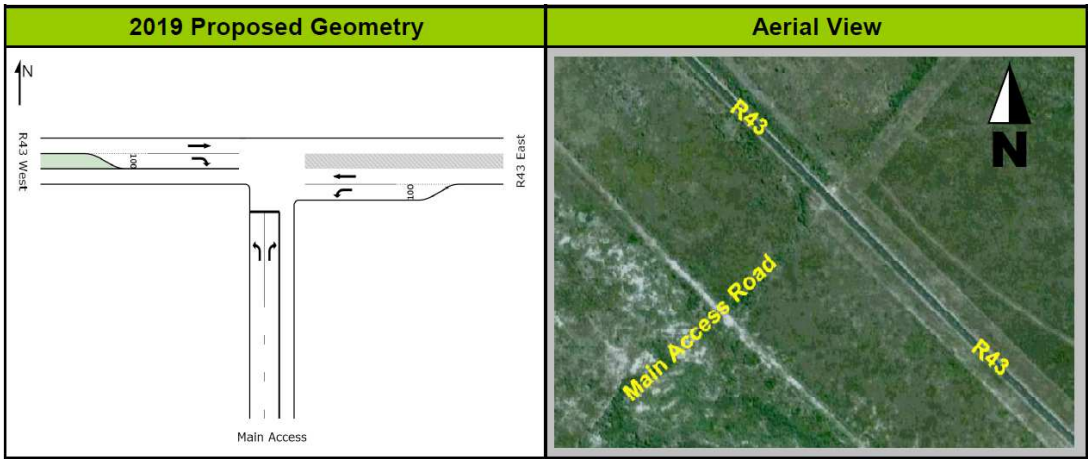


Figure 8.5: R43 / Main Access Road Proposed 2013 Intersection Geometry

(i) 2019 Construction Traffic

All intersection movements will operate adequately at LOS A to LOS C during both the AM and PM peak hours with minimal traffic queues. .

8.3 Abnormal Loads

According to the NSIP *Southern Cape Summary Report (Eskom, 1994)*, the feasibility of transporting heavy loads from Table Bay Harbour in Cape Town to the Bantamsklip site was investigated by Drennan, Maud and Partners in 1988. According to this study, Cape Town Harbour (Table Bay Harbour) is ideally situated and has the infrastructure capabilities for loading and offloading heavy loads.

An investigation has been undertaken to determine the suitable route to transport abnormal loads from Cape Town Harbour to the proposed site. **Figure 8.6** shows the results of the preliminary route investigation. The results have shown that there are several bridges between Cape Town Harbour and the Nuclear-1 site that cannot accommodate abnormal loads. Major upgrades will therefore be required at these intersections and roads and further detailed analysis will be required.

Transport of the abnormal loads via a barge from Cape Town Harbour to a suitable area on the beach close to the Nuclear-1 site at Bantamsklip should be considered. The distance from Cape Town Harbour to Bantamsklip is approximately 150 km. Suitable landing and loading / off-loading facilities appropriate for a barge would have to be constructed along the beach.

The abnormal load would then have to be transported via road from the barge to the Nuclear-1 site at Bantamsklip, which will require more mode changes then if transported directly by road.

PROJECT: **Nuclear 1 : Environmental Impact Assessment**	Approved By: A.Bulman		Scale: NTS	Date: January 2012
DETAIL: **Bantamsklip Abnormal Load Route**	Drawn By: R.Adams	Checked By: S.Chow	Reviewed By: A.Bulman	Project No. J27035 / Drg No. Figure 8.6 / Rev

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8.4 Normal Heavy Load Transport

The main section of the heavy vehicle route from Bantamsklip is along the R43 to the N2 via Sir Lowry's pass into Cape Town.

The current Average Annual Daily Traffic (AADT) and the percentage of heavy vehicles along the R43 and the N2 are illustrated in **Annexure B18**. The R43 and the N2 can be considered existing heavy load roads as the percentage heavy vehicles is minimum 7%, which is higher than the average 5%. The R43 road pavement should be investigated in terms of its remaining pavement life and the impact of construction vehicles over the construction period is considered medium. It is anticipated that the R43 would require strengthening of the pavement in places, which should improve the impact on the structural instability of the road to low. Further detailed structural assessment of the normal heavy load route will be required.

The high volume of heavy load construction traffic during the construction phase is expected to have a high negative impact on the noise levels and traffic / pedestrian safety on the local community of Gansbaai. It is therefore recommended that further investigation is undertaken to construct a temporary bypass around the Gansbaai town for construction traffic, which will reduce this impact.

8.5 Parking

The Nuclear-1 site will experience a daily maximum of 977 vehicular trips (excluding construction vehicles) during the construction period.

General construction workers are expected to arrive on buses or minibus taxis provided by the Eskom or the construction company. An average of 89 buses or minibus taxis will be used for the transportation of construction workers on an average day of the construction period. However, no parking bays will be required for the buses and minibus taxis, as they will not remain on site during the shifts.

It is estimated that a maximum of 900 private vehicles will require parking on during the construction period. A total of 900 parking bays should therefore be provided on the Nuclear-1 site at Bantamsklip during the construction phase to avoid negatively impacting on the surrounding area.

8.6 Public Transport

It is recommended that the construction workers should be transported by contracted buses to and from the site.

Public transport facilities for the contracted buses and minibus taxis will have to be constructed on-site to facilitate the loading and off-loading of workers.

8.7 Non-Motorised Transport

The high volumes of traffic generated by Nuclear-1 are expected to have a medium high impact on the existing pedestrian activities along the route, especially in

Gansbaai. Internal pedestrian trips are also expected to increase during the construction phase. Low traffic speeds should therefore be maintained to ensure pedestrian safety.

8.8 Conclusions

The following can therefore be concluded. The significance of the impacts is summarised in **Table 8.2**:

- The main access to the Nuclear-1 site in Bantamsklip will be constructed off the R43. While only one access point has been analysed as a worst-case scenario, it is acknowledged that two access points are likely to be constructed;

- The construction peak hours for the AM (06:30 – 07:30) and PM (16:00 – 17:00) peak periods have been used for analysis purposes, as the background traffic is considered insignificant compared to the construction traffic peaks;

- All three intersections in the vicinity of the site will operate adequately at LOS A – LOS C with insignificant traffic queues. No upgrades to the existing intersections will therefore be required;

- While outside the scope of this study, it is recognised that the significant increase in traffic volumes (both light and heavy) through Gansbaai, Caledon and Hermanus, are likely to have negative social and environmental consequences that will require further investigation should this site be identified as the preferred site;

- The preferred route for the transportation of abnormal loads is provided in **Figure 8.6**. There are significant bridge obstructions and steep grades along this route, which raises serious concerns regarding its suitability. Further investigation of alternatives, such as transport by sea, will be required;

- N2 and R43 will be used for the transportation of normal heavy loads, as it currently experiences a minimum of 7% heavy vehicles and can be considered as a heavy load route. Further investigation will be required for the construction of a temporary bypass around the Gansbaai town for construction traffic in order to reduce the noise and safety impact on the town of Gansbaai.

Table 8.2: Significance of Impact for Construction phase of Bantamsklip

Impact		Intensity	Value	Extent	Value	Duration	Value	Irreplacable resources	Irrep. value	Cons. Value	Prob.	Prob. value	Sign. value	SIGNIFICANCE
1. Traffic congestion and delay at intersections on the external road network.	Unmitigated	Medium	2	Medium	2	Medium	2	Low	1	2	Mediun	2	3	Medium
	Mitigated	Low	1	Medium	2	Medium	2	Low	1	1	Low	1	1	Low
2. Increased noise impact on local communities due to increased traffic.	Unmitigated	High	3	Medium	2	Medium	2	Medium	2	3	High	3	5	High
	Mitigated	Low	1	Medium	2	Medium	2	Medium	2	1	Low	1	1	Low
3. Decreased pedestrian safety in local communities due to increased traffic.	Unmitigated	High	3	Medium	2	Medium	2	High	3	3	Mediun	2	4	Medium High
	Mitigated	Low	1	Medium	2	Medium	2	High	3	1	Low	1	1	Low
4. Structural damage to road infrastructure along heavy load route.	Unmitigated	Medium	2	High	3	Medium	2	Medium	2	2	Mediun	2	3	Medium
	Mitigated	Low	1	High	3	Medium	2	Medium	2	1	Mediun	2	1	Low
5. Traffic congestion due to transportation of abnormal loads.	Unmitigated	Medium	2	High	3	Medium	2	Low	1	3	High	3	5	High
	Mitigated	Low	1	High	3	Medium	2	Low	1	2	Low	1	2	Low Medium
6. Lack of parking	Unmitigated	Medium	2	Medium	2	Medium	2	Low	1	2	High	3	3	Medium
	Mitigated	Low	1	Low	1	Medium	2	Low	1	1	Low	1	1	Low

8.9 Mitigation actions required

The following mitigation actions are proposed for the construction phase of Nuclear-1:

Access to the Site

- Two access points should be constructed to access the site;

External Road Upgrades

- The remaining pavement life of the R43 should be investigated and the possible improvement of the pavement should be investigated to support the additional traffic generated during the construction phase.
- The construction of a road bypass for heavy construction vehicles around the town of Gansbaai should be investigated.

Internal Requirements

- A total of 900 parking bays should be provided on-site;
- Minibus taxis and buses should be provided to shuttle construction workers to the site. Public transport facilities should be constructed on-site to facilitate the loading and off-loading of workers;

Further Studies Required

- The social and environmental impact of the additional traffic through Gansbaai, Caledon and Hermanus will require further investigation;
- A suitable site along the coast near the Bantamsklip site should be identified to allow loading and off-loading of the barge, which is proposed to transport abnormal loads from Cape Town harbour to the site. A landing facility would be required to be constructed at the appropriate location; and
- A comprehensive Construction Traffic Management Plan should be completed with the relevant authorities before construction commences.

9 THYSPUNT CONSTRUCTION PHASE IMPACT ASSESSMENT

9.1 Access

There are currently no roads of the standard required connecting the Thyspunt site to the existing road network. Access to the site will be required for the construction phase as well as the operational phase.

The site will require a main access and a secondary access which is typically required as an emergency evacuation route and an alternative to the main access. Construction staff and operational staff may also approach the Thyspunt site from more than one direction, therefore making two accesses economically viable.

9.2 Transportation Routes

The site can be approached from three possible directions, from the east, north, or from the west, as shown in **Figure 9.1**. The figure also indicates that the routing towards the site is currently via the Oyster Bay Road (DR1763 - shown as Route 1) from Humansdorp, or the R330 (MR381 - shown as Route 2) from Humansdorp, or DR1762 (MN5040) from St. Francis Bay. Investigation of approach routes towards the Thyspunt site for the construction phase has been completed and is reported in the Aurecon report entitled *Eskom Nuclear 1 Project at Thyspunt Site: Road Investigations for EIA Process Addendum (June, 2011)*. The findings of the report are summarised below.

9.2.1 N2 - Thyspunt

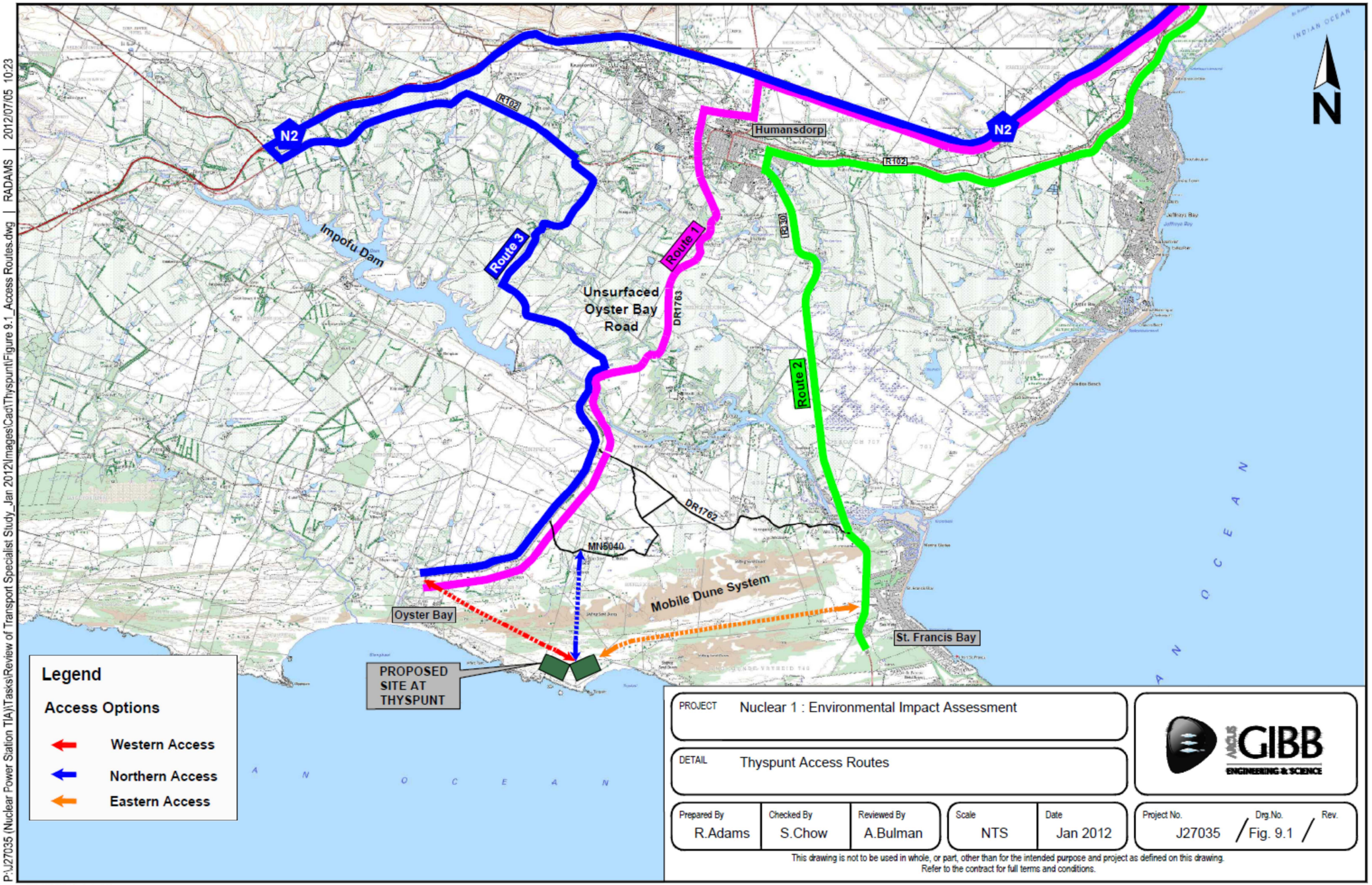
The connections from the Thyspunt accesses towards the N2 and Port Elizabeth during the construction phase have been re-assessed.

The route options for transporting construction materials and equipment (and to connect to the N2) are via the following existing routes:

- Oyster Bay Road (DR 1763) – Route 1;
- R330 (MR 389) – Route 2;
- Routes west of Oyster Bay Road – Route 3;

The impact of heavy construction vehicles transporting materials and equipment using the R330 (MR381) on the existing settlements of Humansdorp, Cape St. Francis, St. Francis Bay and Kwanomzamo is considered medium to high and has therefore been re-assessed since the last version of this report was prepared in July 2011.

Route 3 west (western bypass) of Humansdorp adds considerable additional time and distance to construction trips, is the most costly to upgrade and may be difficult to enforce. It was therefore concluded in the above-mentioned Aurecon report that the "*disadvantages for outweigh the advantages of this route and the route is therefore not considered as a viable option*".


N2
R102
Humansdorp
Impofu Dam
Route 3
Route 1
Route 2
Unsurfaced
Oyster Bay
Road
DR1763
R330
DR1762
MN5040
Mobile Dune System
Oyster Bay
St. Francis Bay
PROPOSED
SITE AT
THYSPUNT
INDIAN OCEAN
N
Legend
Access Options
Western Access
Northern Access
Eastern Access
PROJECT Nuclear 1 : Environmental Impact Assessment
DETAIL Thyspunt Access Routes
Prepared By R.Adams
Checked By S.Chow
Reviewed By A.Bulman
Scale NTS
Date Jan 2012
Project No. J27035
Drg.No. Fig. 9.1
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P:\J27035 (Nuclear Power Station TIA)\Tasks\Review of Transport Specialist Study_Jan 2012\Images\Cad\Thyspunt\Figure 9.1_Access Routes.dwg | RADAMS | 2012/07/05 10:23

It is therefore recommended that a combination of both Oyster Bay Road (Route 1 to western access) and R330 (Route 2 to eastern access) be used for transportation during the construction phase, which will improve the impact on traffic congestion, noise and safety to low / medium. The construction vehicles (normal heavy loads) will utilise ONLY the upgraded Oyster Bay Road (DR1763 - western access) to minimise the impact of construction traffic on the existing network and the infrequent abnormal loads will utilise the R330 (MR381) during the night time.

Construction workers and operational staff are likely to be distributed in various settlements in the neighbouring areas, such as Humansdorp, Jeffrey's Bay etc. The detailed location of the workers villages during the construction phase and their impacts do not form part of this TIA and will be assessed in a separate EIA process.

It is, however, assumed that both Oyster Bay Road and R330 will be utilised for the transportation of staff. The assumptions regarding trip distribution for construction workers and operational staff are described in **Chapter 9.3**.

9.2.2 Oyster Bay Road

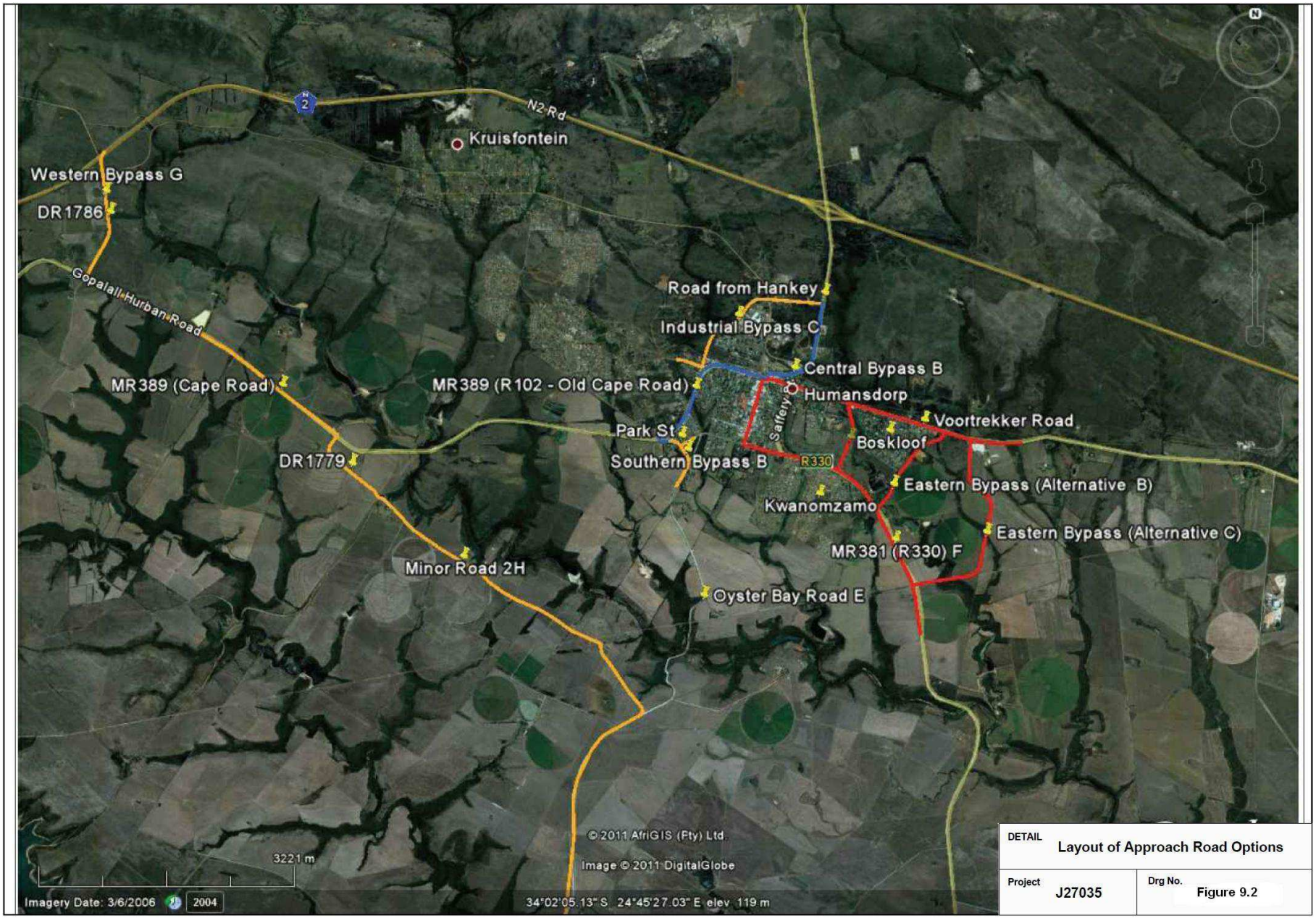
The existing Oyster Bay Road is an unsurfaced road requiring substantial horizontal alignment, vertical alignment, and pavement upgrading to a suitable standard to cope with the construction period of up to nine years. Details of the upgrades are described in the Eskom *Nuclear 1 Project at Thyspunt Site: Road Investigations for EIA Process Addendum.* The existing road is a lightly trafficked road and the existing users will substantially benefit from the upgrading to surfaced standard.

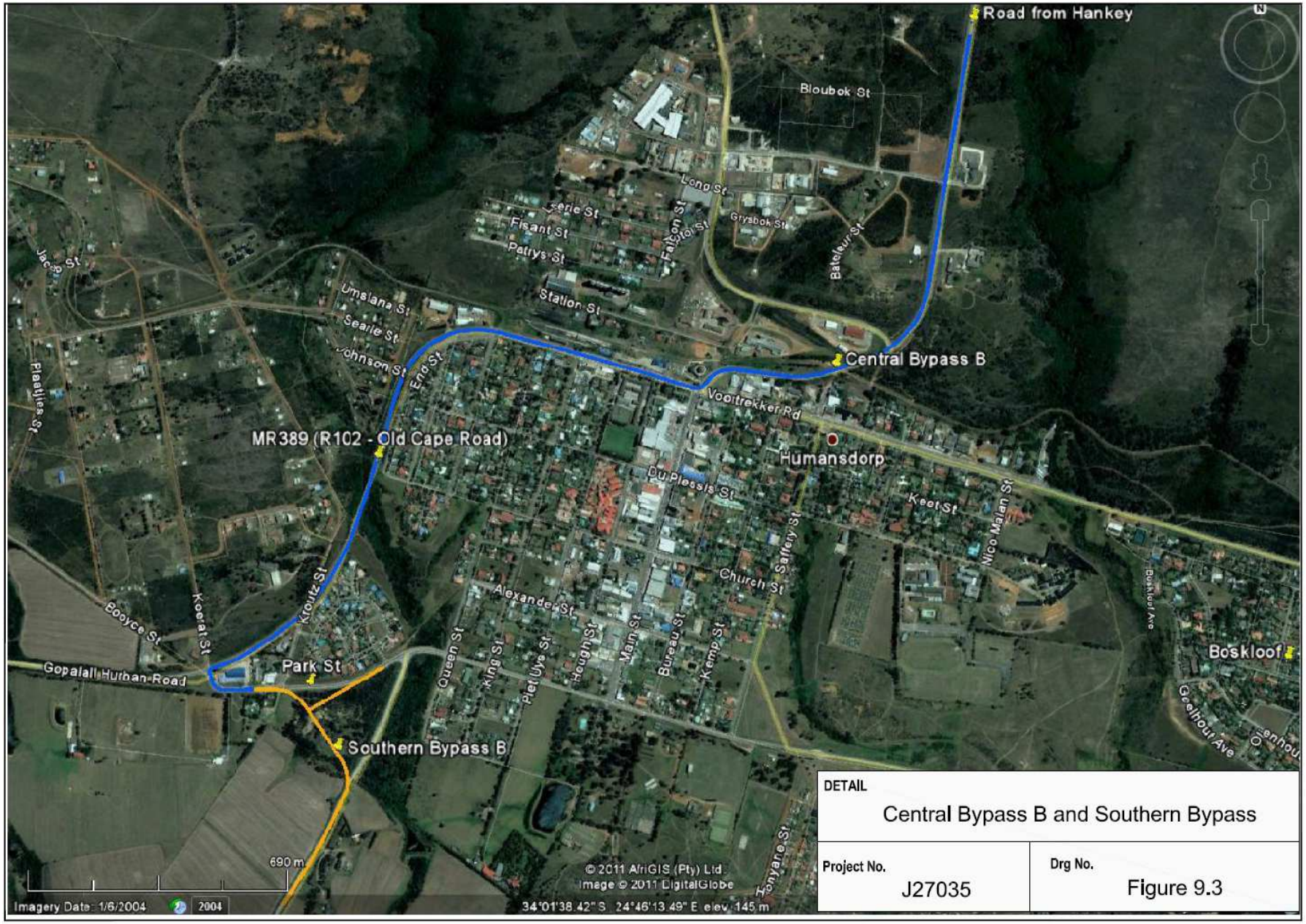
The following revised routes were assessed to connect the Oyster Bay Road with the N2, and are shown in **Figure 9.2**:

- Central Bypass B, and Southern Bypass
- Industrial Bypass C, and Southern Bypass
- Western Bypass G

(a) Central Bypass B, and Southern Bypass

This route from the N2 bypasses Humansdorp Main Street by re-routing through Old Cape Road (MR389) with a Southern Bypass link to the Oyster Bay Road, as shown in **Figure 9.3.** The route has limited impact on residential homes. Improvements in horizontal alignments are required particularly along Park Street, and a number of intersections (Voortrekker Road/Main Road, Cape Road/Park Street and Westgate Road/Park Street) would have to be improved.


N2 Rd
Kruisfontein
Western Bypass G
DR1786
Gopalall Hurban Road
MR389 (Cape Road)
MR389 (R102 - Old Cape Road)
Road from Hankey
Industrial Bypass C
Central Bypass B
Humansdorp
Saffery St
Voortrekker Road
Park St
Boskloof
DR1779
Southern Bypass B
R330
Eastern Bypass (Alternative B)
Kwanomzamo
Eastern Bypass (Alternative C)
MR381 (R330) F
Minor Road 2H
Oyster Bay Road E
© 2011 AfriGIS (Pty) Ltd
Image © 2011 DigitalGlobe
3221 m
Imagery Date: 3/6/2006
2004
34°02'05.13" S 24°45'27.03" E elev 119 m
DETAIL
Layout of Approach Road Options
Project
J27035
Drg No.
Figure 9.2


Road from Hankey
Bloubok St
Long St
Perie St
Fisant St
Petrys St
Falcon St
Grysbok St
Bateleur St
Station St
Umsiana St
Searle St
Johnson St
Eric St
Jacob St
Plaatjies St
Central Bypass B
Voortrekker Rd
MR389 (R102 - Old Cape Road)
Humansdorp
Du Plessis St
Keet St
Nico Malan St
Safety St
Church St
Alexander St
Krouz St
Booyce St
Koerat St
Park St
Gopalall Hurban Road
Queen St
King St
Piet Uys St
Heugh St
Main St
Bureau St
Kemp St
Southern Bypass B
Boskloof
Geelhout Ave
Tenyane St
690 m
© 2011 AfriGIS (Pty) Ltd
Image © 2011 DigitalGlobe
Imagery Date: 1/6/2004
2004
34°01'38.42" S 24°46'13.49" E elev 145 m
DETAIL
Central Bypass B and Southern Bypass
Project No.
J27035
Drg No.
Figure 9.3

The major disadvantage of this route is, however, the Voortrekker Road / Main Street intersection which experiences high traffic volumes and serves as the entrance to Humansdorp. If chosen, the intersection would have to be substantially upgraded.

(b) Industrial Bypass C, and Southern Bypass

The Voortrekker Road / Main Street intersection can be bypassed with an alignment bypassing the industrial area on the western side to avoid the major Humansdorp intersection. While there are gradient design challenges, the re-alignment can be achieved, as shown conceptually on **Figure 9.4**

The industrial bypass will be constructed as a new road, which intersects at Hankey Road (R330) to the north of the Bosbok Street intersection and reconnects with Old Cape Road, bypass the entire Kruisfontein area. The proposed industrial bypass will cross the railway line before it reaches Old Cape Road. The rail traffic experienced at the railway line is light and therefore considered insignificant. A crossing with traffic signals or booms will be sufficient to ensure safety between conflicting vehicle and railway traffic.

It is proposed that Searle Street be realigned to join Voortrekker Road and become the new entrance to the Kruisfontein area. The proposed industrial bypass will join the new Searle Street / Voortrekker Road intersection as a northern approach to connect with Old Cape Road (southern approach).
The major advantage of this alignment is the bypass of the entrance to Humansdorp for construction traffic. The disadvantage is the substantial upgrading of the Searl Street / Voortrekker / Industrial Bypass / Old Cape Road intersection. This alignment is the preferred alternative.

(c) Western Bypass G

This alternative route, shown in **Figure 9.2**, continues with construction traffic west of Humansdorp interchange to the DR1786 overpass. Ramps would have to be constructed to allow temporary access (during the construction phase) for construction traffic. This route on DR1786 would link back to Old Cape Road, DR1779, Minor Road 2H, until Oyster Bay Road. A number of gravel roads would have to be upgraded, and re-aligned, vertically and possibly horizontally. Pedestrian facilities may also be required at appropriate locations.

This route option adds at least 25 km to the previous two alternatives, and will add considerably to overall haulage costs over the construction phase. It may also be difficult to enforce by traffic officers.

While this route option further reduces the impact of construction traffic on Humansdorp, it adds considerable costs over the construction phase.

In summary, assessing the three options described above, Industrial Bypass C with the Southern Bypass is recommended **when assessing all the advantages and disadvantages of all three routes.**


Road from Hankey
Industrial Bypass C
Bloubok St
Long St
Falcon St
Bosbok St
Kwikstertjie Rd
Fisant St
Loerie St
Tiptol St
Grysbok St
Bateleur St
Rhebok St
Palrys St
Station St
Magienda St
Umslana St
Searle St
Johnson St
Church St
Bourdaay Rd
End St
Hugo St
Burlekant St
Du Plessis St
Piet Uys St
Queen St
King St
R330
379 m
d Cape Road)
Imagery Date: 1/6/2004
2004
34°01'18.71" S 24°46'13.65" E elev 187 m
© 2011 AfriGIS (Pty) Ltd
Image © 2011 DigitalGlobe
DETAIL
Industrial Bypass C and Southern Bypass
Project No.
J27035
Drg No.
Figure 9.4

9.2.3 R330

The existing R330 is a surfaced road connecting between N2 and Cape St. Francis through Humansdorp and St. Francis Bay. The section of R330 starting from Humansdorp Main Street was initially considered as the most suitable route for the transportation of abnormal loads. Road surface upgrades to the section of road between the Thyspunt access and the Kromme River Bridge will, however, be required.

Concerns have been raised about the use of Main Street due to high daily volumes of the road. Several alternative Eastern bypasses have therefore been investigated in the *Eskom Nuclear 1 Project at Thyspunt Site: Road Investigations for EIA Process Addendum*.

(a) Eastern Bypass

Alternate existing road, such as Saffery Street, was considered to serve as the bypass route from Humansdorp Main Street. Saffery Street is, however, considered not feasible as an alternate option, as the vertical alignment along Saffery Street is significantly steep and is not suitable for the travelling of abnormal load vehicles. The street is also considered too narrow to have sufficient turning radius for abnormal load vehicles at the Park Street intersection.

New transport roads for abnormal load vehicles were therefore then considered and three alternate bypasses were investigated, as shown in **Figure 9.5**. All three alternatives are proposed new roads that run along existing land boundaries between farmland.

Alternative A directly links between Voortrekker Road (MR389) and Park Street (MR381) and is 850m in length. The beginning of Alternative A crosses the Boskloof Valley and the rest of the route will be constructed on Municipality land.

Alternative B is connects between Voortrekker Road (MR389) and Park Street (MR381) along the east of the Boskloof area, and crosses privately owned farmlands and is 1.3km in length. The topography of Alternative B is considered acceptable, except for the section of the route where it crosses the Boskloof Stream at a deep vertical alignment. Additional cost will be required for the construction of a bridge to cross the stream at an acceptable grade.

Alternative C is located the furthest east from Humansdorp and is the longest of all three alternatives (2.7 km). This route also crosses privately owned farmlands. Similar to Alternative B, Alternative C crosses two relatively deep valleys, which will require additional cost for the construction of bridge structures to achieve acceptable grade crossings.

Alternative A is therefore considered as the most viable option as it is the shortest and most economical route to construct, and it has a good alignment for the transportation of abnormal loads. Once the route is constructed, it will also alleviate the traffic congestion in Humansdorp.


Humansdorp
Du Plessis St
Saffery St
Nico Malan St
Main St
Bureau St
Kemp St
Park St
Eastern Bypass A (Alternative A)
Park St
Protea St
Dahlia St
Voortrekker Road
Boskloof
Geelhout Ave
Olienhout Ave
Wittels Rd
R330
Eastern Bypass (Alternative B)
Honyane St
Mlekula St
Zakhe St
Gxotiwe St
Mtsila St
Vumazonke St
Kelse St
Kwanomzamo
Beda St
MR381 (R330) F
Eastern Bypass (Alterna
© 2011 AfriGIS (Pty) Ltd.
Image © 2011 DigitalGlobe
719 m
Imagery Date 3/6/2006
2003
34°02'14.96" S 24°47'18.33" E elev 104 m
Detail:
Eastern Bypass Alternatives
Project
J27035
Drg No.
Figure 9.5

(b) R330 (MR381)

The section of the R330 between Humansdorp and the Thyspunt site (MR381) mostly provide access to farms and St. Francis Bay, which is considered acceptable to be used as a transportation route. It should, however, be noted that a pedestrian crossing is currently located at the section of R330 south to St. Francis Bay, as shown in **Figure 9.6**, which indicates a demand for pedestrians crossing at this location. Additional warning signage should therefore be provided to ensure safety during the construction period.

Figure 9.6: Pedestrian crossing along R330

9.2.4 Oyster Bay Road to R330 link (DR1762)

A gravel road, known as DR1762, is currently located close to St. Francis Bay and acts as a link between the Oyster Bay Road and the R330, as shown in **Figure 9.7**. According to the *Eskom Nuclear 1 Project at Thyspunt Site: Road Investigations for EIA Process Addendum*, DR 1762 is expected to be used by the local residents and as a secondary link to Thyspunt by the workers.

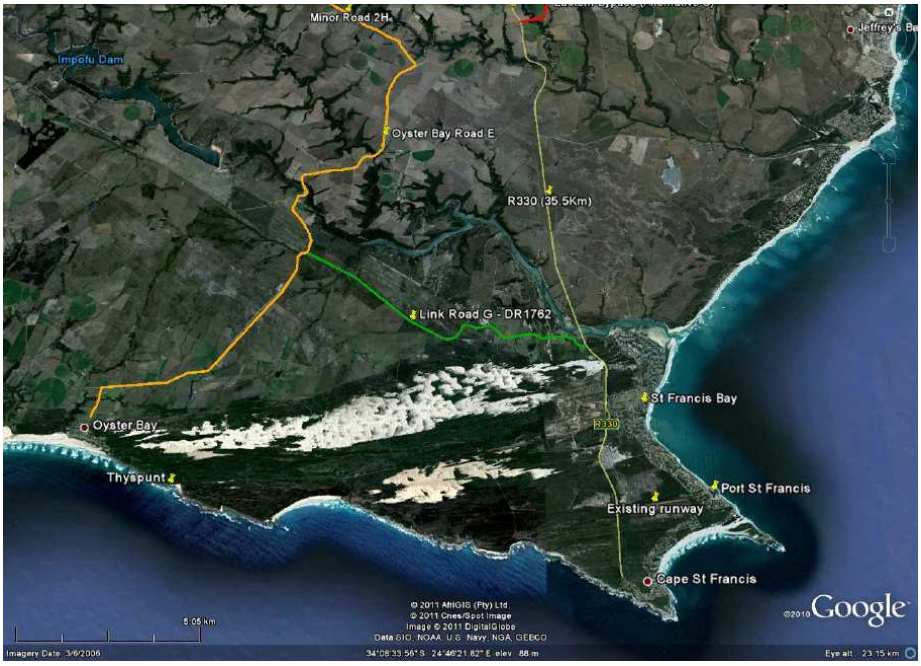


Figure 9.7: DR 1762 between Oyster Bay Road and R330

It is recommended that the road be upgraded to a surfaced road with gravel shoulders. The upgraded road can then serve as a high standard link road for traffic between Oyster Bay and St. Francis Bay without traversing the power station property. It can also serve as an optional route during construction, should the traffic along Oyster Bay Road be too heavy.

9.2.5 Internal Access to the Thyspunt site

As briefly discussed above, the site can be accessed from the east, north, or from the west. For operational and safety requirements, the site requires two accesses.

The report entitled *Eskom Nuclear 1 Project: Thyspunt Site. Proposed Site Access Roads* was undertaken by Aurecon in March 2011 to assess the possible alternatives for internal access to the Thyspunt site. The recommended alternatives for the various internal access are summarised below. Details of the route alternatives can be obtained from the Aurecon report in **Annexure G**.

(a) Eastern Access

The eastern access will serve as the access for light vehicular traffic and the transportation of abnormal loads.

Four options were investigated for the eastern access link from the R330 (MR381) to the site. Option E3 is considered to be the most viable option and the alignment of route option E3 is shown in **Figure 9.8**.

Route option E3 is 11.2 km in length and is considered to be the route with the least environmental and social impact on Thyspunt and the St. Francis area.

Route option E3 is chosen to avoid the eastern end of the existing dune field in the site, as it follows the boundary line between the Dune and the St. Francis Links development. It will also avoid creating dead space between the route and boundary fence by allow the route to follow boundary lines.

P:\J27035 (Nuclear Power Station TIA)\Tasks\Review of Transport Specialist Study_Jan 2012\Images\Cad\Thyspunt\Figure 9.1c_Eastern Bypass Alternatives.dwg | RADAMS | 2012/01/30 02:55:46 PM

Figure 9.8: Recommended Eastern Access Option

The remaining life of the R330 (MR381) should be investigated for possible upgrading by determining whether it can accommodate the increased loading as a result of any abnormal loads during the construction period.

Initial assessment of the Kromme River Bridge and the Sand River culvert indicates that the bridge will be capable of carrying the increased loading during the construction period. Further discussion is contained in **Chapter 9.4**: Abnormal Loads. The traffic distribution during the construction phase is discussed in **Chapter 9.3**.

It should be noted that the section of R330 across Sand River was destroyed by flood and debris flow in July 2011. The box culvert was severely damaged and inhibited traffic flow between Humansdorp and St. Francis Bay while it was being repaired for a few days. Bridges and culvert are generally designed for 1:100 year floods. The flood experienced in 2011 was, however, considered to be a flood with much greater scale than designed for. Construction and operation of Nuclear-1 may be affected should the flood occur again during the construction and operations phase of the proposed nuclear plant. It is, therefore, suggested that a Stormwater Assessment Plan should be undertaken for the flooding situations of Sand River at the R300 crossing. Design specification of the bridge should be reviewed and mitigation measures, such as embankment protection, should be implemented.

(b) Western Access

The western access of the Thyspunt site will be used for light vehicle traffic and the construction traffic (heavy loads).

Ten western access options were investigated and a combination of Route option W8 and W10 was recommended and shown in **Figure 9.9**.

Figure 9.9: Recommended Western Access option

Route option W8 and W10 is 6.7km in length and links between DR1762 and the Thyspunt site.

The route option does not impact on any existing developments or areas and is considered to be the preferred route option as it steers completely away from the Oyster Bay area. The route will, however, encounter several natural obstacles, such as dune ridges and valleys, which should be negotiated carefully in the detailed design phase for the internal access.

(c) Possible Northern Access

Other than the two general eastern and western access, a possible northern access connected to the DR1762 was also considered.

The northern access will be the shortest access route (3.5 m) to the site from an existing road, hence will generate the least construction foot print. The use of a northern access will also avoid disruptions to the Oyster Bay and St. Francis Bay areas. The proposed HV yard, electrical substation, overhead power lines and possible quarry site can also be easily accessed from the northern access.

The route may, however, generate a significant environmental impact as it will access directly across the dune field. Two route options were therefore investigated by dune geomorphologists. Both route options were considered equally viable, but route option N2 was recommended as it is shorter in length. Route option N2 is shown in **Figure 9.10**.

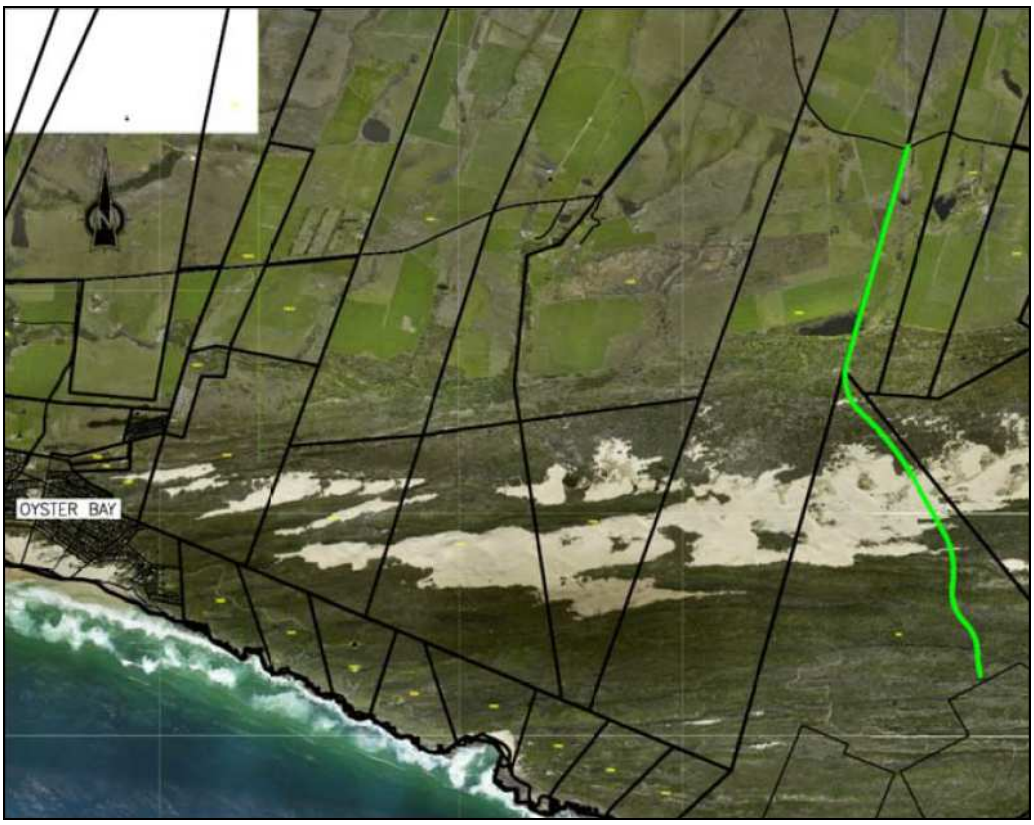


Figure 9.10: Recommended Northern Access option

Route option N2 starts at the existing road DR1762, follows the eastern boundary of the panhandle of the Eskom property, then crosses the dune field onto the Thyspunt site.

The route should be constructed as close to the boundary line as possible to bypass the proposed High Voltage Yard (HV yard). In addition, the HV yard can be accessed off this alignment.

The northern access is considered as the most feasible access route to the Thyspunt site from the traffic and transport viewpoint. The access, however, may cause severe long term environmental impact as it directly crosses the dune field. The northern access is therefore recommended should it be approved by the Environmental Impact Assessment.

(d) Temporary Access Roads

Temporary access roads will be required for construction and staff traffic to access the site during construction of the various access routes.

The proposed temporary access road will be located alongside the recommended western access, as the western access is much shorter than the eastern access and experiences fewer constraints.

The road will consist of two lanes and be 7 m in width. The road will be positioned within the normal road reserve and as far as possible adjacent to the new road profile.

9.3 Traffic Analysis

9.3.1 Description

During the nine years of construction, year six, estimated to be 2019, is considered the peak year where maximum traffic volumes will be experienced. The 2019 scenario has therefore been analysed in order to determine the impact of the worst case scenario on the revised routes.

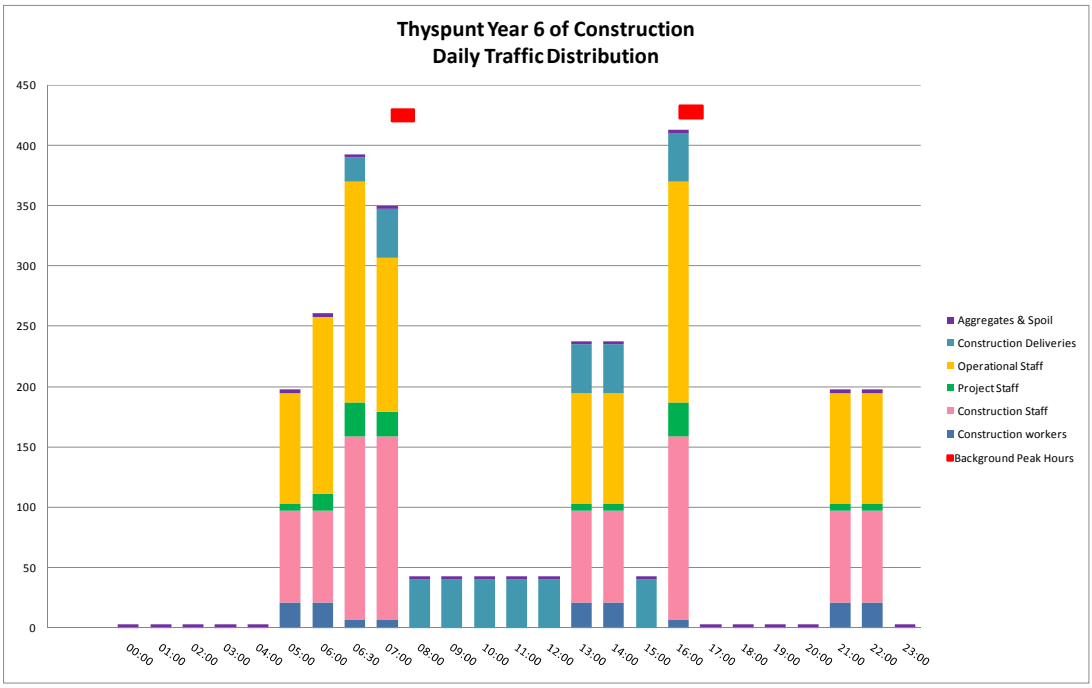
9.3.2 Trip Generation

Eskom has provided a detailed schedule of estimated construction phase trips for each year of the nine year construction phase period, as shown in **Annexure C9**.

The traffic during the construction phase is mainly generated by construction workers, Eskom staff and construction deliveries. Construction workers will be working in shifts and certain construction vehicles will be operating over the 24 period, while Eskom staff will be on site during normal office hours.

Graph 9.1 shows the traffic distribution of an average day during Year Six of the construction period. It shows that the peak hours of the construction occur at 06:30 – 07:30 and 16:00 – 17:00, which is similar to the AM and PM background traffic peak hours of 07:30 – 08:30 and 16:30 – 17:30.

The background traffic is relatively low in relation to the construction traffic volumes. The construction peak hours have therefore been used for analysis purposes.



Graph 9.1 – Daily Traffic Distribution in Year Six of Construction

The total trip generation by the proposed Nuclear-1 site during Year Six of the construction phase is shown in **Table 9.1**.

Table 9.1 – Thyspunt Construction Phase Generated Trips

Types of Traffic	AM (06:30 - 07:30)		PM (16:00 - 17:00)	
	In	Out	In	Out
Construction workers	7	0	0	7
Construction Staff	152	0	0	152
Project Staff	28	0	0	28
Operational Staff	183	0	0	183
Construction Deliveries	10	10	20	20
Aggregates & Spoil	1	1	1	1
Total	**381**	**11**	**21**	**391**

9.3.3 Trip Assignment and Distribution

The intersections along Oyster Bay Road were not investigated in the previous versions of this study, as the road was expected to experience minimal traffic from the construction of Nuclear-1 while the majority of the traffic was expected to utilise R330.

However, in the *Eskom Nuclear 1 Project at Thyspunt Site: Road Investigations for EIA Process Addendum* study undertaken by Aurecon in June 2011, the route option of the proposed Industrial Bypass and Southern Bypass was recommended, which will divert a substantial amount of construction traffic onto the Oyster Bay Road.

An additional traffic count was therefore undertaken on Tuesday, 16 August 2011 to determine the existing traffic conditions on the affected intersections along Oyster Bay Road and in Humansdorp. The results show that Oyster Bay Road currently experiences minimal traffic volumes and is only used by the farms located along the road.

The traffic that will be generated during the construction phase has, therefore, been re-distributed between the western (Oyster Bay Road) and eastern (R330) accesses. The re-distribution of traffic is based on the assumptions made in the *Nuclear-1 Traffic Estimates during Construction and Operation to the Thyspunt Site (June 2010)* undertaken by Eskom.

The distribution and resulting trip generation of construction traffic between the eastern and western accesses is shown in **Tables 9.2** and **9.3**.

Table 9.2: Traffic Distribution between Access Points

CONSTRUCTION PHASE			
WESTERN ACCESS (OYSTER BAY ROAD)		**EASTERN ACCESS (R330)**	
Types of Traffic	**% Split**	**Types of Traffic**	**% Split**
Construction Staff	**30%**	**Construction Staff**	**70%**
Operational Staff (Construction Phase)	**30%**	**Operational Staff (Construction Phase)**	**70%**
General Construction Workers	**55%**	**General Construction Workers**	**45%**
All construction deliveries and equipment	**100%**	**All construction deliveries and equipment**	**0%**
Abnormal Loads (>100 tonnes) approx 60 per unit over 5 years	**0%**	**Abnormal Loads (>100 tonnes) approx 60 per unit over 5 years**	**100%**

Table 9.3: Trip Generation between Access Points

Types of Traffic	Western Access				Eastern Access			
	AM (06:30 - 07:30)		PM (16:00 - 17:00)		AM (06:30 - 07:30)		PM (16:00 - 17:00)	
	In	Out	In	Out	In	Out	In	Out
Construction workers	4	0	0	4	3	0	0	3
Construction Staff	46	0	0	46	106	0	0	106
Project Staff	8	0	0	8	20	0	0	20
Operational Staff	55	0	0	55	128	0	0	128
Construction Deliveries	10	10	20	20	0	0	0	0
Aggregates & Spoil	1	1	1	1	0	0	0	0
Total	**124**	**11**	**21**	**134**	**257**	**0**	**0**	**257**

It should be noted that the proposed construction route of Industrial Bypass and Southern Bypass consists of several reconstructed and realigned intersections.

The Industrial Bypass is expected to join Searle Street and Voortrekker Road (R102) to form a four-way intersection, as shown in **Figure 9.11**. The traffic currently experienced at the Johnson Street / Voortrekker Road (R102) intersection will be redistributed to the proposed intersection in the future scenario, as it will then become the main access into the area west of Voortrekker Road (R102).

Figure 9.11: Realignment of the Industrial Bypass / Searle Street / Voortrekker Road intersection

With regard to the Southern Bypass, Oyster Bay Road will be realigned to join Park Road at the Westgate Road intersection, as shown in **Figure 9.12**. The realignment is suggested to improve the acute turning angle at the existing Oyster Bay Road / Park Street intersection for the construction vehicles. The existing traffic currently experienced at the Oyster Bay Road / Park Street intersection has been redistributed accordingly in the future scenario.

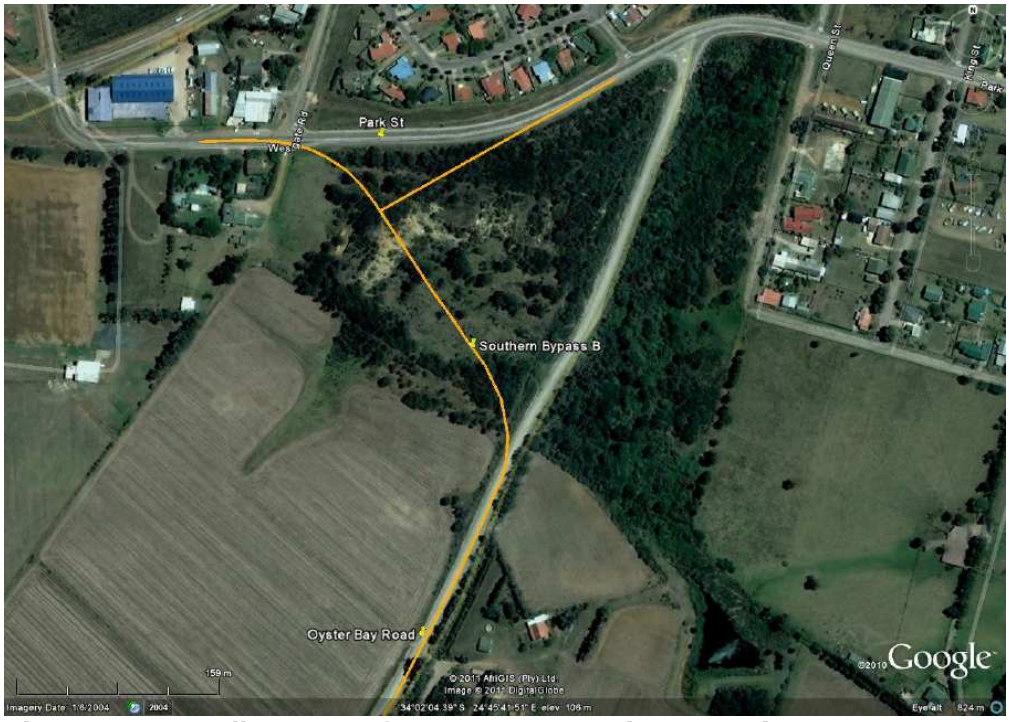


Figure 9.12: Realignment of Oyster Bay Road onto Park Street

The directional distribution of the generated trips for both the AM and PM peak hours is based on the assumption that both the construction and Eskom staff will reside in neighbouring towns during the construction period and that the construction deliveries will be transported via the N2. The percentage distribution, for the AM and PM peak hours is shown in **Annexure C10 and C11**.

The distributions of generated traffic by the proposed development for both the AM and PM peak periods are shown in **Annexure C12 and C13,** respectively.

The 2019 construction phase total traffic (2019 background traffic plus construction generated traffic) for the AM and PM peak periods is shown in **Annexures C14 and C15,** respectively.

The increased holiday background traffic scenario (see **Volume 1, Chapter 6**) has not been used in this analysis as construction is not expected to occur during the peak holiday season.

9.3.4 Capacity Analysis

Intersection analysis was performed using the SIDRA 5.1 Computer Programme for the following main intersections:

- R330 / N2 Northern off-ramp;
- R330 / N2 Southern off-ramp;
- R330 / Proposed Industrial Bypass;
- Main Street (R330) / Voortrekker Road (R102);
- Main Street (R330) / Park Road;
- R330 / DR 1762;
- R330 / St. Francis Bay Access Road;
- R330 / Eastern Access;
- Proposed Industrial Bypass / Searle Street / Voortrekker Road (R102);
- Voortrekker (R102) / Westgate / Koerat Street
- Oyster Bay Road (Proposed Southern Bypass) / Park Street; and
- Oyster Bay Road (DR1763)/ Western Access

The **2019 Construction Total Traffic scenario** was analysed during the AM and PM peak hours.

The LOS and 95th percentile vehicle queues for this scenario are summarised in **Annexure C16 and C17**.

The construction vehicles trips are expected to have a high impact on traffic congestion and delay of the existing road network. The impact will, however, improve to low once the mitigation measures implemented. The analysis results are summarised hereafter.

(a) R330 / N2 North Off-ramp

The existing geometry and aerial view of R330 / N2 North Off-Ramp is shown in **Figure 9.13**.

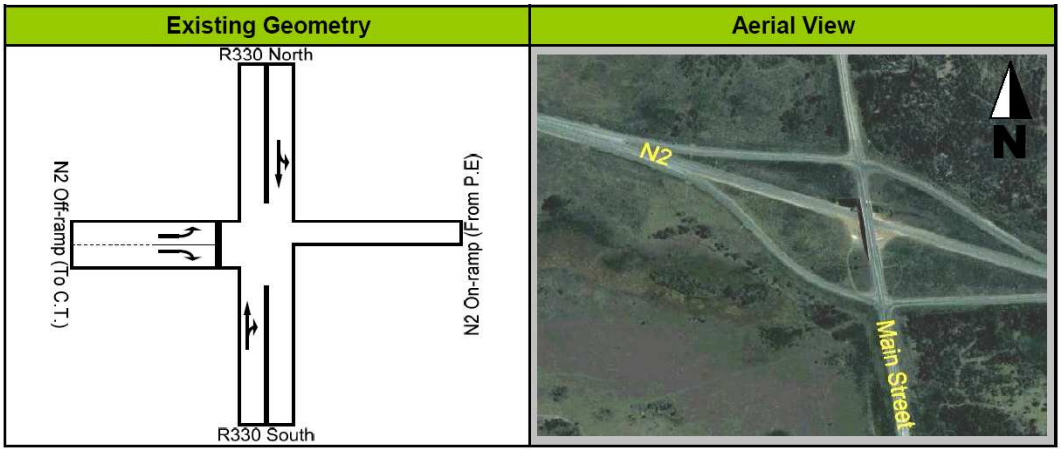


Figure 9.13: R330 / N2 North Off-Ramp Existing Intersection Geometry

(i) 2019 Construction Traffic

The intersection will operate well at LOS A – LOS B with minimal traffic queues during both the AM and PM peak hours. No upgrades are therefore required.

(b) R330 / N2 South Off-Ramp

The existing geometry and aerial view of R330 / N2 South Off-Ramp is shown in **Figure 9.144**.

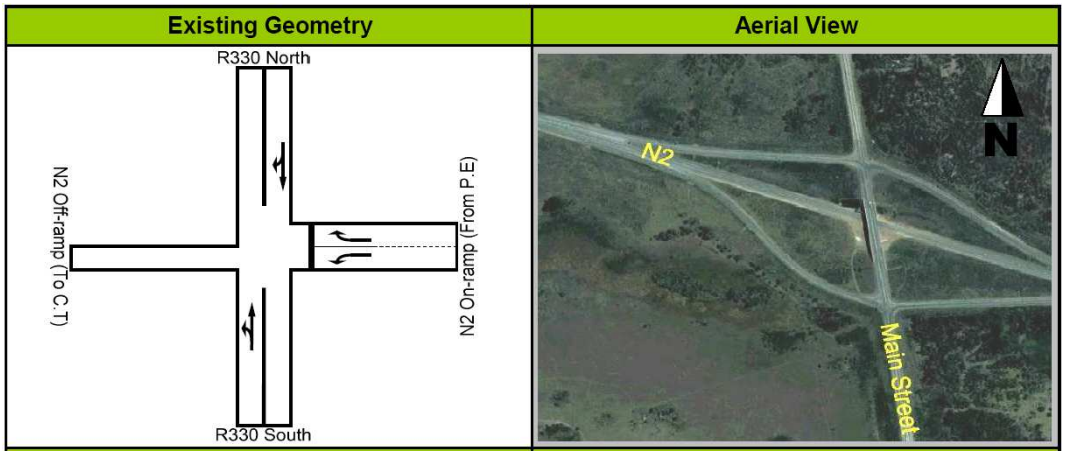


Figure 9.14: R330 / N2 South Off-Ramp Existing Intersection Geometry

(i) 2019 Construction Traffic

The intersection will operate well at LOS A – LOS B with minimal traffic queues during both the AM and PM peak hours. No upgrades are therefore required.

(c) R330 / Proposed Industrial Bypass

The proposed geometry of R 330 / Proposed Industrial Bypass is shown in **Figure 9.15**.

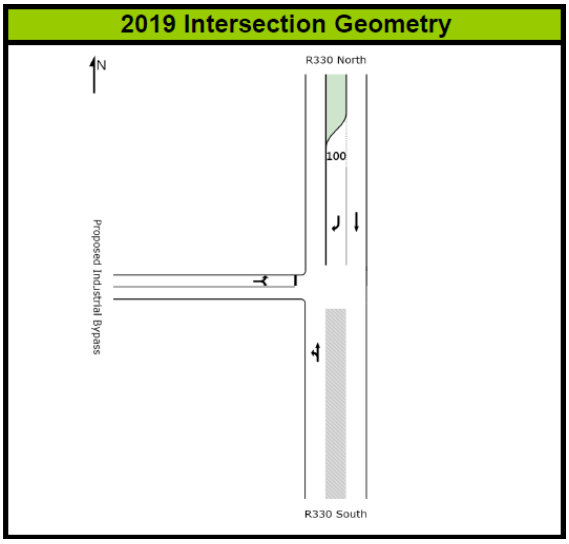


Figure 9.15: R330 / Industrial Bypass Proposed Intersection Geometry

(i) 2019 Construction Traffic

The intersection will operate well at LOS A – LOS B with minimal traffic queues during both the AM and PM peak hours.

(d) Main Street (R330) / Voortrekker Road (R102)

The existing geometry and aerial view of Main Street (R330) / Voortrekker Road (R102) is shown in **Figure 9.16**.

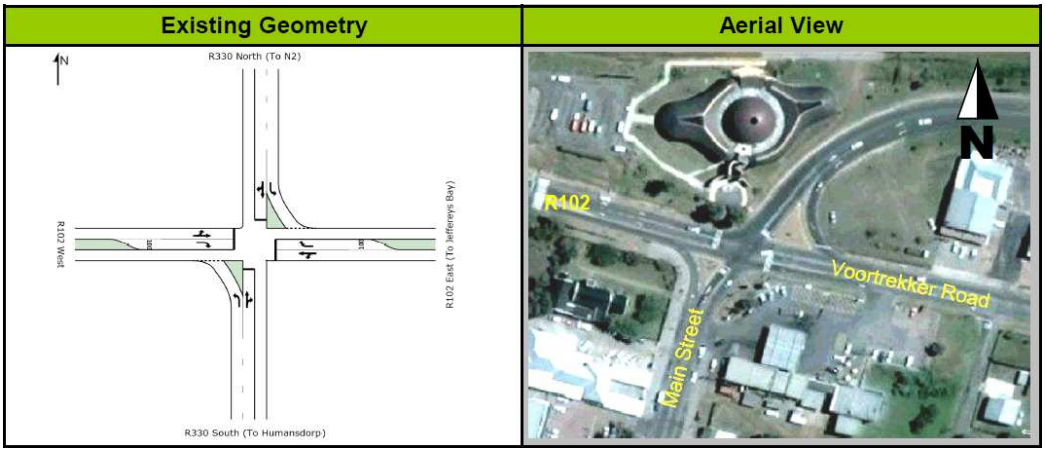


Figure 9.16: Main Street (R330) / Voortrekker Road (R102) Existing Intersection Geometry

(i) 2019 Construction Traffic

The intersection will operate poorly at LOS C – F during both the AM and PM peak hours with the maximum 95th percentile queues of 46 and 53 vehicles during the AM and PM peak hours respectively along the Main Street approaches.

(ii) Upgrades Required

As discussed in **Volume 1, Chapter 6**, the intersection will require upgrading to a signalised intersection or a roundabout for the 2023 scenario due to background traffic growth. The upgraded intersection will operate adequately at LOS A – LOS C during both the AM and PM peak hours with the 95th percentile queues of 5 and 6 vehicles along the Main Street approaches. No further upgrades to this intersection will therefore be required due to the addition of limited construction traffic.

(e) Main Street (R330) / Park Street

The existing geometry and aerial view of Main Street (R330) / Park Street is shown in **Figure 9.17**.

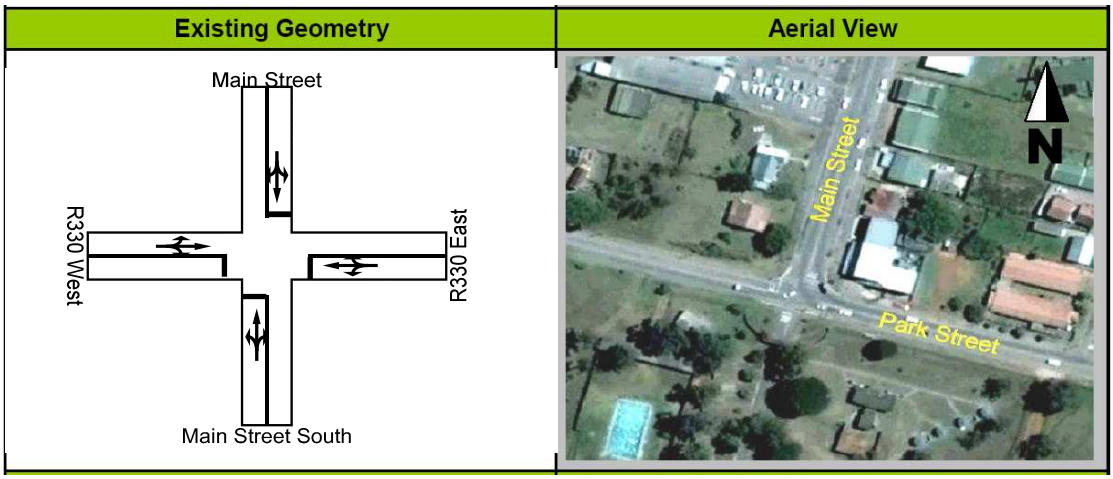


Figure 9.17: Main Street (R330) / Park Street Existing Intersection Geometry

(i) 2019 Construction Traffic

The intersection will operate well at LOS A with minimal traffic queues during both the AM and PM peak hours. No upgrades are therefore required.

(f) R330 / DR 1762

The existing geometry and aerial view of R330 / DR 1762 is shown in **Figure 9.18**.

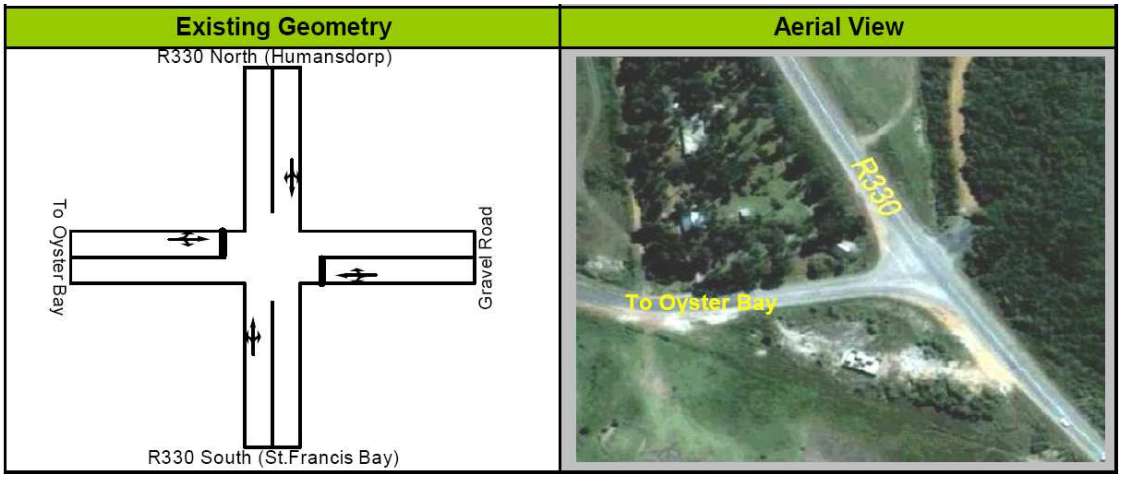


Figure 9.18: R330 / DR 1762 Road Existing Intersection Geometry

(i) 2019 Construction Traffic

The intersection will operate adequately at LOS A – LOS C with minimal traffic queues during both the AM and PM peak hours. No intersection upgrades are therefore required.

(g) R330 / St. Francis Bay Access Road

The existing geometry and on-site photo of R330 / St. Francis Bay Access Road is shown in **Figure 9.19**.

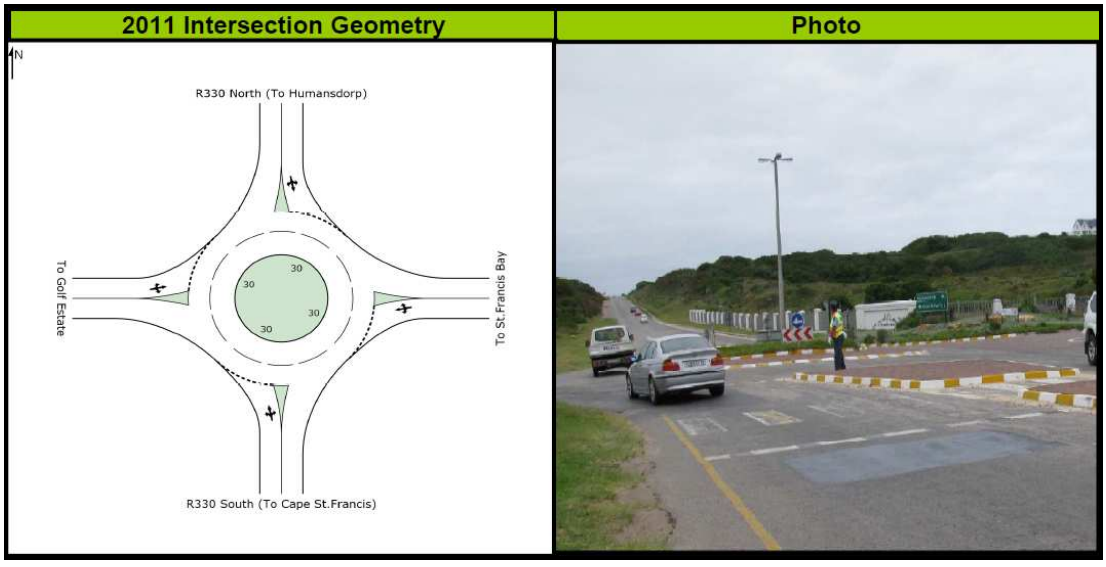


Figure 9.19: R330 / St Francis Bay Access Road Existing Intersection Geometry

(i) 2019 Construction Traffic

The intersection will operate adequately at LOS A – LOS C with minimal traffic queues during both the AM and PM peak hours. No upgrades are therefore required.

(h) R330 / Eastern Access

The proposed eastern access geometry of R330 / Eastern Access Road is shown in **Figure 9.20**.

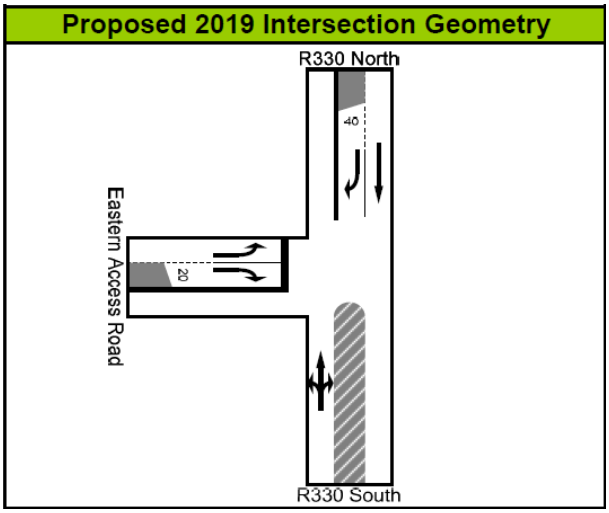


Figure 9.20: R330 / Eastern Access Road Proposed Intersection Geometry

(i) 2019 Construction Traffic

The R330 approaches will operate well at LOS A with minimal traffic queues during both the AM and PM peak hours. The Eastern Access approach will operate adequately at LOS C and LOS B during the AM and PM peak hours respectively with minimal traffic queues during both peak hours.

(i) Industrial Bypass / Searle Street / Voortrekker Road (R102)

The geometry of the proposed Industrial Bypass / Searle Street / Voortrekker Road (R102) intersection is shown in **Figure 9.21**.

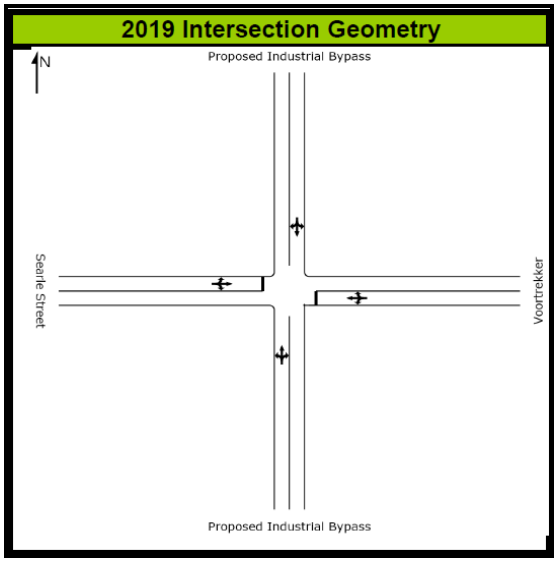


Figure 9.21: Proposed geometry of Industrial Bypass / Searle Street / Voortrekker Road intersection

(i) 2019 Construction Traffic

The intersection will operate well at LOS A – LOS B with minimal traffic queues during both the AM and PM peak hours.

(j) Voortrekker (R102) / Westgate Road / Koerat Street

The geometry of the proposed Voortrekker (R102) / Westgate Road / Koerat Street intersection is shown in **Figure 9.22**.

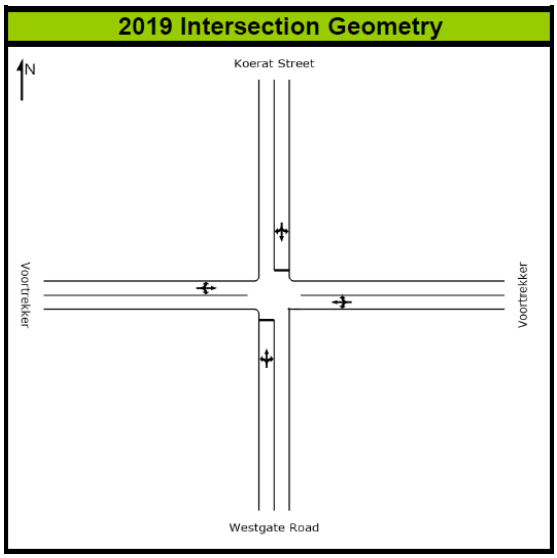


Figure 9.22: Proposed geometry of the Voortrekker (R102) / Westgate Road / Koerat Street intersection

(i) 2019 Construction Traffic

The intersection will operate well at LOS A – LOS B with minimal traffic queues during both the AM and PM peak hours.

(k) Oyster Bay Road (Proposed Southern Bypass) / Park Street

The geometry of the proposed Oyster Bay Road (Proposed Southern Bypass) / Park Street is shown in **Figure 9.23**.

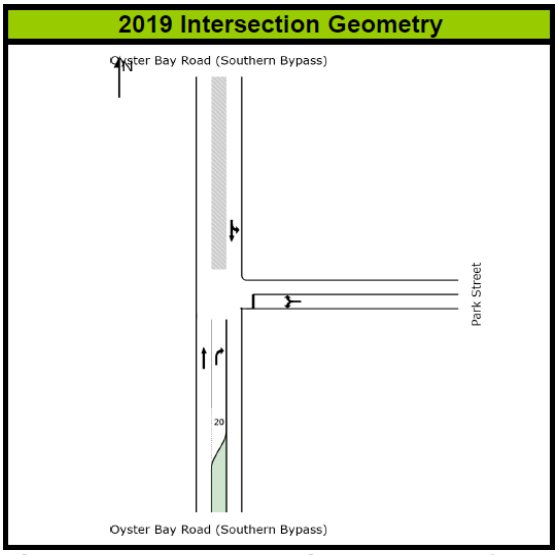


Figure 9.23: Proposed geometry of Oyster Bay Road (Southern Bypass) / Park Street

(i) 2019 Construction Traffic

The intersection will operate well at LOS A – LOS B with minimal traffic queues during both the AM and PM peak hours.

(l) Oyster Bay Road / Western Approach

The geometry of the proposed Oyster Bay Road / Western Access intersection is shown in **Figure 9.24**.

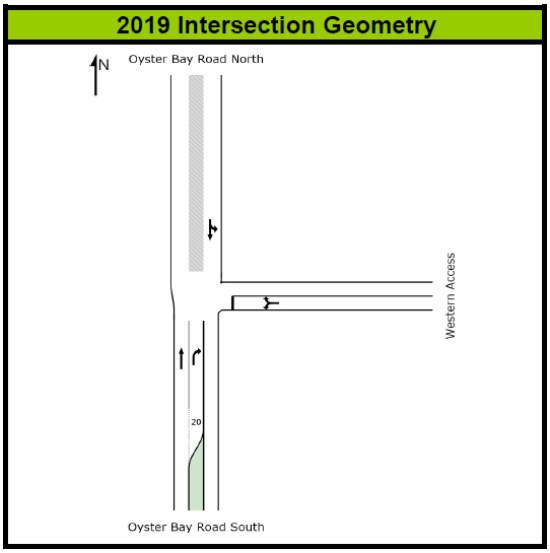


Figure 9.24: Proposed geometry of the Oyster Bay Road / Western Access

(i) 2019 Construction Traffic

The intersection will operate well at LOS A – LOS B with minimal traffic queues during both the AM and PM peak hours.

9.4 Abnormal Loads

9.4.1 Description

The *Eskom Nuclear 1 Project: Thyspunt Site Abnormal Load Haul Route Investigation* was carried out by Aurecon in March 2011 in order to investigate the feasibility of transporting abnormal loads to the Thyspunt site.

In terms of available ports, both Port Elizabeth and the Port of Nqura (Coega) were assessed in the study and both ports are considered suitable for the off-loading of abnormal loads. Port Elizabeth is, however, chosen as the preferred option as the Port Elizabeth exit route to N2 is shorter and will require less re-construction.

The maximum values of the abnormal loads required for the nuclear plant are; weight – 630 tonnes; height – 8m; width – 11m; length – 46m. It must be borne in mind to add vehicle mass, vehicle length and total height of the loaded component to obtain maximum shipping values. The abnormal loads will be transported by multi-wheeled trailer, either self-propelled or pulled by power units. **Figure 9.25** shows a Two Trailer Wide Self Propelled Modular Transporter (SPMT) that may be used for the transportation.

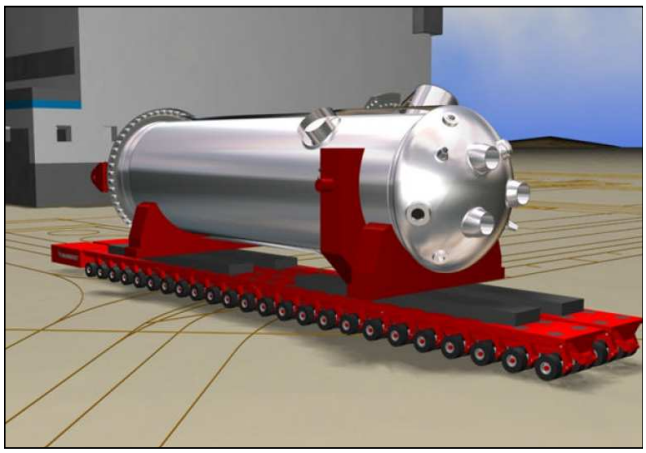


Figure 9.25: Two Trailer Wide Self Propelled Modular Transporter (SPMT)

Despite the excessive weight of the loads, the study states that the abnormal loads should not exceed the structural capacity of the public roads as a prevailing framework of axle loads is accounted for in the design of the roads.

For abnormal loads to be transported on public roads, an abnormal loads permit is required. A period permit can be applied for the transportation of abnormal loads over a relatively short period using the same type of vehicles and along the same route.

9.4.2 Preferred Route

Several route options were investigated in the *Eskom Nuclear 1 Project: Thyspunt Site Abnormal Load Haul Route Investigation* and the recommended route for the transportation of abnormal loads from Port Elizabeth to Thyspunt are shown in **Figure 9.26**. The main section of the abnormal vehicle route will be from Port Elizabeth Harbour, via the N2, interchange east of Jeffrey's Bay, along the R102 to proposed Eastern Bypass Alternative A onto Park Street, and continue down the R330 (MR381), passes St. Francis Bay and access at the Eastern Access of the Thyspunt site. The recommended route is considered the most economical and will require the least amount of road improvement.

A number of obstacles and difficulties will, however, still be present along the route and their mitigation measures are as follow:

- **Overhead bridges** – Transport vehicles can make use of the on / off ramps at interchanges to avoid overhead bridges. Temporary ramps or detour routes will need to be constructed should there be no existing on / off ramps.

- **Under bridges** – Propping will be required at most under bridges to ensure stability during the transportation. **Strengthening and bracing will be required at the Van Staden's gorge arch bridge.**

- **Turning intersections / roundabouts** – Temporary upgrades will be required at the roundabouts and intersections where turning of the abnormal vehicles is involved. Examples of upgrades are upgrading of bell-mouths, removal of street furniture and road widening.

- **Overhead cables** – Overhead cables will be lifted or temporarily removed along the route should it interfere with the abnormal loads.

Furthermore, it is recommended that the section of the R330 south of Kromme River to Thyspunt be upgraded to a Class 2 road with passing lanes and surfaced shoulders. The section of road will also be used by general light traffic going to the Nuclear-1 site, therefore the upgrade will benefit both operations. It is also recommended that a large berm be constructed between the section of R330 and St. Francis Bay to act as a sound and vehicle headlight barrier to the area.

As discussed in **Chapter 9.2.3**, a pedestrian crossing is currently located along the section of R330 south of St. Francis Bay, which indicates pedestrian activity is present at the location. It would, however, not be affected by the abnormal loads as the transportation will only take place during the night and on weekends.

Details of the assessment and recommendations can be obtained from the *Eskom Nuclear 1 Project: Thyspunt Site Abnormal Load Haul Route Investigation* Report undertaken by Christopher Roberts in March 2011.

PROJECT: Nuclear 1 : Environmental Impact Assessment	Approved By: A.Bulman			Scale: NTS	Date: January 2012
DETAIL: Thyspunt Abnormal Load Route	Drawn By: R.Adams	Checked By: S.Chow	Reviewed By: A.Bulman	Project No. / Drg No. / Rev: J27035 / Figure 9.26 /	

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Refer to the contract for full terms and conditions.

9.4.3 Abnormal Load Route Traffic

The AM, midday and PM peak hour 2007 background traffic link volumes along the R330 from the R102 to the Nuclear-1 site are shown in **Annexures C18 – C20**. The hourly traffic volumes along the R330 (MR381) shown in shaded blocks occur during the peak hour and the hourly volumes along the N2 and R330 (MR381) shown in white block occur during the non-peak hour.

9.4.4 Trip Frequency and Time

It is estimated that approximately 60 loads per reactor unit in excess of 100 tons will be transported in the non-peak periods over a five year period. The impact of the abnormal load transport is expected to have a medium / high impact on traffic congestion during the transport.

It is, therefore, recommended that the abnormal load trips be undertaken during the evening (21:00 - 05:00) and in daylight hours over weekends during non-peak periods to reduce the impact.

9.5 Normal Heavy Load Transport

As discussed earlier, all heavy load construction traffic will be directed around Humansdorp via the industrial and southern bypass, onto the upgraded Oyster Bay Road to the site via the western access. This will then have a low impact on the surrounding residential and commercial areas.

9.6 Parking

The Nuclear-1 site will experience a daily maximum of 977 vehicular trips (excluding construction vehicles) during the construction period.

General construction workers are expected to arrive on buses or minibus taxis provided by the Eskom or the construction company. An average of 89 buses or minibus taxis will be used for the transportation of construction workers on an average day of the construction period. However, no parking bays will be required for the buses and minibus taxis, as they will not remain on site during the shifts.

It is estimated that a maximum of 900 private vehicles will require parking on the site during the construction period. A total of 900 temporary parking bays should therefore be provided on the Nuclear-1 site at Thyspunt during the construction phase to avoid the impact of lack of parking in the surrounding area.

9.7 Public Transport

It is recommended that the construction workers should be transported by contracted buses and minibus taxis to and from the site.

Public transport facilities will have to be constructed on site for the loading and off-loading of workers.

9.8 Non-Motorised Transport

The generated traffic is expected to have a medium high impact on the existing pedestrian activities of the surrounding areas. Internal pedestrian trips are also expected to increase during the construction phase. Low speeds should therefore be maintained to ensure pedestrian safety.

9.9 Conclusions

The following can therefore be concluded. The significance of the impacts is summarised in **Table 9.4**:

- Two access points, namely the Western and Eastern Access, should be provided at the Thyspunt site for the construction phase. The Western Access will be used for construction vehicles and light vehicles. The Eastern Access will be used for light vehicles and the occasional abnormal loads;

- All construction vehicles transporting materials and equipment should use the Oyster Bay Road (DR1763).) The Oyster Bay Road (DR1763) should be upgraded to ensure structural integrity for the vehicle loading through the nine year construction period. The upgrade should include surfacing, vertical and horizontal alignment improvements and pedestrian facilities where appropriate;

- Abnormal loads will be transported along the R330 (MR381) to the Eastern Access only. Transportation of the abnormal loads is recommended to take place during the evening (21:00 – 05:00) during weekdays and in daytimes during weekends.

- The construction traffic management plan will be required to ensure the volume of light construction, staff and worker traffic using the R330 and eastern access is kept to a minimum and heavy construction traffic does not us this route.

- An Industrial and Southern Bypass linking the Oyster Bay Road to the N2, bypassing Humansdorp Main Street, should be constructed for the construction phase;

- Alternative A of the Eastern Bypass linking Voortrekker Road (R102) and Park Street (R330), as shown in **Figure 9.5**, should be constructed for the construction phase;

- A Stormwater Assessment Plan should be undertaken to assess the flooding situation at the Sand River along R330.

- The gravel road, DR1762, currently serving as a link between the Oyster Bay Road and the R330 should be upgraded to a surfaced road to serve as a secondary link to the Thyspunt site and for the local residents;

- Port Elizabeth should be used as the port for the off-loading of abnormal loads. The abnormal load route has been recommended in a study carried out by Aurecon in March 2011;

- Temporary road improvements will be required to alleviate the obstacles along the abnormal load route including the upgrading of the R330 to a Class 2 road between the Thyspunt access and the Kromme River bridge;
- A total of 900 parking bays will be required during the construction period; and

- The construction workers should be transported to and from site by contracted minibuses and buses as no public transport service is currently available in the area.

Table 9.4: Significance of Impacts for Construction Phase of Thyspunt

Impact		Intensity	Value	Extent	Value	Duration	Value	Irreplacable resources	Irrep. value	Cons. Value	Prob.	Prob. value	Sign. value	SIGNIFICANCE
1. Traffic congestion and delay at intersections on the external road network.	Unmitigated	High	3	Medium	2	Medium	2	Low	1	3	High	3	5	High
	Mitigated	Low	1	Medium	2	Medium	2	Low	1	1	Low	1	1	Low
2. Increased noise impact on local communities due to increased traffic.	Unmitigated	High	3	Medium	2	Medium	2	Medium	2	3	Medium	2	4	Medium High
	Mitigated	Low	1	Medium	2	Medium	2	Medium	2	1	Low	1	1	Low
3. Decreased pedestrian safety in local communities due to increased traffic.	Unmitigated	High	3	Medium	2	Medium	2	High	3	3	Medium	2	4	Medium High
	Mitigated	Low	1	Medium	2	Medium	2	High	3	2	Medium	2	3	Medium
4. Structural damage to road infrastructure along heavy load route.	Unmitigated	Medium	2	Medium	2	Medium	2	Medium	2	2	Medium	2	3	Medium
	Mitigated	Low	1	Medium	2	Medium	2	Medium	2	1	Low	1	1	Low
5. Traffic congestion due to transportation of abnormal loads.	Unmitigated	Medium	2	High	3	Medium	2	Low	1	3	Medium	2	4	Medium High
	Mitigated	Low	1	High	3	Medium	2	Low	1	2	Low	1	2	Low Medium
6. Lack of parking	Unmitigated	Medium	2	Medium	2	Medium	2	Low	1	2	High	3	3	Medium
	Mitigated	Low	1	Low	1	Medium	2	Low	1	1	Low	1	1	Low

9.10 Mitigation actions required

The following mitigation actions are therefore proposed for the daily construction phase transport of Nuclear-1:

Access to the Site

- Two access points, namely the Western and Eastern Access, should be provided for the construction period of the Thyspunt site.

External Road Upgrades

- The proposed Industrial and Southern Bypasses should be constructed to avoid construction traffic travelling between the N2 and the Oyster Bay Road using the Humansdorp Main Street;
- The Eastern Bypass should be constructed to avoid general traffic and abnormal loads travelling between Voortrekker Road (R102) and the R330 from using the Humansdorp Main Street;
- Oyster Bay Road should be upgraded to a surfaced road for the construction period;
- DR1762 should be upgraded to a surfaced road to serve as link for the local residents and Thyspunt workers;
- The section of the R330 between Kromme River to the Thyspunt site should be upgraded to a Class 2 road with passing lanes and surfaced shoulder;
- Additional warning signage should be provided for the existing pedestrian crossing on R330 for the construction period;

Abnormal Load Route

- The temporary road improvements for the abnormal load route should be constructed as recommended in the *Eskom Nuclear 1 Project: Thyspunt Site Abnormal Load Haul Road Investigation* report;
- Abnormal loads should be transported between 21:00 – 05:00 during the week and in daytime during the weekends;
- Additional warning signs should be provided at the pedestrian crossing along the R330 to ensure safety of pedestrians;

Internal Requirements

- A total of 900 parking bays should be provided on site for the construction period;
- Minibus taxi and buses should be provided to shuttle construction workers to the site. Public transport facilities will have to be constructed on-site to facilitate the loading and off-loading of workers;

Further Studies Required

- The social and environmental impact of the additional traffic on the Oyster Bay Road and R330 will require further investigation;
- The cost of the external road upgrades should be included in the financial feasibility model of this site.
- A comprehensive Construction Traffic Management Plan should be completed and approved by the relevant authorities before construction commences.

10 DUYNEFONTEIN OPERATIONAL PHASE IMPACT ASSESSMENT

10.1 Access

Access 2 of the existing Koeberg Nuclear Power Station will be used as the main access for the Nuclear-1 site during the operation phase. It is assumed in this analysis that all revised routes and upgrades constructed for the construction phase will be permanent and available for continuous use in the operations phase.

10.2 Operations Phase Traffic

The peak hours for the operations phase of Nuclear-1 will approximately coincide with the peak hours of the background traffic as follows:

- AM peak hour – 07:00 to 08:00;
- PM peak hour – 16:30 to 17:30.

10.2.1 Trip Generation

It is estimated that approximately 1 300 staff members are required to operate the Nuclear-1 site during the operational phase. Visitor traffic to Nuclear-1 is expected to occur outside of the AM and PM peak hours and is therefore not included in the assessment.

The facility will operate for 24 hours per day and staff will work in three daily shifts as follows:

- Shift 1: 23:00 to 07:00;
- Shift 2: 07:00 to 15:00;
- Shift 3: 15:00 to 23:00.

Figure 10.1 shows the shift timetable for Nuclear-1. It was assumed that 15% of workers would operate Nuclear-1 in Shift 1, 60% of workers in Shift 2 and 25% of workers in Shift 3.

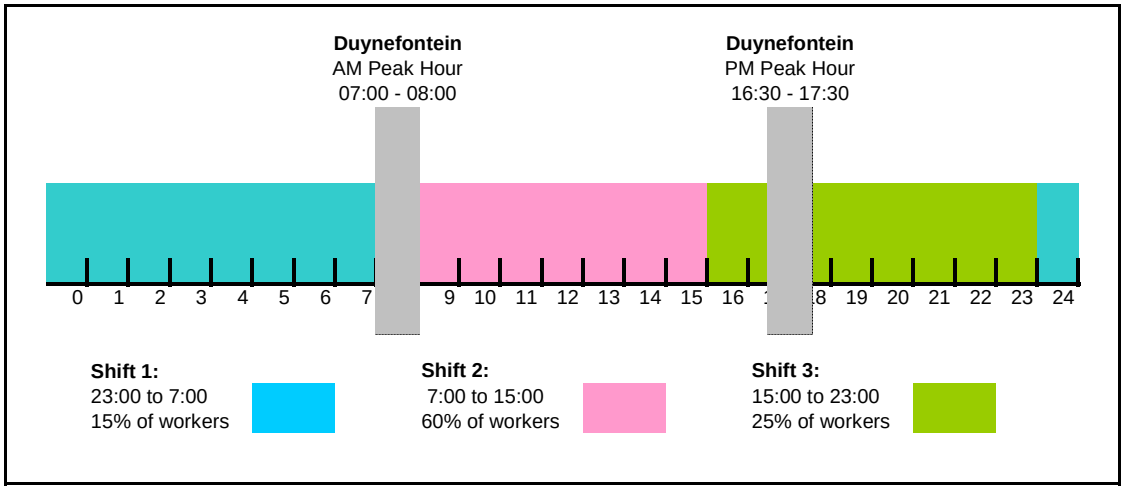

Figure 10.1: Shift Timetable

The shift timetable was interpreted and the results show that:

- **AM Peak hour:** Staff from Shift 1 (195 persons) are expected to depart between 07:00 and 09:00 while staff from Shift 2 (780 persons) are expected to arrive between 06:30 and 07:30, resulting in 30% of Shift 1 staff (59 persons) departing and 30% of Shift 2 staff arriving during the AM peak hour.
- **PM Peak hour:** Staff from Shift 2 (780 persons) are expected to depart between 15:00 and 17:00 while staff from Shift 3 (325 persons) are expected to arrive between 14:30 and 15:30 resulting in 50% of Shift 2 staff (390 persons) departing and none of Shift 3 staff arriving during the PM peak hour. However, 30% of Shift 3 staff (98 persons) is assumed to arrive during the PM peak hour for the worst case scenario.
- It should be noted that altering of the operational shift periods of Nuclear-1 could result in additional peak hour trips being generated. The impact on the road network should therefore be re-assessed.

- The trip generation of the operational phase of the proposed Nuclear-1 is shown in **Table 10.1** and the detailed trip generation table is provided in **Annexure A22.** The modal split of 70% private transport and 30% public transport has been applied.

Table 10.1 – Trip Generation of Operational Phase

Land Use Type	Total Staff (No)	Directional Percentage of Shift Staff Travelling in Peak hour				Total Peak Person Trips Generated						Total Vehicle Trips Generated					
		AM Peak		PM Peak		AM Peak			PM Peak			AM Peak			PM Peak		
		In (Shift 2)	Out (Shift 1)	In (Shift 3)	Out (Shift 2)	In	Out	Total	In	Out	Total	In	Out	Total	In	Out	Total
Duynefontein: Nuclear Operational Phase	1300	30%	30%	30%	50%	234	59	293	98	390	488	68	17	85	28	113	141
TOTAL	**1300**					**234**	**59**	**293**	**98**	**390**	**488**	**68**	**17**	**85**	**28**	**113**	**141**

The operations phase will generate a total of 85 and 141 vehicular trips during the AM and PM peak hours respectively, which is significantly less than the construction phase trip generation of 391 and 412 trips during the AM and PM peak hours, hence the impact of the operations phase is considered low/ medium and will be significantly less than that of the construction phase. The traffic conditions during the construction phase is therefore considered to be the worst case scenario and the upgrades recommended for the construction phase will be more than sufficient to meet the expected demand during the operations phase. No further analysis of intersections has therefore been undertaken in this chapter.

10.3 Parking

Koeberg Nuclear Power Station currently provides a total of 950 parking bays for approximately 1300 staff members. It is estimated that Nuclear-1 will require the same number of staff, therefore a total of 950 parking bays should also be provided during the operations phase of Nuclear-1. The number of parking bays provided is also based on a private vehicle : public transport ratio of 70:30. The number of parking bays provided on-site during the construction phase will therefore be adequate for the operations phase and the impact of parking overflow is considered to be medium.

10.4 Public Transport

The number of public transport trips that will be generated by the proposed Nuclear-1 site at Duynefontein can be accommodated by the current public transport system, as well as the proposed IRT system that will start operations in 2013.

10.5 Non-Motorised Transport

The impact of the generated traffic during the operations phase is expected to have a low / medium impact on the pedestrian activities of the surrounding road network.

Traffic calming measures and a speed limit of 40 km/h should be implemented on the new internal roads and Access Road 2 to ensure pedestrian and cyclist safety.

10.6 Low to Medium Radioactive Waste Transport

Low to medium-level radioactive waste produced by Nuclear-1 will be stored at Vaalputs, which is located in the Northern Cape Province. In terms of the *National Radioactive Waste Management Policy and Strategy for South Africa*, Vaalputs is the designated national repository for low and intermediate level radioactive waste. Currently Vaalputs has only reached 5% of its capacity and should therefore have sufficient capacity for the disposal of radioactive waste of Nuclear-1.

The transportation of radioactive waste will be undertaken under the regulatory control of the National Nuclear Regulator and in accordance with international standards. Two to four shipments of low to medium-level radioactive waste will be made each week. It is proposed that the waste is transported using the current route via the N7 to Vaalputs as shown in **Figure 10.2**.

The low to medium-level radioactive waste of Koeberg Nuclear Power Station is currently stored at Vaalputs. Approximately 48 low to medium radioactive waste consignments are transported from Koeberg Nuclear Power Station to Vaalputs annually as part of the normal operations.

If Nuclear-1's waste transport consignments coincide with Koeberg's consignments, the additional impacts on the relevant transportation network should be minimal.


Vaalputs
Duynefontein
ATLANTIC OCEAN
Northern Cape
Western Cape
Eastern Cape
Springbok
Namaqua National Park
Goegab Nature Reserve
Kamieskroon
Garies
Hondeklipbaai
Skulpfonteinpunt
Strandfonteinpunt
Island Point
Melkbospunt
Nieuwoudtville
Calvinia
Vanrhynsdorp
Vredendal
Klawer
Lambert's Bay
Baboon Point
Rooiduinepunt
Uitspankraal
Clanwilliam
Wuppertal
Citrusdal
Velddrif
Paternoster
Vredenburg
Saldanha
Hopefield
Piketberg
Porterville
Moorreesburg
Langebaan
West Coast National Park
Dassen Island
Ceres
Wellington
Worcester
Montagu
Robertson
Milnerton
CAPE TOWN
Bellville
Stellenbosch
Somerset West
Hout Bay
Simons Town
Cape Peninsula National Park
Cape of Good Hope
Strand
Caledon
Hermanus
Gansbaai
Napier
Bredasdorp
Quoin Point
Struis Bay
Cape Agulhas
De Hoop N. R.
Cape Infante
Cape Barracouta
Riversdale
Heidelberg
Albertinia
Mossel Bay
Cape Vacca (Kanonpunt)
George
Wilderness National Park
Knysna
Knysna National Lake Area
Plettenberg Bay
Tsitsikamma Nat. Park
Humansdorp
Cape St. Francis
Cape Recife
PORT ELIZABETH
Despatch
Algoa Bay
Uitenhage
Port Alfred
Alexandria
GRAHAMSTOWN
Alicedale
Kirkwood
Addo Elephant National Park
Willowmore
Steytlerville
Baviaanskloof Wilderness Area
Joubertina
Kareedouw
Jansenville
Cookhouse
Somerset East
Fort Beaufort
King William's Town
Cradock
Mountain Zebra Nat. Park
Petersburg
Pearston
Adelaide
Tarkastad
Sada
Graaff-Reinet
Aberdeen
Adendorp
Murraysburg
Beaufort West
Karoo National Park
Tankwa-Karoo National Park
Sutherland
Prince Albert
Swartberg N.R.
Laingsburg
Touws River
Ladismith
De Rust
Oudtshoorn
Dysselsdorp
Jniondale
Rietbron
Klipplaat
Middelburg
Rosmead
Hofmeyr
Molteno
Sterkstroom
Queenstown
Nieu Bethesda
Richmond
Hutchinson
Loxton
Victoria West
Williston
Carnarvon
Van Wyksvlei
Brandvlei
Copperton
Britstown
Vosburg
De Aar
Hanover
Noupoort
Steynsburg
Burgersdorp
Oviston
Oviston Nature Reserve
Ventersted
Aliwal North
Colesberg
Petrusville
Phillipstown
Gariep Dam N.R.
Bethulie Game Farm
Tussen-die-Riviere
Springfontein
Phillipolis
Trompsburg
Vanderkloof
Vanderkloof Dam
Fauresmith
Luckhoff
Strydenburg
Edenburg
Reddersburg
Vanstadensrus
Nature Reserve
Legend
Waste Storage Site
Radioactive Waste Route
PROJECT
Nuclear 1 : Environmental Impact Assessment
Duynefontein Transport Impact Assessment
DETAIL
Proposed Route for Low to Medium Radioactive Waste
ARCUS GIBB
ENGINEERING & SCIENCE
Drawn By
R.Adams
Designed By
S.Chow
Reviewed By
A.Bulman
Scale
NTS
Date
January 2012
Project No.
J27035
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Rev.
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10.7 Emergency Evacuation

A 0 km to 0.8 km Exclusion Zone and a 0.8 km to 3 km Long Term Protective Action Planning Zone are required by the EUR to be implemented around nuclear facility for safety purposes. No new developments are allowed to be located within the Exclusion Zone and existing and planned developments situated within UPZ are required to be included in the facility's emergency evacuation plan.

Koeberg Nuclear Power Station, however is required to have a 0 km to 5 km Exclusion Zone and a 5 km to 16 km Long Term Protective Action Planning Zone by the National Nuclear Regulator (NNR) to be implemented around a nuclear facility for safety purposes as shown in **Figure 10.3**. No new developments will be allowed to be built within the Exclusion Zone and existing and planned developments situated within Long Term Protective Action Planning Zone are required to be included in the facility's emergency evacuation plan. The evacuation plan has to demonstrate the ability to evacuate of the public within the Exclusion Zone within 4 hours and Long Term Protective Action Planning Zone within 1 week.

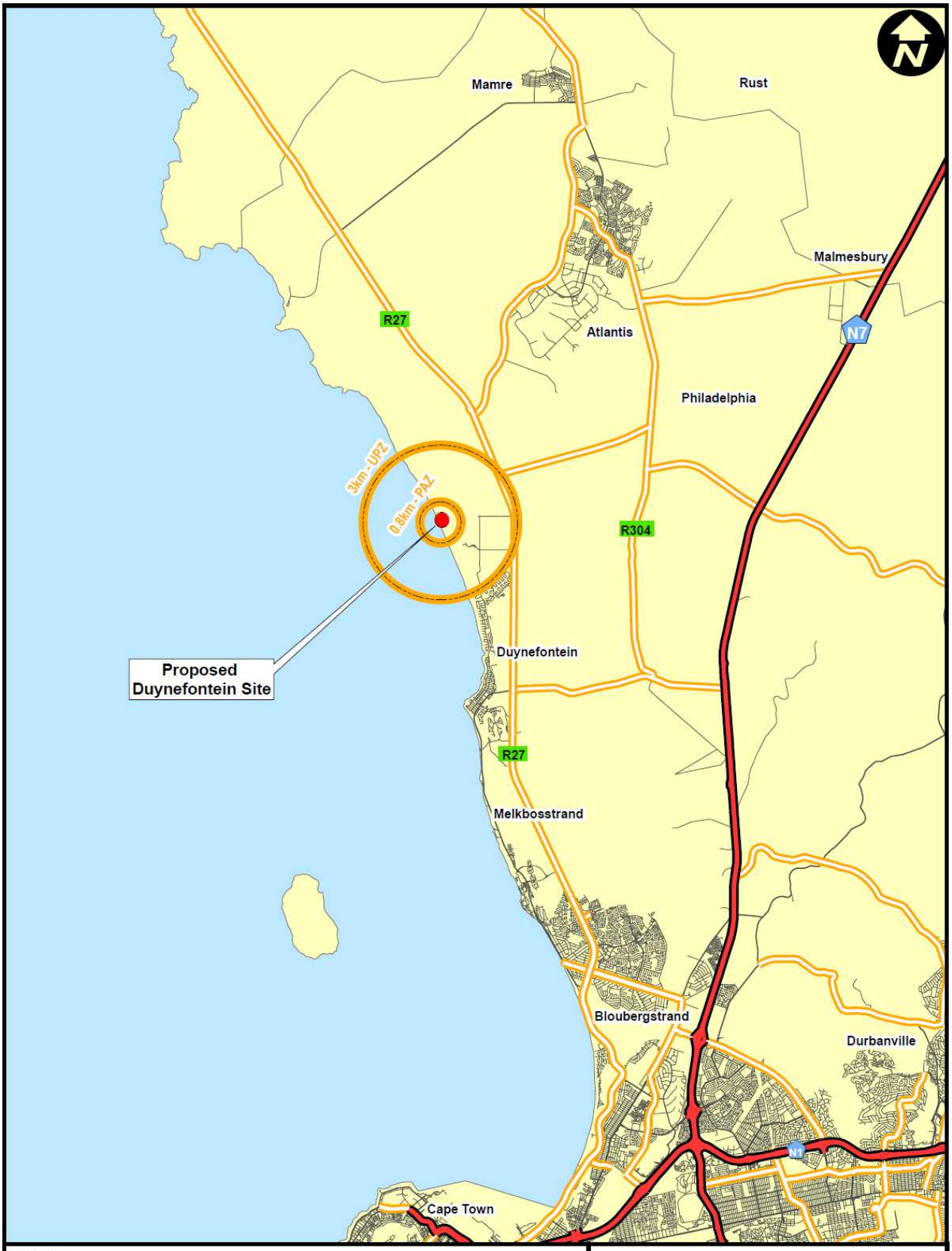
Koeberg Nuclear Power Station currently has an emergency evacuation plan, which complies with the evacuation time requirements for each zone.

The Nuclear-1 evacuation zones will coincide with the Koeberg Power Station zones, should Nuclear-1 be located at the Duynefontein site. The Nuclear-1 staff and general public within 16 km of the site will be the only additional person to be included in the existing emergency evacuation plan.

The *Koeberg Nuclear Power Station 2005 Emergency Plan (HHO, 2005)* states that *"if the capacity of the road system is reduced by 60% of normal capacity, the required population evacuation can still be evacuated within acceptable time limits"*.

During the operations phase of Nuclear-1 (1300 staff) facilities, approximately 1 000 vehicles will be required to evacuate the total of 3 150 staff members of both plants.

The surrounding road network currently has the capacity to accommodate 3 600 vehicles per hour and the traffic generated by the operation phase of Nuclear-1 is approximately 30% of the capacity. The operational phase of Nuclear-1 will therefore not affect the evacuation times assessed in the current Nuclear-1 Emergency Plan as it is located within the Nuclear-1, 5 km Exclusion Zone and 16 km Long Term Protective Action Planning Zone. The impact of congestion during emergency evacuation is therefore considered medium.



Project : **Nuclear 1 : Environmental Impact Assessment**						
Detail : **Duynefontein Emergency Evacuation Zones**						
Prepared by : **R.Adams**	Checked by : **S.Chow**	Reviewed by : **A.Bulman**	Scale : **1 : 200 000**	Date : **January 2012**	Project No. : **J27035**	Drg No. : **Figure 10.3** / Rev : _

The current evacuation time requirement is summarised in **Table 10.2**. The *Koeberg Nuclear Power Station Emergency Plan: Transport Modelling and Evacuation Management Plan (HHO, 2005)* should be referred to for more details and should be updated to include Nuclear-1 facilities.

Table 10.2 – Koeberg Nuclear Power Station's current evacuation time assessment results

Legislative Requirements				Koeberg Nuclear Power Station Current Evacuation Assessment	
Persons	**Area**	**Safety Zone**	**Time period**	**Assessment Period**	**Time (2005 to 2030)**
All Public	360 degree radius	PAZ 0km to 5km	Within 4 hours	AM Peak "worst case"	1.8 to 2 hours
All Public	Any 67.5 degrees	UPZ 5km to 16km	Within 16 hours		8.2 to 14.3 hours

10.8 Air Route Impacts

10.8.1 Air Routes

A *Site Safety Report (Eskom, 2006)*, which addresses the impact of Nuclear-1 on all airports and air routes, was completed for the Koeberg Nuclear Power Station in 2006. As Nuclear-1 falls within Koeberg Nuclear Power Station's safety zones (5 km UPZ and 16 km EPZ), the impacts of Nuclear-1 on air routes will be the same as the existing Koeberg Nuclear Power Station.

However, Duynefontein is situated on a heading of 333°T and 19.476NM (36.069 km) from Cape Town International Airport. It is situated within the existing restricted area FAR 36 for Koeberg, which extends from Ground level to 2000 feet (ft) above ground level.

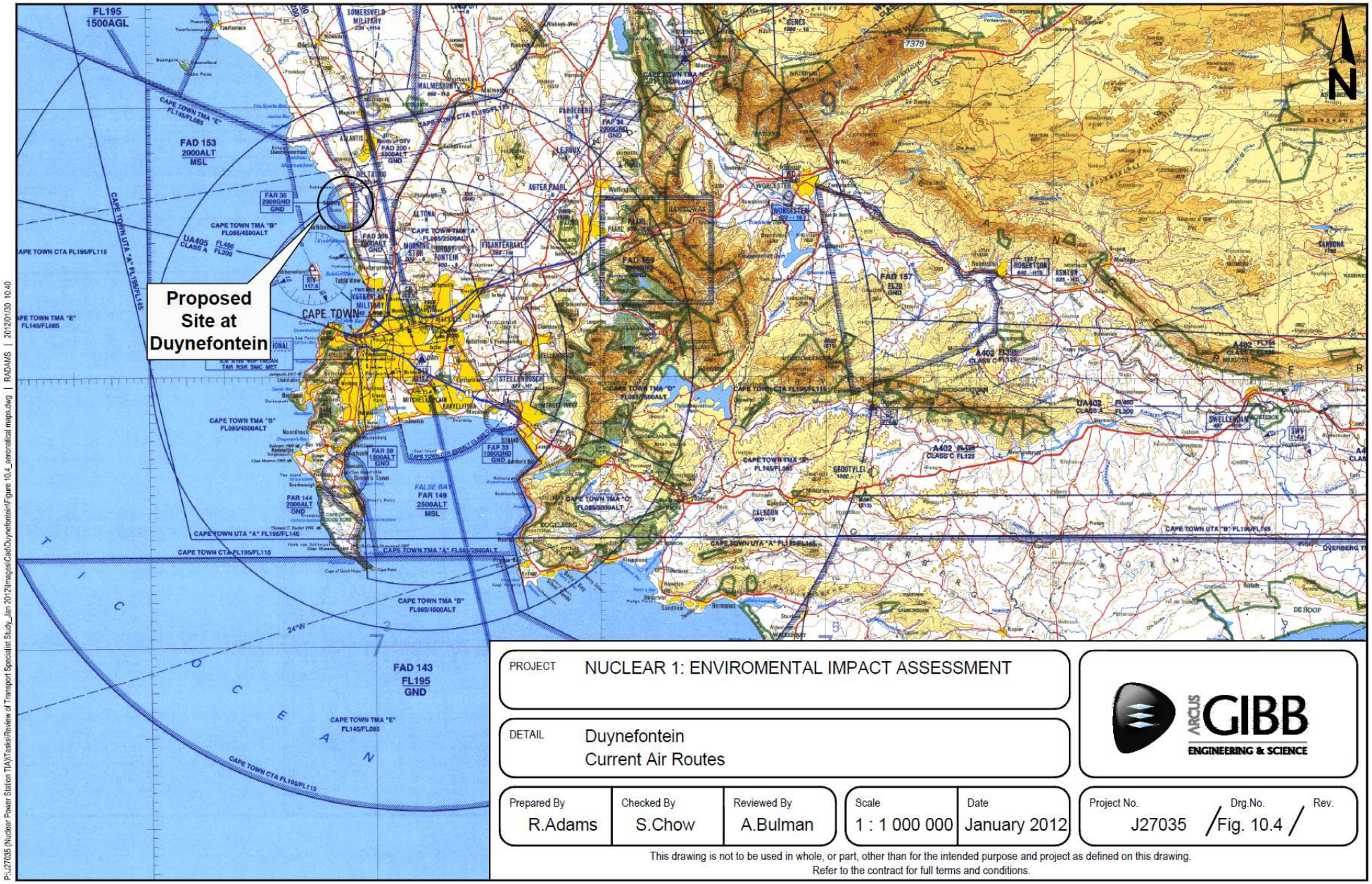
Aircrafts such as aviation aircraft, microlights and helicopters generally operate between ground level and 2000 ft. Military aircraft and helicopters routing between AFB Langebaanweg and Ysterplaat could also be found along this route. The possible impact of Nuclear-1 interfering with the aviation operations is therefore considered low / medium.

The Duynefontein site might require a change to the height restrictions of FAR 36 depending on the requirements for Nuclear-1. The air routes over the Duynefontein site are shown in **Figure 10.4.**

10.9 Shipping Lane Impacts

The South African Maritime Safety Authority (SAMSA) is the custodian of South African seas and the champion of the nation's maritime traditions.

According to the *Maritime Zones Act*, the sea can be classified into the following zones:



PROJECT	NUCLEAR 1: ENVIROMENTAL IMPACT ASSESSMENT					
DETAIL	Duynefontein Current Air Routes					
Prepared By	Checked By	Reviewed By	Scale	Date	Project No.	Drg.No. / Rev.
R.Adams	S.Chow	A.Bulman	1 : 1 000 000	January 2012	J27035	Fig. 10.4

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P:\J27035 (Nuclear Power Station TIA)\Tasks\Review of Transport Specialist Study_Jan 2012\Images\Cad\Duynefontein\Figure 10.4_aeronautical maps.dwg | RADAMS | 2012/01/30 10:40

- **Internal waters:** The internal waters of the Republic shall comprise all waters landward of the baselines (which are the straight lines joining the grouped co-ordinates); and all harbours. Any law in force in the Republic, including the common law, shall also apply in its internal waters and the airspace above its internal waters. The right of innocent passage shall not exist in the internal waters, except if the internal waters concerned were territorial waters before the commencement of this Act.
- **Territorial waters:** The sea within a distance of twelve nautical miles from the baselines shall be the territorial waters of the Republic. Any law in force in the Republic, including the common law, shall also apply in its territorial waters and the airspace above its territorial waters. The right of innocent passage shall exist in the territorial waters.
- **Contiguous zone:** The sea beyond the territorial waters, but within a distance of twenty four nautical miles from the baselines, shall be the contiguous zone of the Republic. Within the contiguous zone and the airspace above it, the Republic shall have the right to exercise all the powers which may be considered necessary to prevent contravention of any fiscal law or any customs, emigration, immigration or sanitary law and to make such contravention punishable.
- **Maritime cultural zone:** The sea beyond the territorial waters, but within a distance of twenty four nautical miles from the baselines, shall be the maritime cultural zone of the Republic. Subject to any other law the Republic shall have, in respect of objects of an archaeological or historical nature found in the maritime cultural zone, the same rights and powers as it has in respect of its territorial waters.
- **Exclusive economic zone:** The sea beyond the territorial waters, but within a distance of two hundred nautical miles from the baselines, shall be the exclusive economic zone of the Republic. Subject to any other law the Republic shall have, in respect of all natural resources in the exclusive economic zone, the same rights and powers as it has in respect of its territorial waters.

SAMSA therefore has full jurisdiction (sovereignty) over the internal waters while foreign vessels have rights in the territorial waters and other zones.

Furthermore, vessels such as boats and ships (including containers ships) are allowed within five nautical miles from the shoreline, while trawlers and tankers are only allowed in the deep sea (25 nautical miles from the shoreline). These areas are indicated in **Figure 10.5** for Cape Town and Saldanha Harbours.

SAMSA does not keep a record of vessels travelling past the proposed sites. Many vessels have an Automatic Identification System (AIS) that can be turned off. There are also no Traffic Separation Schemes (TSS). Vessels usually catch the current. Separation zones are usually identified alongside “NO GO” zones.

A *Site Safety Report (Eskom, 2006)*, which addresses all shipping lane data and Nuclear-1’s impacts on those routes, was completed for the Koeberg Nuclear Power Station in 2006. As Nuclear-1 falls within the Koeberg Nuclear Power Station safety zones (5 km UPZ and 16 km EPZ) the impacts of Nuclear-1 on shipping lanes is considered low medium and will be the same as the existing Koeberg Nuclear Power Station.

The *Sea-Shore Act, 1935 (Act No. 21 of 1935)* identifies a security exclusion zone for a nuclear power station as the portion of the sea-shore opposite the seaward boundary of the Duynefontein farm and a corresponding portion of the sea for a distance of 2 km seawards from the low-water mark. The exclusion zone of Nuclear-1 will coincide with the exclusion zone of Koeberg Nuclear Power Station should Nuclear-1 be constructed at the Duynefontein site.

Project :
Nuclear 1 : Environmental Impact Assessment

Detail :
Duynefontein
Sea Traffic Zones (Cape Town & Saldanha Harbours)

ARCUS GIBB ENGINEERING & SCIENCE

Prepared by :	Checked by :	Reviewed by :	Scale :	Date :	Project No. :	Drg No. :	Rev :
P.Smith	S.Chow	A.Bulman	N.T.S	January 2012	J27035	Figure 10.5	_

10.10 Conclusions

The significance of the impacts is summarised in **Table 10.3**. It should be noted that it was assumed in the assessment table that the transport infrastructure built during the construction phase will still be in place and the assessment therefore assumes this to be existing infrastructure.

- Access 2 of the existing Koeberg Nuclear Power Station should be used as the main access to the Duynefontein site;
- The operations phase of Nuclear-1 will generate less traffic than the construction phase and no further road upgrades will be required over and above those implementation for the construction phase;
- A total of 950 parking bays will be required on-site;
- Traffic calming measures and speed limit of 40 km/h should be established on the internal roads of Nuclear-1;
- The low – medium radioactive waste should be transported to Vaalputs by road and minimal traffic impact is expected;
- 1 000 vehicles will be required to evacuate the staff members of both Nuclear-1 and Koeberg Nuclear Power Plant.

Table 10.3: Significance of Impacts for Operations Phase of Duynefontein

Impact		Intensity	Value	Extent	Value	Duration	Value	Irreplacable resources	Irrep. value	Cons. Value	Prob.	Prob. value	Sign. value	SIGNIFICANCE
1. Traffic congestion and delay at intersections on the external road network.	Unmitigated	Low	1	Medium	2	High	3	Low	1	2	Low	1	2	Low Medium
	Mitigated													
2. Increased noise impact on local communities due to increased traffic.	Unmitigated	Low	1	Medium	2	High	3	Low	1	2	Low	1	2	Low Medium
	Mitigated													
3. Decreased pedestrian safety in local communities due to increased traffic.	Unmitigated	Low	1	Medium	2	High	3	High	3	2	Low	1	2	Low Medium
4. Lack of parking	Unmitigated	Low	1	Medium	2	High	3	Low	1	2	Mediun	2	3	Medium
5. Possibility of radiation release during transport of radioactive waste.	Unmitigated	High	3	High	3	High	3	High	3	3	Low	1	3	Medium
6. Congestion during emergency evacuation	Unmitigated	High	3	Medium	2	High	3	High	3	3	Low	1	3	Medium
7. Interference with aviation	Unmitigated	Low	1	Medium	2	High	3	Low	1	2	Low	1	2	Low Medium
8. Disturbance to maritime operations	Unmitigated	Low	1	Medium	2	high	3	Low	1	2	Low	1	2	Low Medium

10.11 Mitigating Actions Required

Other than the provision of 950 parking bays and public transport facilities on-site, no mitigating actions will be required over and above those implemented for the construction phase of the project.

11 BANTAMSKLIP OPERATIONAL PHASE IMPACT ASSESSMENT

11.1 Access

Nuclear-1 is proposed to be accessed via two access points, which should be built during the construction phase, off the R43. It is assumed in this analysis that all revised routes and upgrades constructed for the construction phase will be permanent and available for continuous use in the operations phase.

11.2 Operations Phase Traffic

The following section assesses the cumulative transport impacts of the operational phase on the local transport system. The AM and PM peak hours are the critical daily time periods and therefore the following assessment was undertaken for these peak hours.

The AM and PM peak hours are:

- AM Peak hour – 08:00 – 09:00;
- PM Peak hour – 16:00 to 17:00.

11.2.1 Trip Generation

It is estimated that approximately 1300 staff members are required to operate the Nuclear-1 site during its operational phase. Visitor traffic to Nuclear-1 is expected to occur outside of the AM and PM peak hours and is therefore not included in the analysis.

The facility will operate for 24 hours per day and staff will work in three daily shifts as follows:

- Shift 1: 23:00 to 07:00;
- Shift 2: 07:00 to 15:00; and
- Shift 3: 15:00 to 23:00.

Figure 11.1 shows the shift timetable for Nuclear-1. It was assumed that 15% of workers would operate Nuclear-1 in Shift 1, 60% of workers in Shift 2 and 25% of workers in Shift 3.

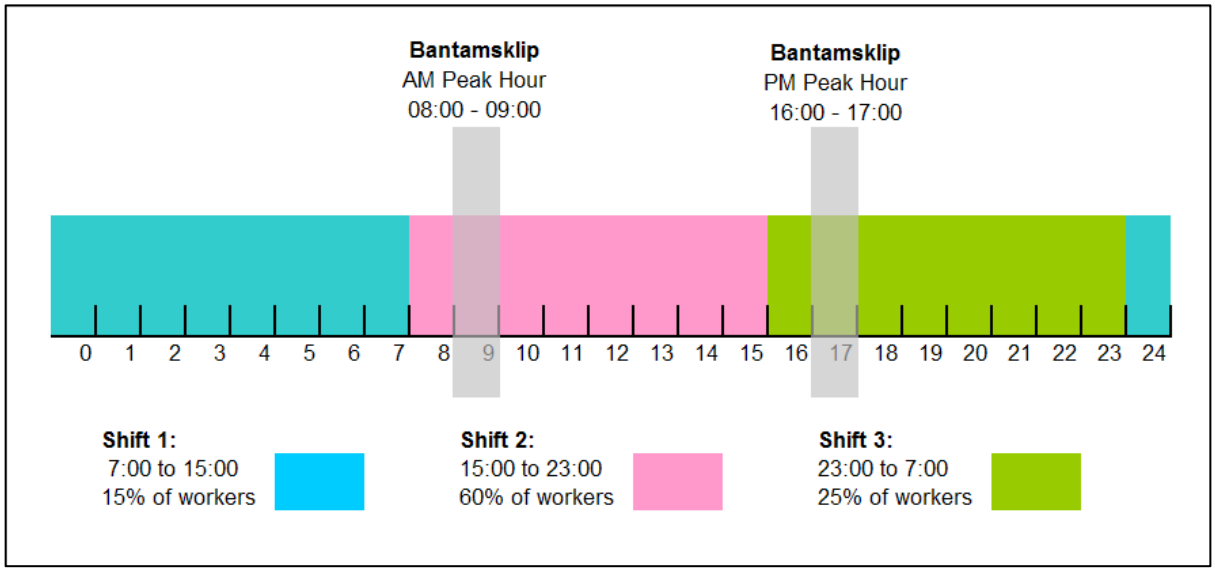

Figure 11.1: Shift Timetable

The shift timetable was interpreted and the results show that:

- **AM Peak hour:** Staff from Shift 1 (195 persons) are expected to depart between 07:00 and 09:00 while staff from Shift 2 (780 persons) are expected to arrive between 06:30 and 07:30, resulting in 30% of Shift 1 staff (59 persons) departing and none of Shift 2 staff arriving during the AM peak hour. However, 30% of Shift 2 staff (234 persons) was assumed to arrive during the AM peak hour for the worst case scenario.
- **PM Peak hour:** Staff from Shift 2 (780 persons) are expected to depart between 15:00 and 17:00 while staff from Shift 3 (325 persons) are expected to arrive between 14:30 and 15:30 resulting in 50% of Shift 2 staff (390 persons) departing and none of Shift 3 staff arriving during the PM peak hour. However, 30% of Shift 3 staff (98 persons) was assumed to arrive during the PM peak hour for the worst case scenario.
- It should be noted that altering of the operational shift periods could result in additional generated peak hour trips. Its impact on the surrounding road network should then be re-assessed.

Currently only 30% of residents use public transport, while the remainder walk, cycle or use private transport. However, due to the nature of the area and the nature of Nuclear-1's operations, it has been assumed that additional public transport services will be added to the network to cater for the Nuclear-1 staff trip demand.

The current modal share usage of Koeberg Nuclear Power Station staff members is approximately 70% private vehicles and 30% public transport. This was used as a guide to determine the modal share usage of nuclear power station staff members.

A modal split of 70% private transport, 20% minibus taxis and 10% buses was therefore applied.

During the operational stage of Nuclear-1, normal daily travel between main residential centres, surrounding main towns (e.g. Gansbaai, Hermanus) and the nuclear power station will result in increased usage of the surrounding internal road network and national road network.

The peak hour trips generated by the proposed Nuclear-1 site during the operational phase are shown in **Table 11.1** and the detailed trip generation table is provided in **Annexure B19**.

Table 11.1 – Summary of Operational Phase Nuclear-1 Peak Hour Trips Generated

Land Use Type	People (No)	Directional Percentage of Shift Staff Travelling in Peak hour				Total Peak Person Trips Generated						Total Vehicle Trips Generated					
		AM Peak		PM Peak		AM Peak			PM Peak			AM Peak			PM Peak		
		In (Shift 2)	Out (Shift 1)	In (Shift 3)	Out (Shift 2)	In	Out	Total	In	Out	Total	In	Out	Total	In	Out	Total
Proposed Nuclear Site at Bantamsklip	1300	30%	30%	30%	50%	234	59	293	98	390	488	69	17	86	29	115	144
TOTAL	**1300**					**234**	**59**	**293**	**98**	**390**	**488**	**69**	**17**	**86**	**29**	**115**	**144**

The operations phase of Nuclear-1 will generate a total of 86 and 144 vehicular trips during the AM and PM peak hours respectively, which is significantly less than the construction phase trip generation of 391 and 412 trips during the AM and PM peak hours, hence the operations phase impact is considered low / medium and will have less impact on the surrounding road network than the construction phase. The traffic conditions during the construction phase are therefore considered to be the worst case scenario. The existing intersections and proposed upgrades that were recommended for the construction phase will therefore be sufficient to accommodate the impact of the operations phase.

11.3 Parking

Koeberg Nuclear Power Station currently provides a total of 950 parking bays for approximately 1 300 staff member. It is estimated that Nuclear-1 will require the same number of staff; therefore a total of 950 parking bays should be provided during the operations phase of Nuclear-1. The number of parking bays provided is based on a private vehicle: public transport ratio of 70:30. The number of parking bays provided on-site during the construction phase will therefore be adequate for the operations phase and the impact is considered medium.

11.4 Public Transport

Additional public transport services will have to be provided to accommodate the number of public transport trips generated by the proposed Nuclear-1 site at Bantamsklip.

A total of 30 minibus taxi and 4 bus trips per day will be required for the transportation of the Nuclear-1 staff during the operational period.

11.5 Non-Motorised Transport

The generated traffic is expected to have a low medium impact on the pedestrian activities of the surrounding road network.

Traffic calming measures and a speed limit of 40 km/h should be implemented on the new internal roads of Nuclear-1 to ensure pedestrian and cyclist safety.

11.6 Low to Medium Radioactive Waste Transport

Low to medium-level radioactive waste produced by Nuclear-1 will be stored at Vaalputs, which is located in the Northern Cape Province.

The transportation of radioactive waste will be undertaken under the regulatory control of the National Nuclear Regulator and in accordance with international standards. Two to four shipments of low to medium-level radioactive waste will be made each week.

It is proposed that the waste be transported via the N2 and N7 to Vaalputs as shown in **Figure 11.2.** *Maud, Drennan and Partners* conducted a preliminary investigation in 1988 with regard to the transport of nuclear waste from the Bantamsklip site to Vaalputs. The results of this study indicate that road transport is the most viable option. Radioactive waste will be required to be transported cross-country from the Western Cape to the Northern Cape. The impact of possible radiation release during the transportation is considered medium.

11.7 Emergency Evacuation

A 0 km to 0.8 km Exclusion Zone and a 0.8 km to 3 km Long Term Protection Action Planning Zone are required by the EUR to be implemented around a nuclear facility for safety purposes, as shown in **Figure 11.3**. No new developments are allowed to be located within the Exclusion Zone and existing and planned developments situated within Long Term Protection Action Planning Zone are required to be included in the facility's emergency evacuation plan.

The Nuclear-1's Emergency Plan must be compiled to include non-nuclear and nuclear accidents occurring at the Nuclear-1. During the operational phase, the 1 300 staff would be evacuated using approximately 434 vehicles.

A single lane road capacity is approximately 1 500 vehicles per hour. This initial assessment indicates that the road capacity is sufficient to evacuate 434 vehicles an hour.

Legend

Waste Storage Site	☒
Radioactive Waste Route	red line

PROJECT	Nuclear 1: Environmental Impat Assessment Bantamsklip Transport Impact Assessment
DETAIL	Proposed Route of Low to Medium Radioactive Waste

ARCUS GIBB ENGINEERING & SCIENCE

Drawn By	Designed By	Reviewed By	Scale	Date	Project No.	Drg.No.	Rev.
R.Adams	S.Chow	A.Bulman	NTS	January 2012	J27035	Fig 11.2	

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P:\J27035 (Nuclear Power Station 1\A)\Tasks\Review of Transport Specialist Study_Jan 2012\Images\Cad\Bantamsklip\Figure 11.2_Fuel and Radioactive Wast.dwg | RADAMS | 2012/01/30 11:01

PROJECT: Nuclear 1 : Environmental Impact Assessment	ARCUS GIBB ENGINEERING & SCIENCE	Drawn By: R.Adams	Checked By: S.Chow
		Reviewed By: A.Bulman	Approved By: A.Bulman
DETAIL: Bantamsklip Emergency Evacuation Zones	Scale: 1 : 230 000	Date: January 2012	Project No.: J27035 / Drg No.: Figure 11.3 / Rev:

This drawing is not to be used in whole, or part, other than for the intended purpose and project as defined on this drawing.

Refer to the contract for full terms and conditions.

In order to improve the possible impact of congestion during emergency evacuation, the upgrading of the DR 1206 gravel road which links the R43 to Bredasdorp should be considered, as the R43 heading west towards Pearly Beach is the only current exit route.

A detailed Emergency Plan (including a Transport Model and an Evacuation Management Plan) should, however, be compiled to enable testing of different scenarios.

11.8 Air Route Impacts

Bantamsklip is situated on a heading of 257° T and 35.758 NM (66.223 km) from Air Force Base (AFB) Overberg. AFB Overberg is the SA Air Force's Testing and Development centre. It is also situated under the AFB Overberg Terminal Control Area (TCA) which extends from 6 500 to 14 500 feet above mean sea level.

One of each aircraft type in use by the SA Air Force is stationed at this base. These include fighter aircraft and helicopters. Live missile firing and bomb testing from fully weapon loaded aircraft are conducted at this facility. This facility is also used by foreign countries for aircraft and weapons testing. Aircraft from these countries range from helicopters and fighter aircraft to very large tanking aircraft operating down to very low altitudes.

Exercises by local and foreign Air Forces and Navies are conducted in this area as well. A restricted area (FAR 147 - Ground level to 19 500 feet above mean sea level) has been declared for this reason. Bantamsklip is situated 13.4 NM (24.816 km) within this restricted area.

Bantamsklip is also situated 15.508 NM (27.720 km) to the east of a Danger Area, FAR 143, which extends from Ground Level to 19 500 ft. above mean sea level. FAR 143 is used by the Navy as a training area, which includes the firing of live missiles and guns as well as the demolition of ammunition. The range of the missiles onboard the new Frigate vessels of the SA Navy is ±43 km, with a safe distance of ±50 km. FAR 143 is also used for combined exercises by local and foreign Air Forces and Navies, which includes the firing of live ammunition.

General aviation aircraft as well as helicopters also operate along the coast at low levels. A total of eight known aerodromes/airstrips lie within a 30NM (55.56 km) radius of Bantamsklip. The closest aerodrome is Pearly Beach which is situated 4.763 NM (8.821 km) to the North-West of Bantamsklip. The runway direction is in a North-West/South-East direction. The closest air routes pass 26.597 NM (49.257 km) to the north of Bantamsklip.

The Bantamsklip site would require the promulgation of new Restricted / Danger / Prohibited areas to improve the impact of interference with the aviation operations from medium to low. The air routes over the Bantamsklip site are shown in **Figure 11.4**.

11.9 Shipping Lane Impacts

The South African Maritime Safety Authority (SAMSA) is the custodian of South African seas and the champion of the nation's maritime traditions. SAMSA, therefore has full jurisdiction (sovereignty) over the domestic waters, while in the territorial waters and other zones, foreign vessels have rights.

Furthermore, vessels such as boats and ships (including containers ships) are allowed within five nautical miles from the shoreline, while trawlers and tankers are only allowed in the deep sea (25 NM from the shoreline). These areas are indicated in **Figure 11.5**. The impact of the possible disturbance to maritime operations is considered medium.

SAMSA does not keep a record of vessels travelling past the proposed site. Many vessels have an Automatic Identification System (AIS) that can be turned off.

In terms of the Sea-Shore Act (Act No. 21 of 1935), a safety exclusion zone must be identified if a nuclear power station is built on the Bantamsklip site. The proposed exclusion zone for the Bantamsklip site is situated in domestic waters. An application to SAMSA will, therefore, have to be put forward to create an exclusion zone for Bantamsklip.

P:\J27035 (Nuclear Power Station TIA)\Tasks\Review of Transport Specialist Study_Jan 2012\Images\Cad\Bantamsklip\Figure 11.4_aeronatical maps.dwg | RADAMS | 2012/01/30 11:29

PROJECT	NUCLEAR 1: ENVIROMENTAL IMPACT ASSESSMENT
DETAIL	Bantamsklip Current Air Routes

ARCUS GIBB ENGINEERING & SCIENCE

Prepared By	Checked By	Reviewed By	Scale	Date	Project No.	Drg.No.	Rev.
R.Adams	S.Chow	A.Bulman	1 : 1 000 000	January 2012	J27035	Fig. 11.4	

Project :
Nuclear 1 : Environmental Impact Assessment

Detail :
Bantamsklip
Sea Traffic Zones (Cape Town Harbour)

ARCUS GIBB ENGINEERING & SCIENCE

Prepared by :	Checked by :	Reviewed by :	Scale :	Date :	Project No. :	Drg No. :	Rev :
P.Smith	S.Chow	A.Bulman	N.T.S	January 2012	J27035	Figure 11.5	_

11.10 Conclusions

The significance of impacts is summarised in **Table 11.2**. It should be noted that it was assumed in the assessment table that the transport infrastructure built during the construction phase will still be in place and the assessment therefore assumes this to be existing infrastructure.

- The operations phase of Nuclear-1 is expected to generate less traffic than construction phase and no further road upgrades will be required over and above those implemented for the construction phase.

- The upgrading of the DR 1206 to a surfaced road should be considered in order to provide a second emergency evacuation route towards Bredasdorp. The emergency evacuation plan should give guidance on this;

- A total of 950 parking bays should be provided for the operations phase;

- Traffic calming measures and a speed limit of 40 km/h should be established on the internal roads of the site;

- Additional public transport services will be required for the operations phase;

- The disposal of low – medium radioactive waste will be transported to Vaalputs, Northern Cape via road; and

- Approximately 434 vehicles will be required to evacuate the staff members of Nuclear-1.

Table 11.2: Significance of Impacts for Operations Phase of Bantamsklip

Impact		Intensity	Value	Extent	Value	Duration	Value	Irreplacable resources	Irrep. value	Cons. Value	Prob.	Prob. value	Sign. value	SIGNIFICANCE
1. Traffic congestion and delay at intersections on the external road network.	Unmitigated	Low	1	Medium	2	High	3	Low	1	2	Low	1	2	Low Medium
	Mitigated													
2. Increased noise impact on local communities due to increased traffic.	Unmitigated	Low	1	Medium	2	High	3	Low	1	2	Medium	2	3	Medium
	Mitigated													
3. Decreased pedestrian safety in local communities due to increased traffic.	Unmitigated	Low	1	Medium	2	High	3	High	3	2	Low	1	2	Low Medium
	Mitigated													
4. Lack of parking	Unmitigated	Low	1	Medium	2	High	3	Low	1	2	Medium	2	3	Medium
	Mitigated													
5. Possibility of radiation release during transport of radioactive waste.	Unmitigated	High	3	High	3	High	3	High	3	3	Low	1	3	Medium
	Mitigated													
6. Congestion during emergency evacuation	Unmitigated	High	3	Medium	2	High	3	High	3	3	High	3	5	High
	Mitigated	High	3	Medium	2	High	3	High	3	3	Low	1	3	Medium
7. Interference with aviation	Unmitigated	Medium	2	Medium	2	High	3	Low	1	2	Medium	2	3	Medium
	Mitigated	Low	1	Medium	2	Low	1	Low	1	1	Low	1	1	Low
8. Disturbance to maritime operations	Unmitigated	Low	1	Medium	2	High	3	Low	1	2	Medium	2	3	Medium
	Mitigated	Low	1	Low	1	Low	1	Low	1	1	Low	1	1	Low

11.11 Mitigating Actions Required

The following mitigating actions are therefore proposed for the operational phase transport aspects of the Nuclear-1:

- A total of 950 permanent parking bays should be provided;
- A total of 30 minibus taxi and 4 bus trips per day should be provided to transport the Nuclear-1 staff and public transport facilities should be provided on-site for the loading and off-loading of workers;
- The DR 1206 should be upgraded to a surfaced road to provide a second emergency evacuation route towards Bredasdorp;
- A detailed emergency evacuation plan should be compiled for the Bantamsklip Nuclear-1 site;
- The Bantamsklip site requires the promulgation of a new Restricted / Danger / Prohibited area for the air space over the proposed nuclear power station;
- The Bantamsklip site requires an application to be put forward to create an internal water exclusion zone required for a nuclear power station as per the Sea-Shore Act (Act No.21 of 1935).

12 THYSPUNT OPERATIONAL IMPACT ASSESSMENT

12.1 Access

The Western Access (via Oyster Bay Road) and Eastern Access (via R330) will be provided as access points for the Thyspunt site during the operations phase. It is assumed in this analysis that all revised routes and upgrades constructed for the construction phase will be permanent and available for continuous use in the operations phase.

12.2 Operations Phase Traffic

12.2.1 Description

The following section assesses the transport impacts of the operational phase on the local transport system. The AM and PM peak hours are the critical daily time periods and therefore the following assessment was undertaken for these peak hours.

The AM and PM peak hours are:

- AM peak hour - 07:30 to 08:30; and
- PM peak hour - 16:30 to 17:30.

12.2.2 Trip Generation

It is estimated that approximately 1 300 staff members are required to operate the Nuclear-1 site during its operational phase. Visitor traffic to Nuclear-1 is expected to occur outside of the AM and PM peak hours and is therefore not included in the analysis.

The facility will operate for 24 hours per day and staff will work in three daily shifts as follows:

- Shift 1: 23:00 to 07:00;
- Shift 2: 07:00 to 15:00; and
- Shift 3: 15:00 to 23:00.

Figure 12.1 shows the shift timetable for Nuclear-1. It was further assumed that 15% of workers would operate Nuclear-1 in Shift 1, 60% of workers in Shift 2 and 25% of workers in Shift 3.

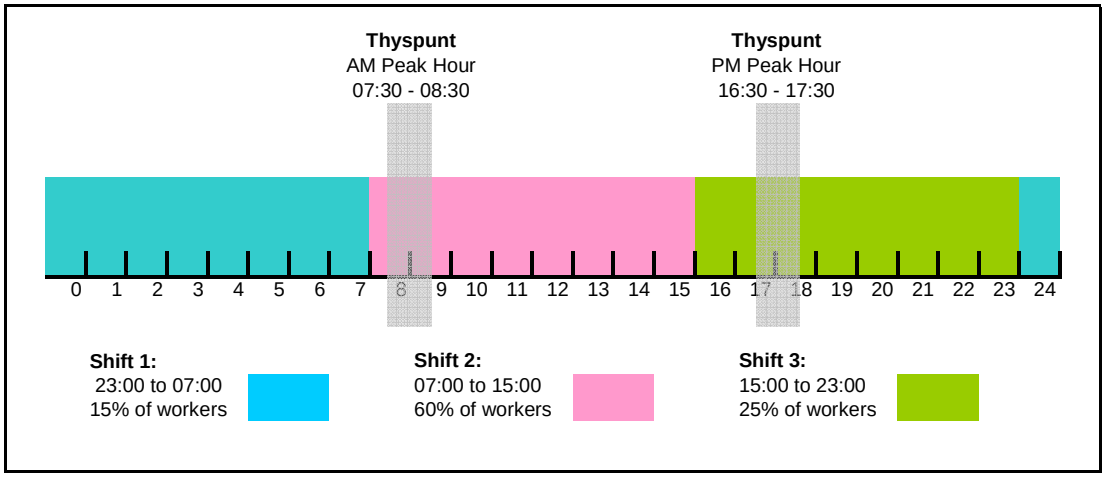


Figure 12.1: Shift Timetable

The shift timetable was interpreted and the results show that:

- **AM Peak hour:** Staff from Shift 1 (195 persons) are expected to depart between 07:00 and 09:00 while staff from Shift 2 (780 persons) are expected to arrive between 06:30 and 07:30, resulting in 50% of Shift 1 staff (59 persons) departing and none of Shift 2 staff arriving during the AM peak hour. However as a worst case scenario, 30% of Shift 2 staff (234 persons) was assumed to arrive during the AM peak hour.
- **PM Peak hour:** Staff from Shift 2 (780 persons) are expected to depart between 15:00 and 17:00 while staff from Shift 3 (325 persons) are expected to arrive between 14:30 and 15:30 resulting in 30% of Shift 2 staff (390 persons) departing and none of Shift 3 staff arriving during the PM peak hour. However as a worst case, 30% of Shift 3 staff (98 persons) was assumed to arrive during the PM peak hour.
- It should be noted that altering of the operational shift periods of Nuclear-1 could result in additional generated peak hour trips. Intersection capacities should then be re-assessed to determine whether upgrades are required.

The existing modal split in the region is 30% private vehicles and 13% public transport, while the remainder walk or use other transport. The private vehicle trips were therefore increased as expected during the operational phase of the nuclear power station.

Furthermore, due to the nature of the area and the nature of the operations, it was assumed additional public transport services would be added to the network to cater for the additional Nuclear-1 staff trip demand. A modal split of 70% private transport, 20% minibus taxis and 10% buses was therefore used.

During the operational stage of Nuclear-1, normal daily travel between the main residential centres (e.g. Humansdorp), surrounding main towns (e.g. Port Elizabeth) and the nuclear power station will result in increased usage of the surrounding internal road network and national road network.

The trips generated by the proposed Nuclear-1 site during the operational phase are shown in **Table 12.1** and the detailed trip generation table is provided in **Annexure C22**.

Table 12.1 – Summary of Operational Phase Nuclear-1 Peak Hour Trips Generated

Land Use Type	People (No)	Directional Percentage of Shift Staff Travelling in Peak hour				Total Peak Person Trips Generated						Total Vehicle Trips Generated					
		AM Peak		PM Peak		AM Peak			PM Peak			AM Peak			PM Peak		
		In (Shift 2)	Out (Shift 1)	In (Shift 3)	Out (Shift 2)	In	Out	Total	In	Out	Total	In	Out	Total	In	Out	Total
Proposed Nuclear Site at Thyspunt	1300	30%	50%	30%	30%	234	98	332	98	234	332	69	29	98	29	69	98
TOTAL	**1300**					**234**	**98**	**332**	**98**	**234**	**332**	**69**	**29**	**98**	**29**	**69**	**98**

The operation phase of Nuclear-1 generate a total of 98 vehicular trips during both the AM and PM peak hours, which is significantly less than the construction phase trip generation of 391 and 412 trips during the AM and PM peak hours, hence the operations phase will have less impact on the surrounding road network than the construction phase. The traffic conditions during the construction phase are therefore considered to be the worst case scenario. The existing intersections and proposed upgrades that were accommodated for the construction phase will therefore be sufficient to accommodate the impact of the operation phase.

12.3 Parking

The Koeberg Nuclear Power Station currently provides a total of 950 parking bays for approximately 1 300 staff member. It is estimated that Nuclear-1 will require the same number of staff, therefore a total of 950 parking bays should be provided during the operation phase of Nuclear-1. The number of parking bays provided is based on a private vehicle: public transport ratio of 70:30. The number of parking bays provided in construction phase will therefore be adequate for the operations phase and the impact is considered medium.

12.4 Public Transport

Additional public transport services will be required to accommodate the number of public transport trips generated by the proposed Nuclear-1 site at Thyspunt.

A total of 24 minibus taxi and 4 bus trips per day is required to provide transport for the Nuclear-1 staff during the operational phase.

12.5 Non-Motorised Transport

The pedestrian activities in the surrounding road network are expected to be affected by the additional traffic and the impact is considered low / medium.

Traffic calming measures and a speed limit of 40 km/h should be implemented on the new internal roads of Nuclear-1 to ensure pedestrian and cyclist safety.

12.6 Low to Medium Radioactive Waste Transport

Low to medium-level radioactive waste produced by Nuclear-1 will be stored at Vaalputs, which is located in the Northern Cape Province.

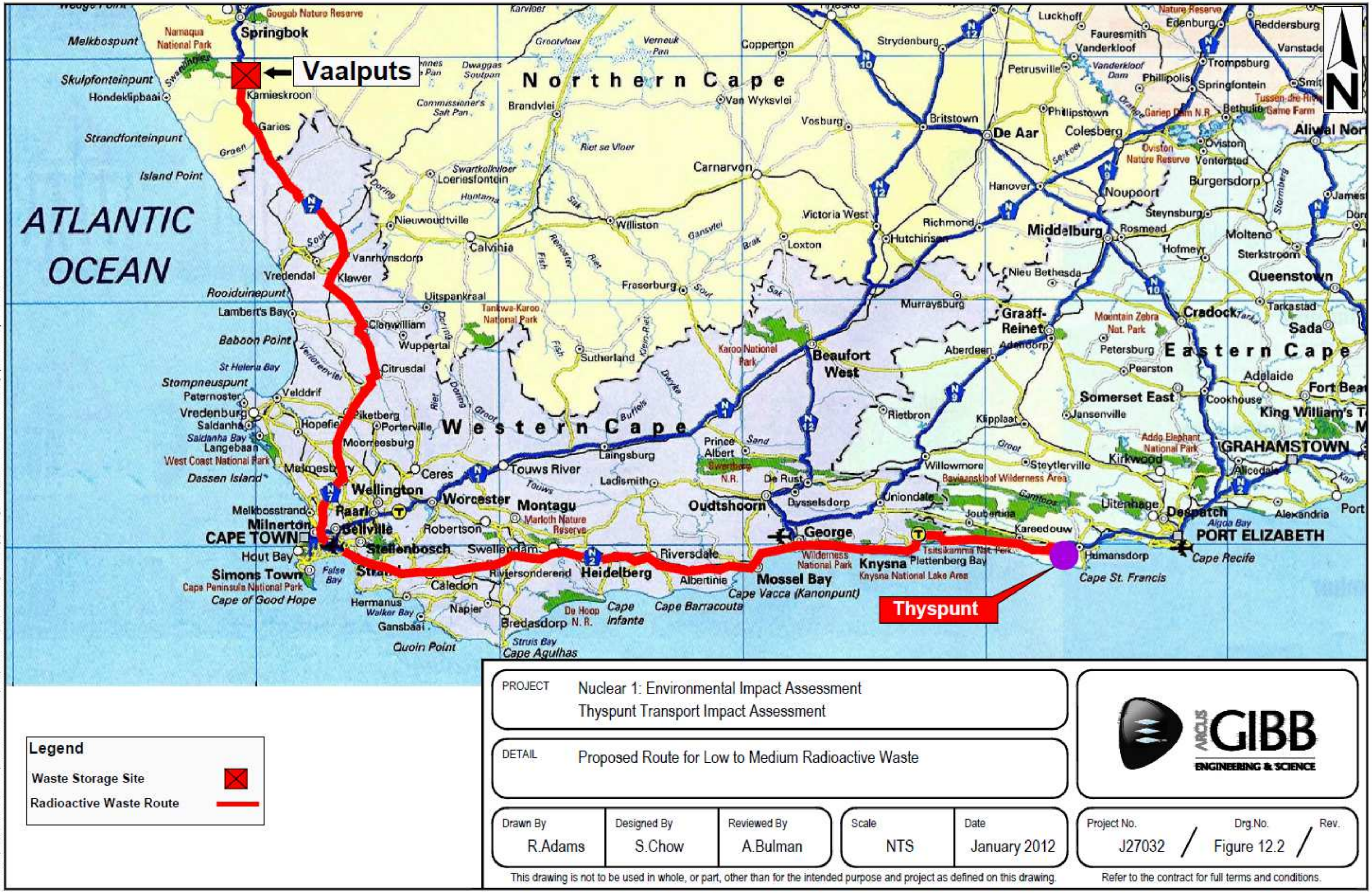
The transportation of radioactive waste will be undertaken under the regulatory control of the National Nuclear Regulator and in accordance with international standards. Two to four shipments of low to medium-level radioactive waste will be made each week.

Maud, Drennan and Partners conducted a preliminary investigation between 1984 and 1987 with regard to the transport of nuclear waste from the Thyspunt site to Vaalputs. The results of this study indicate that road transport is the most viable option. Radioactive waste will be required to be transported cross-country from the Eastern Cape to the Northern Cape. It is proposed that the waste be transported via the N2 and N7 to Vaalputs, as shown in **Figure 12.2** and the impact of release of radiation during the transportation is considered medium.

12.7 Emergency Evacuation

A 0 km to 0.8 km Exclusion Zone and a 0.8 km to 3 km Long Term Protection Action Planning Zone are required by the EUR to be implemented around a nuclear facility for safety purposes. No new developments are allowed to be located within the Exclusion Zone and existing and planned developments situated within Long Term Protection Action Planning Zone are required to be included in the facility's emergency evacuation plan. The Emergency Evacuation Zones are shown in **Figure 12.3A**.

The *Eskom Nuclear-1 Project: Thyspunt Site Evacuation Route* study was undertaken by Aurecon in March 2011. Evacuation routes for the neighbouring towns are identified and shown in **Figure 12.3B**. With the existing condition and proposed upgrading of the R330 and the Oyster Bay Road, the roads are considered sufficient for the evacuation with minimised congestion.


Vaalputs
Thyspunt
ATLANTIC OCEAN
Northern Cape
Western Cape
Eastern Cape
Springbok
Kamieskroon
Garies
Vanrhynsdorp
Klawer
Clanwilliam
Citrusdal
Piketberg
Wellington
Paarl
Bellville
CAPE TOWN
Stellenbosch
Worcester
Swellendam
Heidelberg
Riversdale
Mossel Bay
George
Knysna
Plettenberg Bay
Humansdorp
PORT ELIZABETH
Oudtshoorn
Beaufort West
Legend
Waste Storage Site
Radioactive Waste Route
PROJECT
Nuclear 1: Environmental Impact Assessment
Thyspunt Transport Impact Assessment
DETAIL
Proposed Route for Low to Medium Radioactive Waste
GIBB
ENGINEERING & SCIENCE
Drawn By
R.Adams
Designed By
S.Chow
Reviewed By
A.Bulman
Scale
NTS
Date
January 2012
Project No.
J27032
Drg.No.
Figure 12.2
Rev.
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Refer to the contract for full terms and conditions.

PROJECT: Nuclear 1 : Environmental Impact Assesment	ARCUS GIBB ENGINEERING & SCIENCE	Drawn By: R.Adams	Checked By: S.Chow
		Reviewed By: A.Bulman	Approved By: A.Bulman
DETAIL: Thyspunt Emergency Evacuation Zones	Scale: 1 : 225 000	Date: January 2012	Project No. / Drg No. / Rev: J27035 / Figure 12.3a /

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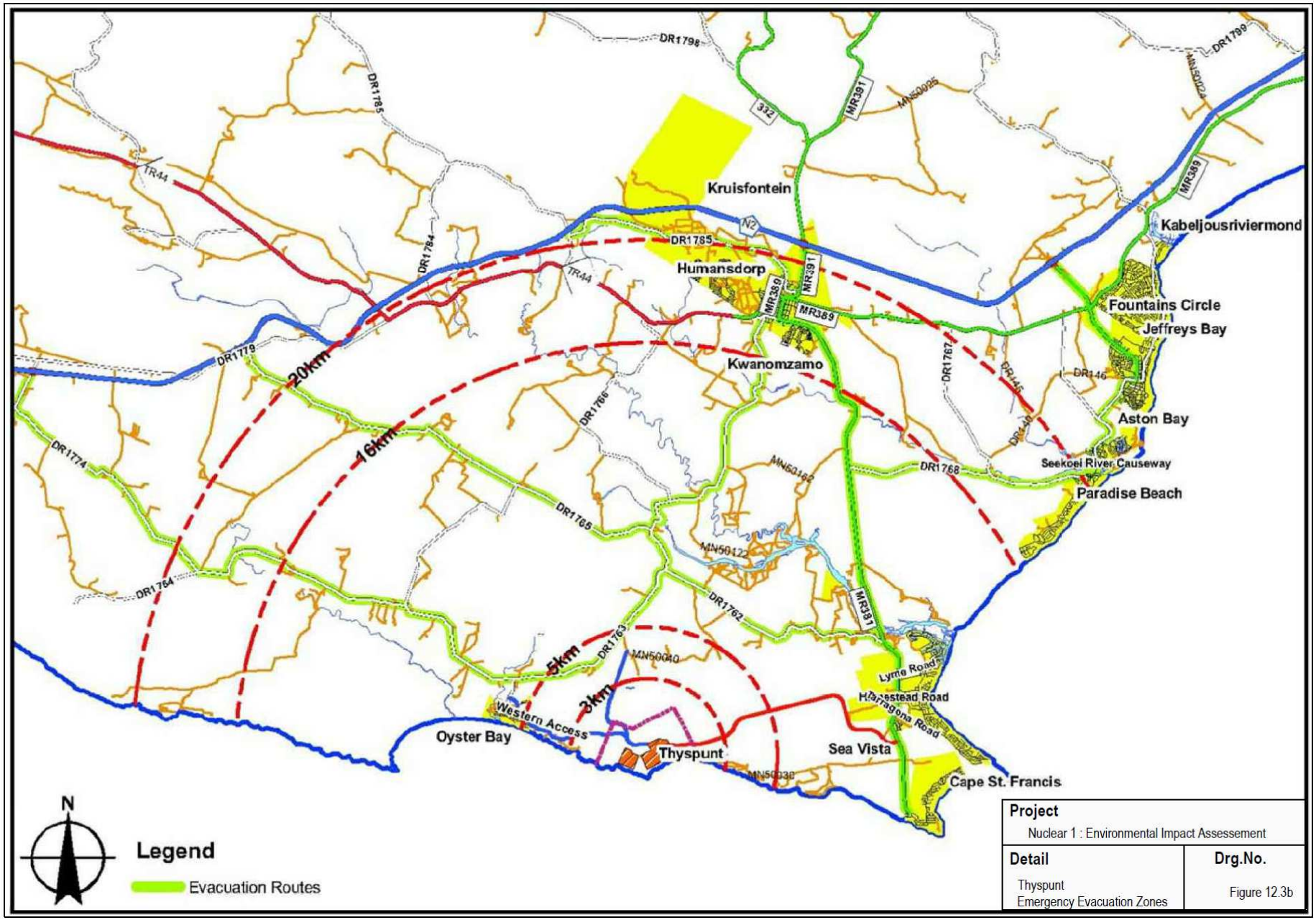

Kruisfontein
Humansdorp
Kwanomzamo
Kabeljousriviermond
Fountains Circle
Jeffreys Bay
Aston Bay
Seekoei River Causeway
Paradise Beach
Oyster Bay
Western Access
Thyspunt
Sea Vista
Cape St. Francis
Lyme Road
Harestead Road
Tarragona Road
20km
16km
5km
3km
N2
TR44
DR1798
DR1799
DR1785
DR1784
DR1779
DR1774
DR1766
DR1767
DR1768
DR1765
DR1764
DR1763
DR1762
DR146
DR145
MR391
MR389
MR387
332
MN50095
MN50024
MN50122
MN50040
MN50038
N
Legend
Evacuation Routes
Project
Nuclear 1 : Environmental Impact Assessement
Detail
Thyspunt
Emergency Evacuation Zones
Drg.No.
Figure 12.3b

The Nuclear-1 Emergency Plan must be compiled to include non-nuclear and nuclear accidents occurring at the Nuclear-1. During the operational phase, the 1 300 staff would be evacuated using approximately 434 vehicles.

A single lane road capacity is approximately 1 200 vehicles per hour. This initial assessment indicates that the road capacity of the two access routes is sufficient to evacuate 434 vehicles an hour and the impact is considered medium.

12.8 Air Route Impacts

Thyspunt is situated 87 km from Port Elizabeth International Airport. It is also situated within the Terminal Control Area (TCA) of Port Elizabeth International Airport, which extends from 6500 to 14 500 feet above mean sea level. Thyspunt is situated 3.986 NM (7.382 km) to the North-East of the OKSET, a Standard Instrument Departure (SID) route termination point for Port Elizabeth International Airport as well as the starting and termination point of the UQ49 Air Route. It is also 10.299 NM (19073 km) to the South-South-West of EVISO, a Standard Instrument Arrival (STAR) route starting point for Port Elizabeth International Airport as well as the starting and termination point of the A402, UA402 and UZ14 Air Routes. This might require the redesign of these procedures as well as re-routing of the Air Routes.

A total of seven known aerodromes/airstrips lie within a 30 NM (55.56 km) radius of Thyspunt. It is also situated 6.585 NM (12.195 km) to the West of St. Francis Field (FACF) and 10.618 NM (19.664 km) to the South-West of Paradise Beach (FAPX) aerodromes, which are both licensed aerodromes.

Aircraft operating in this area are Commercial aircraft (up to Boeing 747 size), mostly at higher levels, but smaller General Aviation aircraft, as well as helicopters, operate down to very low levels along the coast. Military aircraft and helicopters also operate in this area down to very low levels.

The Thyspunt site would require the promulgation of new Restricted / Danger / Prohibited areas to improve the impact from medium to low. The air routes over the Thyspunt site are shown in **Figure 12.4**.

12.9 Shipping Line Impacts

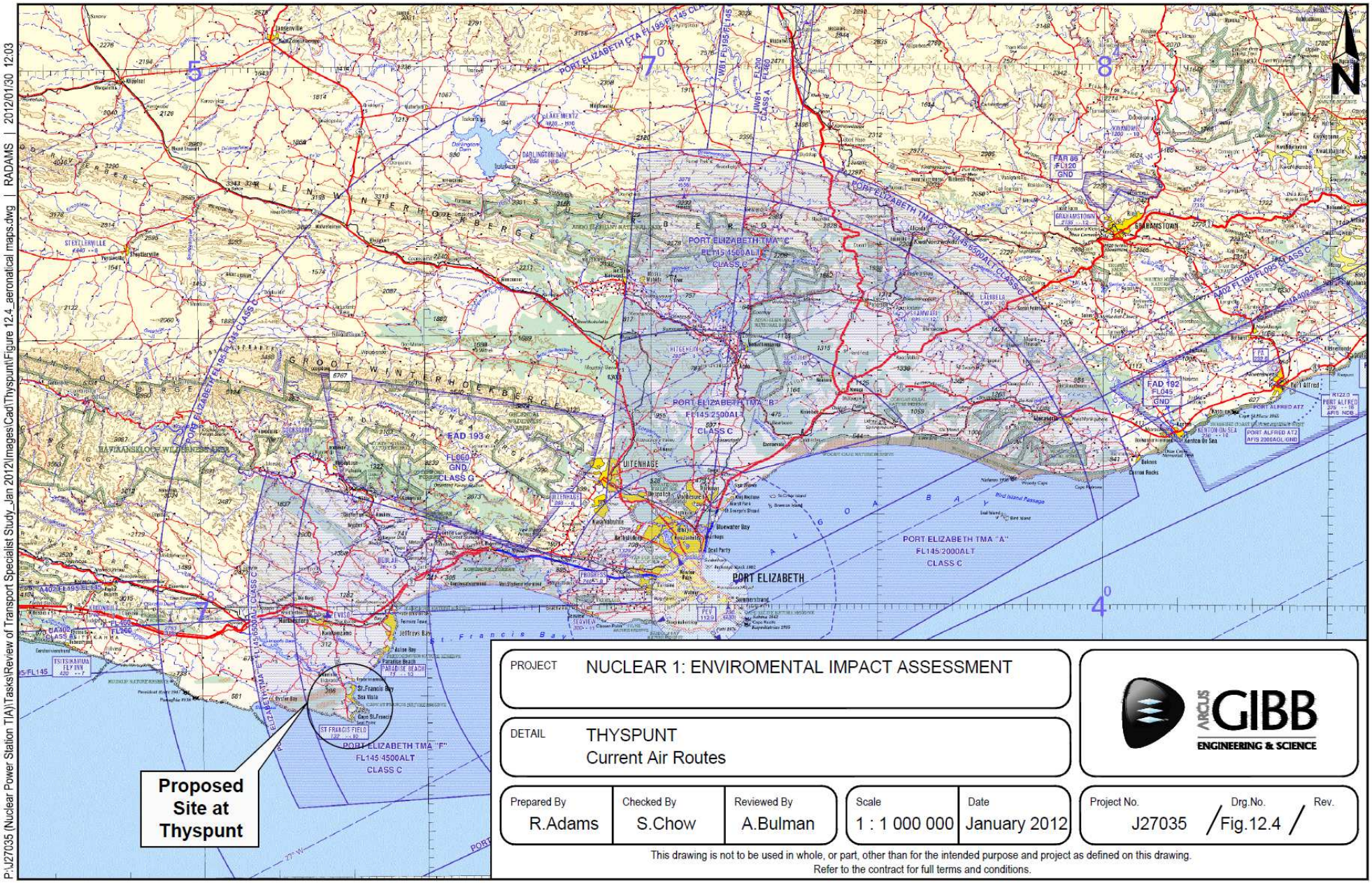
The South African Maritime Safety Authority (SAMSA) is the custodian of South African seas and the champion of the nation's maritime traditions. SAMSA therefore have full jurisdiction (sovereignty) over the internal waters while in the territorial waters and other zones, foreign vessels have rights.

Furthermore, vessels such as boats, ships (including containers ships) are allowed within five nautical miles from the shoreline while trawlers and tankers are only allowed in the deep sea (25 NM from the shoreline). These areas are indicated in **Figure 12.5**.

SAMSA does not keep a record of vessels travelling past the proposed sites. Many vessels have an Automatic Identification System (AIS) that can be turned off allowing them to be undetected.

In terms of the Sea-Shore Act (Act No. 21 of 1935), a security exclusion zone must be identified if a nuclear power station is built on the Thyspunt site. However, the proposed exclusion zone for the Thyspunt site is not fully located in domestic waters and the area is therefore semi-uncontrolled.

This could result in security issues for the nuclear power station. An application will therefore have to be put forward to create an exclusion zone for Thyspunt. It should be noted that there are fishing sites along the coast of Port Elizabeth, close to Thyspunt, that will be affected by the implementation of an exclusion zone.


P:\J27035 (Nuclear Power Station TIA)\Tasks\Review of Transport Specialist Study_Jan 2012\Images\Cad\Thyspunt\Figure 12.4_aeronatical maps.dwg | RADAMS | 2012/01/30 12:03
PORT ELIZABETH TMA "C"
FL145/4500ALT
CLASS C
PORT ELIZABETH TMA "B"
FL145/2500ALT
CLASS C
PORT ELIZABETH TMA "A"
FL145/2000ALT
CLASS C
PORT ELIZABETH TMA "F"
FL145/4500ALT
CLASS C
PORT ELIZABETH
UITENHAGE
FAD 193
FL060
GND
CLASS G
FAD 192
FL045
GND
FAR 86
FL120
GND
Proposed Site at Thyspunt
PROJECT NUCLEAR 1: ENVIROMENTAL IMPACT ASSESSMENT
DETAIL THYSPUNT
Current Air Routes
ARCUS GIBB ENGINEERING & SCIENCE
Prepared By R.Adams
Checked By S.Chow
Reviewed By A.Bulman
Scale 1 : 1 000 000
Date January 2012
Project No. J27035
Drg.No. Fig.12.4
Rev.
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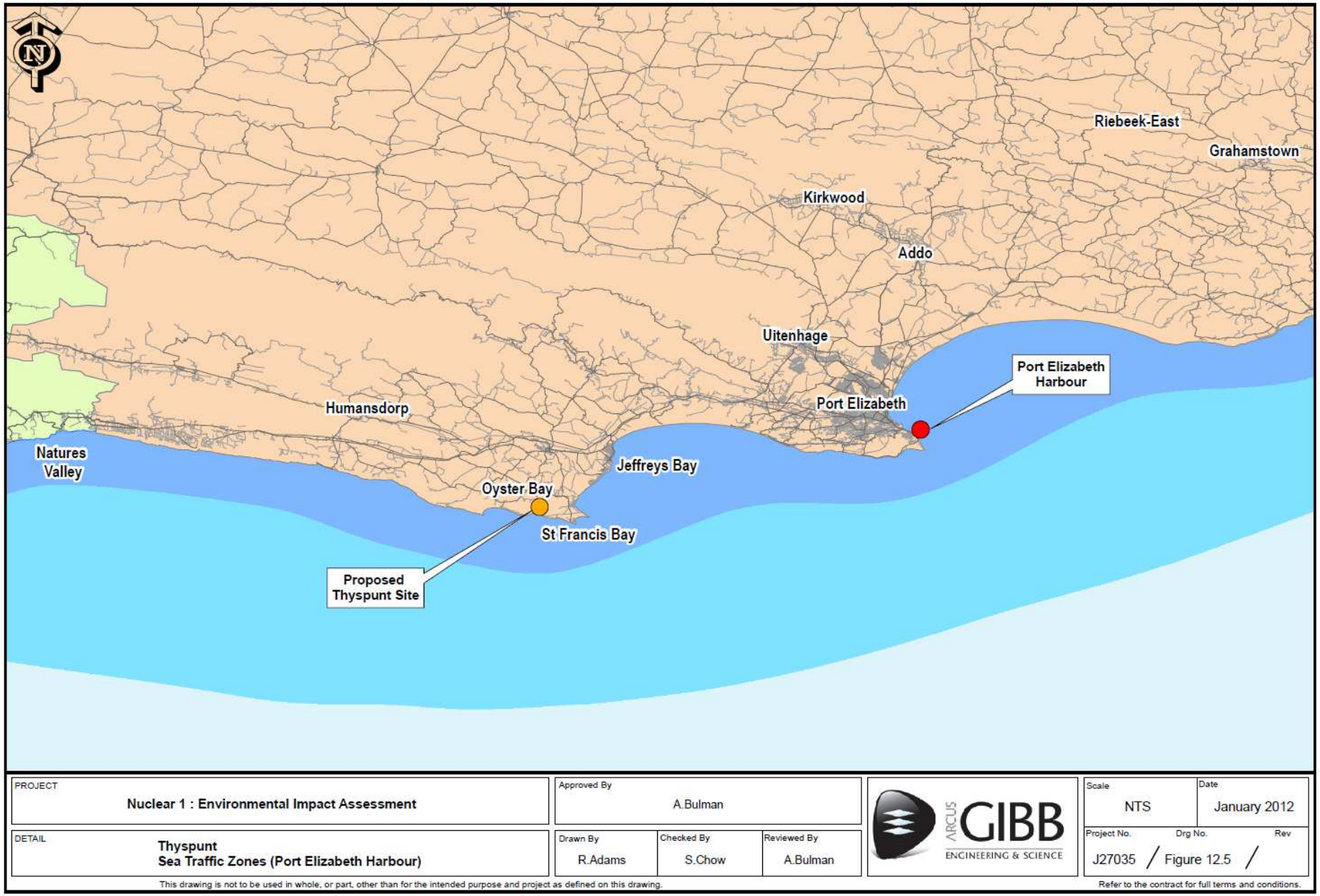

PROJECT: Nuclear 1 : Environmental Impact Assessment		Approved By: A.Bulman			Scale: NTS / Date: January 2012
DETAIL: Thyspunt Sea Traffic Zones (Port Elizabeth Harbour)		Drawn By: R.Adams	Checked By: S.Chow	Reviewed By: A.Bulman	Project No.: J27035 / Drg No.: Figure 12.5 / Rev:

ARCUS GIBB ENGINEERING & SCIENCE

12.9.1 Conclusions

The following can therefore be concluded that and the significance of the impacts is summarised in **Table 12.2**:

- The operations phase of Nuclear-1 is expected to generate less traffic than the construction phase and no further road upgrades will be required over and above those implemented for the construction phase;
- A total of 950 parking bays should be provided for the operations phase;
- Traffic calming measures and speed limit of 40 km/h should be established on the internal roads of Nuclear-1;
- Additional public transport services should be provided for the operations phase;
- Approximately 434 vehicles will be required to evacuate the staff members of Nuclear-1.

Table 12.2: Significance of Impacts for Operations Phase of Thyspunt

Impact		Intensity	Value	Extent	Value	Duration	Value	Irreplacable resources	Irrep. value	Cons. Value	Prob.	Prob. value	Sign. value	SIGNIFICANCE
1. Traffic congestion and delay at intersections on the external road network.	Unmitigated	Low	1	Medium	2	High	3	Low	1	2	Low	1	2	Low Medium
	Mitigated													
2. Increased noise impact on local communities due to increased traffic.	Unmitigated	Low	1	Medium	2	High	3	Low	1	2	Low	1	2	Low Medium
	Mitigated													
3. Decreased pedestrian safety in local communities due to increased traffic.	Unmitigated	Low	1	Medium	2	High	3	High	3	2	Low	1	2	Low Medium
	Mitigated													
4. Lack of parking	Unmitigated	Low	1	Medium	2	High	3	Low	1	2	Medium	2	3	Medium
	Mitigated													
5. Possibility of radiation release during transport of radioactive waste.	Unmitigated	High	3	High	3	High	3	High	3	3	Low	1	3	Medium
	Mitigated													
6. Congestion during emergency evacuation	Unmitigated	High	3	Medium	2	High	3	High	3	3	Low	1	3	Medium
	Mitigated													
7. Interference with aviation	Unmitigated	Medium	2	Medium	2	High	3	Low	1	2	Medium	2	3	Medium
	Mitigated	Low	1	Low	1	Low	1	Low	1	1	Low	1	1	Low
8. Disturbance to maritime operations	Unmitigated	Medium	2	Medium	2	High	3	Low	1	2	High	3	3	Medium
	Mitigated	Low	1	Medium	2	Low	1	Low	1	1	Low	1	1	Low

12.10 Mitigating Actions Required

The following mitigating actions are therefore proposed for the operational phase transport aspects of the Nuclear-1:

- A total of 950 permanent parking bays are to be provided on the site;
- A total of 24 minibus taxi and 4 bus trips per day and public transport facilities should be provided on-site for the loading and off-loading of workers;
- The Thyspunt site requires the promulgation of a new Restricted / Danger / Prohibited area for the air space over the proposed nuclear power station;
- The Thyspunt requires an application to be put forward to create an exclusion zone for ships required for a nuclear power station in terms of the *Sea-Shore Act (No. 21 of 1935)*.

13 CONCLUSIONS

The key conclusions are as follows:

The **Duynefontein** site does not require significant upgrades during the construction and operational phases of Nuclear-1 with regard to intersection upgrades and heavy load transport road upgrades. Several intersections along the R27 will require upgrading, including a possible grade-separated interchange. The site will require a significant number of stand-by evacuation vehicles to ensure safe evacuation of construction workers if an accident does occur at the Koeberg Nuclear Power Station during the construction period. These vehicles can be used to shuttle the construction workers to and from the site during the AM and PM peak periods.

The significance of impacts for both the construction and operations phase of the Duynefontein site are summarized in **Tables 7.2** and **10.3**.

The **Bantamsklip** site will have a significant impact on the transport network with upgrades required to the public transport system, heavy load routes and road upgrades required for emergency evacuation purposes. Due to the Bantamsklip site's isolated location, transporting abnormal loads by road will require significant upgrades and the alternative transport by sea should be considered. However, this would require the construction of landing and loading / off-loading facilities along the beach to be identified. The increased heavy traffic volumes in the area may have social and environmental impacts on Gansbaai in particular, which will require further investigation of a heavy vehicle bypass route for the town.

The significance of impacts for both the construction and operations phase of the Bantamsklip site is summarized in **Table 8.2** and **11.2**.

The **Thyspunt** site requires significant transport upgrades with regard to public transport, and access, and emergency evacuation, during the construction phases. The recommended routes in Version 9 of this report were revised as a result of public input and recommendations received between 29 May 2011 and 2 June 2011. Based on the feedback received, the R330 is now proposed to be used for light vehicle traffic and abnormal load transport, and sections will require upgrading for this purpose. The Oyster Bay Road is now proposed be upgraded to a surfaced road to be used during the construction and operations phases for staff access, light vehicle traffic, heavy vehicle traffic and as an emergency evacuation route for areas such as Oyster Bay. DR1762, which links the R330 and Oyster Bay Road is now proposed to be surfaced to provide improved east-west connectivity. Bypass roads to the east and west of Humansdorp are also now proposed to be constructed to reduce the traffic impact on central Humansdorp.

The significance of impacts for both the construction and operations phase of the Thyspunt site is summarized in **Table 9.4** and **12.2**.

14 SUMMARY OF MITIGATING ACTIONS

The mitigating actions for the three sites are summarised below.

14.1 Mitigating Actions – Duynefontein

14.1.1 *Status Quo* Assessment

- The R27 / Main Access Road intersection is required to be upgraded by 2023, to enable the intersection to cope with the projected traffic demand. If the PGWC's proposal to upgrade to a grade separated intersection is feasible then this option should be implemented. If this option is not feasible, the R27 / Main Access Road intersection signalisation upgrade option, as shown in **Figure 4.3**, should be reconsidered.

- The R27 / Napoleon Street intersection should be upgraded. The exact scope of this upgrade must be agreed with the PGWC in conjunction with the above upgrade.

14.1.2 Construction phase:

Access to the Site

- Construction of an access road to Nuclear-1 at the existing Emergency Access Road to the Koeberg Nuclear Power Plant;

External Road Upgrades

- The R27 pavement to be investigated to determine its remaining life as well as the impact of construction traffic during the construction phase.
- The R27 / Main Access Road intersection should be upgraded to a signalised intersection as shown in **Figure 7.3**. Alternatively, after negotiation with the PGWC, upgraded to a grade-separated interchange.
- The R27 / Napoleon Street intersection should be upgraded to a signalised intersection, as shown in **Figure 7.5.** If the R27 / Main Access Road intersection is grade-separated then the signalisation of this intersection will not be required. These options are to be discussed with the PGWC;
- The R27 / Access 2 intersection should be upgraded to a signalised intersection as shown in **Figure 7.9** for the duration of construction**.** If the R27 / Main Access Road intersection is grade-separated, then the signalisation of this intersection will not be required and may revert to an emergency access only;
- Relevant signage, street lighting and a reduction of the speed limit from 120 km/h to 80 km/h is required to be constructed along the R27 approaching the proposed signalised upgrades of the above-mentioned intersections;

Abnormal Load Route

- Construct a level crossing over the railway line at Saldanha Bay Harbour;
- Upgrade two unsurfaced road sections at Saldanha Bay Harbour;

- Three intersection widening upgrades at Saldanha Bay Harbour;
- Construction of a bypass upstream of the Modder River Bridge to traverse the Modder River;
- Abnormal loads to be transported during off-peak periods particularly during the night (21:00-05:00);

Internal Requirements

- A total of 900 parking bays should be provided on-site;
- Minibus taxis and buses should be provided to transport construction workers to the site. Public transport facilities should be constructed on-site to facilitate the loading and off-loading of workers;

Further Studies Required

- The *Koeberg Nuclear Power Station Emergency Plan: Transport Modelling and Evacuation Management Plan* should be updated to include the evacuation of the Nuclear-1 construction workers;
- A comprehensive Construction Traffic Management Plan should be completed, in conjunction with the authorities, for the duration of the construction period;

14.1.3 Operations Phase

- A total of 950 parking bays should be provided for the operations phase; and
- Public transport facilities should be provided on-site for the loading and off-loading of workers.

14.2 Mitigating Actions – Bantamsklip

14.2.1 *Status Quo* Assessment

No mitigating actions are required at the *status quo* stage.

14.2.2 Construction Phase

Access to the Site

- Two access points should be constructed to access the site;

External Road Upgrades

- The remaining pavement life of the R43 should be investigated and the possible improvement of the pavement should be investigated to support the additional traffic generated during the construction phase.

Internal Requirements

- A total of 900 parking bays should be provided on-site;
- Minibus taxis and buses should be provided to shuttle construction workers to the site. Public transport facilities should be constructed on-site to facilitate the loading and off-loading of workers;
- The construction of a road bypass for heavy construction vehicles around the town of Gansbaai should be investigated.

Further Studies Required

- The social and environmental impact of the additional traffic through Gansbaai, Caledon and Hermanus will require further investigation;
- A suitable site along the coast near the Bantamsklip site should be identified to allow loading and off-loading of the barge, which is proposed to transport abnormal loads from Cape Town harbour to the site. A landing facility would be required to be constructed at the appropriate location; and
- A comprehensive Construction Traffic Management Plan should be completed with the relevant authorities before construction commences.

14.2.3 Operations Phase

- A total of 950 permanent parking bays should be provided;
- A total of 30 minibus taxi and 4 bus trips per day should be provided to transport the Nuclear-1 staff;
- The DR 1206 should be upgraded to a surfaced road to provide a second emergency evacuation route towards Bredasdorp;
- The Bantamsklip site requires the promulgation of a new Restricted / Danger / Prohibited area for the air space over the proposed nuclear power station;
- The Bantamsklip site requires an application to be put forward to create an internal water exclusion zone required for a nuclear power station as per the Sea-Shore Act (Act No.21 of 1935).

14.3 Mitigating Actions – Thyspunt

14.3.1 *Status Quo* Assessment

No mitigation actions are required at the *status quo* stage. .

14.3.2 Construction Phase

Access to the Site

- Two access points, namely Western and Eastern Access, should be provided for the construction period of the Thyspunt site. The Western Access will be used for heavy construction vehicles and light vehicles. The Eastern Access will be used for light vehicles and the occasional abnormal loads;

External Road Upgrades

- The proposed Industrial and Southern Bypasses should be constructed to avoid construction traffic using the Humansdorp Main Street travelling between the N2 and the Oyster Bay Road;
- The Eastern Bypass should be constructed to avoid general traffic using the Humansdorp Main Street to travel between Voortrekker Road (R102) and the R330;
- Oyster Bay Road should be upgraded to a surfaced road for the construction period;
- DR1762 should be upgraded to a surfaced road to serve as link for the local residents and Thyspunt workers;
- The section of the R330 between Kromme River to the Thyspunt site should be upgraded to a Class 2 road with passing lanes and surfaced shoulder;
- Additional warning signage should be provided for the existing pedestrian crossing on R330 for the construction period;

Abnormal Load Route

- The temporary road improvements for the abnormal load route be constructed as recommended in the *Eskom Nuclear 1 Project: Thyspunt Site Abnormal Load Haul Road Investigation* report undertaken by Christopher Roberts in March 2011;
- Abnormal loads should be transported between 21:00 – 05:00 during the week and in daytime during the weekends;
- Additional warning signs should be provided at the pedestrian crossing along the R330 to ensure safety of pedestrians;

Internal Requirements

- A total of 900 parking bays should be provided on site for the construction period;
- Minibus taxi and buses should be provided to shuttle construction workers to the site. Public transport facilities will have to be constructed on-site to facilitate the loading and off-loading of workers;

Further Studies Required

- The social and environmental impact of the additional traffic on the Oyster Bay Road and R330 will require further investigation;
- The cost of the external road upgrades should be included in the financial feasibility model of this site.
- A comprehensive Construction Traffic Management Plan should be completed and approved by the relevant authorities before construction commences.

14.3.3 Operations Phase

- A total of 950 permanent parking bays are to be provided on the site;

- A total of 24 minibus taxi and 4 bus trips per day need to be provided to transport the Nuclear-1 staff;
- The Thyspunt site requires the promulgation of a new Restricted / Danger / Prohibited area for the air space over the proposed nuclear power station;
- The Thyspunt requires an application to be put forward to create an exclusion zone for ships required for a nuclear power station in terms of the Sea-Shore Act (Act No. 21 of 1935*)*.

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