ESKOM HOLDINGS SOC LTD

KOEBERG NUCLEAR POWER STATION
EXTENSION OF EXISTING CAR PARK

TRAFFIC IMPACT ASSESSMENT

HHO Africa
Infrastructure Engineers
Cape Town

7234
April 2017

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1.0 INTRODUCTION

1.1 BACKGROUND

An application has been made to extend the car park at Koeberg Nuclear Power Station to accommodate additional contract workers during outage periods. The current facility is not adequate to accommodate the surplus demand for parking, and has prepared a plan to extend the current facility.

The motivation for the project as supplied by the Project Manager is given below :

“KNPS performs a refuelling outage approximately every 18 months on each unit (i.e. between one and two outages per year). The outage duration is between 1 and 3 months depending on the work scope. The current car park facilities are inadequate to support the additional outage workforce. Additionally, to ensure continued operation of KNPS until 2045, major refurbishment and maintenance of the facility and its associated infrastructure is a necessity. During these major planned maintenance periods, additional staff and contractors are required on site for the successful completion of these activities. To accommodate the increase in staff and contractor numbers during these outage periods, Eskom has proposed an extension to an existing car park located on the KNPS site. This project will be a direct extension of the existing parking area and comprise of both paved and gravel parking bays. The gravel parking bays will cater for any overflow, especially when there is an overlap in shifts” (Ref 1).

"The Car Park Extension Project will provide an additional 206 permanent (paved) and 212 temporary (gravel) parking bays with an expected development footprint of approximately 11 000m². This will increase the number of parking bays at Access Control Point (ACP) 2 from 1015 to 1415 and the combined parking available at both ACP1 and ACP2 from 1185 to 1585 (a 34% increase)” (Ref 1). The conceptual layout is illustrated in Figure 1 overleaf).

The City of Cape Town has requested a traffic statement to accompany the application, as it is concerned that the access intersections, in particular the Main Access intersection with the R27, may not be able to accommodate the traffic flow increase associated with the increased parking activity on site.

1.2 SCOPE OF THIS REPORT

This report examines the traffic implications of the proposed extension of the ACP1 parking area at the Koeberg Nuclear Power Station.

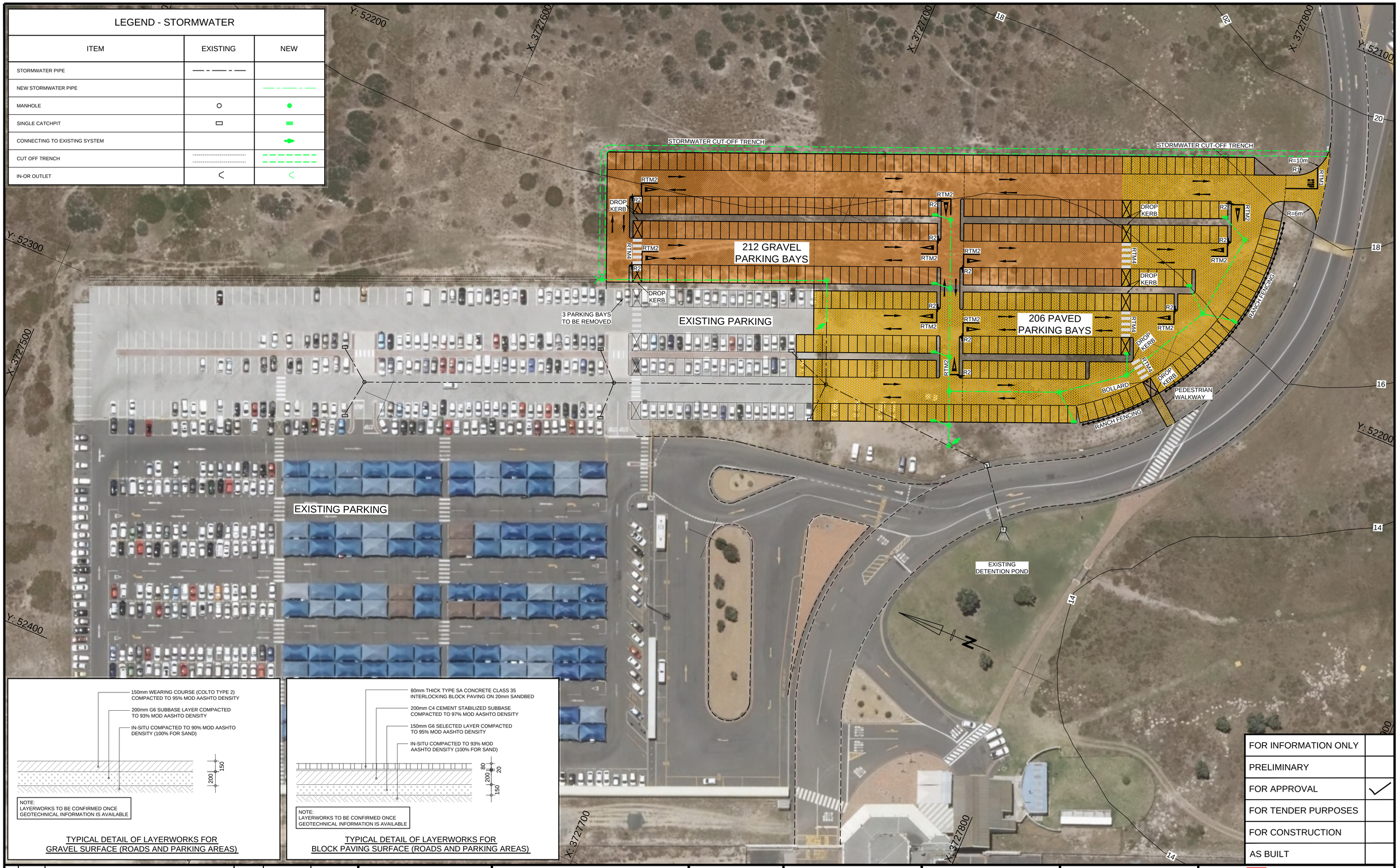
Traffic data for the existing situation on the surrounding road network was obtained by means of peak hour intersection counts, undertaken by HHO Africa.

Analyses of peak hour operations at the main access intersection with the R27 have been undertaken, for the existing situation (outside of outages), as well as during outage periods. No other developments have been included in the assessment.

The scope of the report extends beyond a traffic statement, as analyses of the main intersection were undertaken, and is hence termed a traffic impact assessment.

LEGEND - STORMWATER

ITEM	EXISTING	NEW
STORMWATER PIPE		
NEW STORMWATER PIPE		
MANHOLE		
SINGLE CATCHPIT		
CONNECTING TO EXISTING SYSTEM		
CUT OFF TRENCH		
IN-OR OUTLET		



TYPICAL DETAIL OF LAYERWORKS FOR GRAVEL SURFACE (ROADS AND PARKING AREAS)

TYPICAL DETAIL OF LAYERWORKS FOR BLOCK PAVING SURFACE (ROADS AND PARKING AREAS)

FOR INFORMATION ONLY	
PRELIMINARY	
FOR APPROVAL	✓
FOR TENDER PURPOSES	
FOR CONSTRUCTION	
AS BUILT	

REV	DATE	REVISION DESCRIPTION	DRAWN	DESIGNED	REV ENGINEER
01	AUG 2016	GRAVEL AND PAVING AMENDED	S.M.	A.L.	
02	AUG 2016	GRAVEL AND PAVING AREA AMENDED	S.M.	A.L.	

CONSULTING ENGINEER

DATE

CLIENT

DATE

0 10 20 30 40 50 60 70 80 90 100

100mm ON ORIGINAL PLAN

OneWay™ to zero harm

CLIENT

Eskom

KOEBERG NUCLEAR POWER STATION
R27 off WEST COAST ROAD
MELKBOSSTRAND
7441
TEL: (021) 550 5027

PROJECT

KOEBERG POWER STATION

DRAWING DESCRIPTION

COMPOSITE LAYOUT

WorleyParsons
resources & energy
P.O.Box 398
BELLVILLE 7535
TEL:+27 21912 3000
FAX:+27 21912 3222
e-mail: Capetown.office@WorleyParsons.com

DATE: MAY 2016

SCALE: (ORIGINAL A1) 1:500

DRG No.: C00278-WW-DAL-0003

REV.: 02

LOCATION: P:\Civil\4 New Civil Project Folders\Koeberg Parking\Drawings\01 Concept\C00278_Proposal New Parking Rev 0.dwg

FIGURE 1.1

2.0 EXISTING AND FUTURE TRAFFIC OPERATIONS

2.1 INTRODUCTION

Peak periods of traffic operations at the power station occur during the weekday AM and PM commuter peak periods. Therefore, for the purpose of this report, the impact of the proposed development will be assessed during the weekday AM and PM peak periods of operation.

2.2 COLLECTION OF DATA

2.2.1 Traffic Data

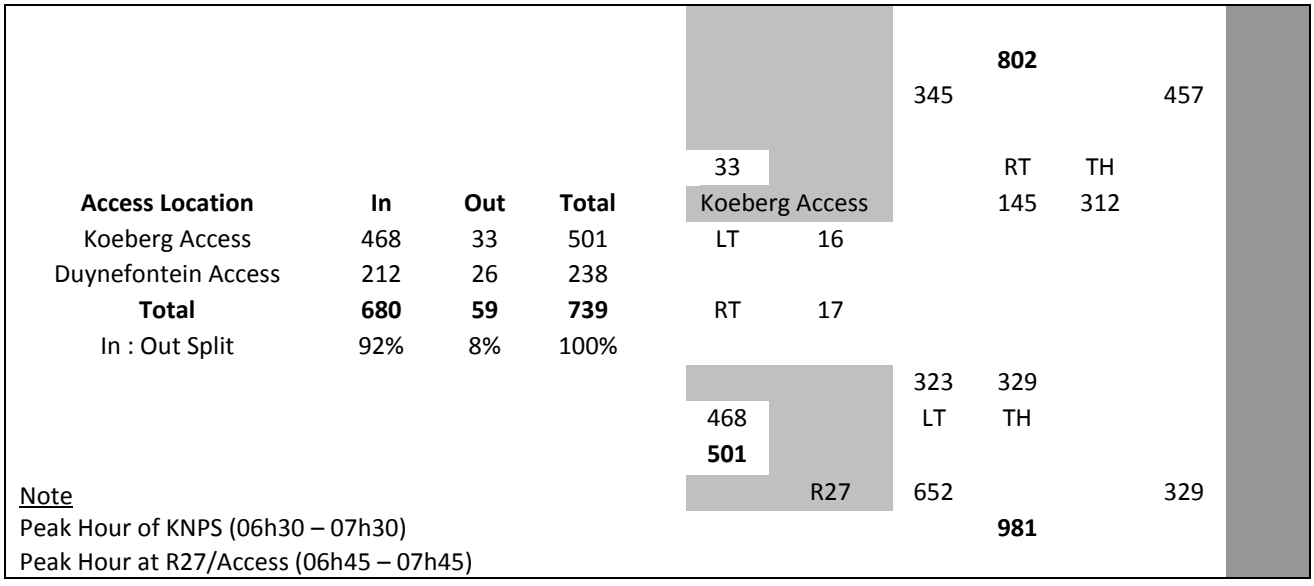
Weekday commuter peak period traffic counts were undertaken at the following intersections during March 2017 :

- West Coast (R27)/ Koeberg Access Road (unsignalised)
- Duynefontein Access to Koeberg (unsignalised)

The results of these counts are indicated in Figure 2.1 for the weekday AM and PM peak hours of operation. Historical traffic data was obtained from a previous report undertaken for a proposed administrative centre and training facility at the site, in 2007 (Ref 2).

The traffic survey was conducted during normal commuter peak periods (between 06h30 and 08h30, and 16h00 to 18h00), with office hours between 07h30 and 16h30. The movement pattern of shift workers are only partially captured by these counts. Most shift workers work three fixed 8-hour shifts, starting at 07h00, 15h00 and 23h00, while other security related shift workers work two shifts starting at 06h00 and 18h00. Their movements hence largely fall outside normal commuter periods.

Traffic data on existing access patterns at KNPS was obtained from the Nuclear Environmental Manager at the facility (Ref 3).



Access Location	In	Out	Total
Koeberg Access	468	33	501
Duynefontein Access	212	26	238
Total	**680**	**59**	**739**
In : Out Split	92%	8%	100%

FIGURE 2.1 : EXISTING TRAFFIC FLOWS AT KOEBERG POWER STATION : AM PEAK HOUR

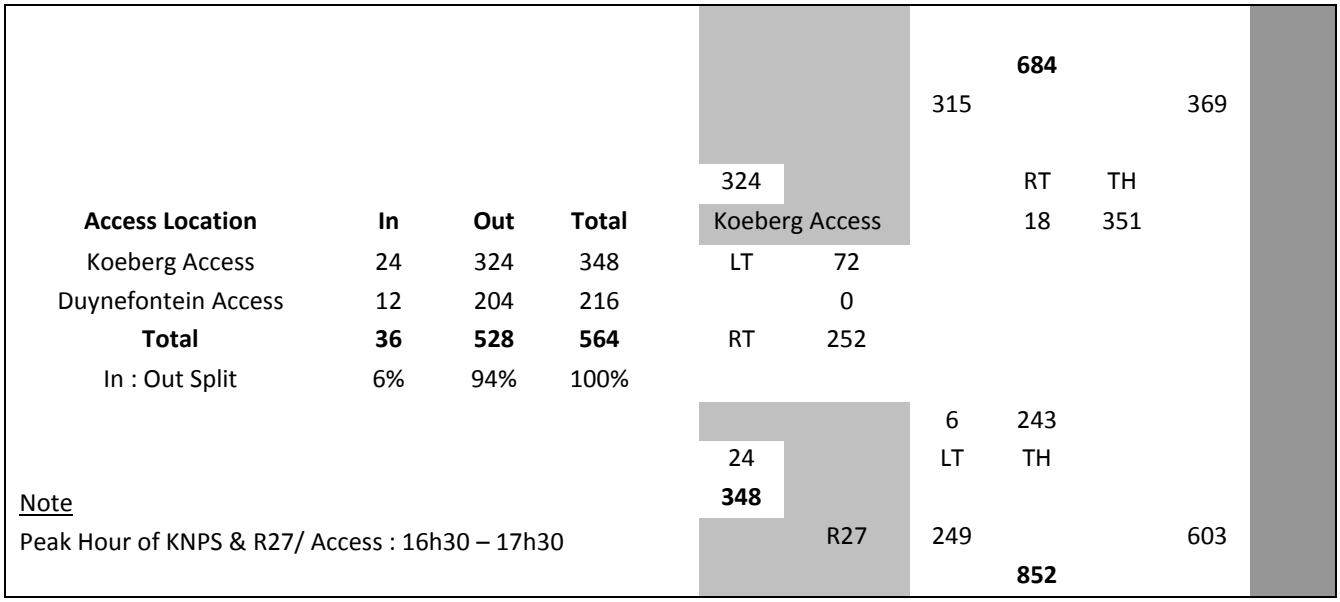


FIGURE 2.2 : EXISTING TRAFFIC FLOWS AT KOEBERG POWER STATION : PM PEAK HOUR

2.3 EXISTING TRAFFIC CHARACTERISTICS

2.3.1 Traffic Flows

Existing peak hour two way flows on the R27 and along the access roads are summarised in Figures 2.1 and 2.2 above. A comparison of historic and current traffic flows are given in Table 2.1 below.

TABLE 2.1 : COMPARISON OF HISTORIC & CURRENT TRAFFIC FLOWS ALONG R27 AT KOEBERG ACCESS

Location / Year	AM		PM	
	2007	**2017**	**2007**	**2017**
North of Koeberg Access				
Northbound	411	345	370	315
Southbound	346	457	528	369
Total	**757**	**802**	**898**	**684**
South of Koeberg Access				
Northbound	672	652	318	249
Southbound	298	329	691	603
Total	**970**	**981**	**1009**	**852**

The following general existing traffic characteristics along the R27 are notable :

- Traffic flows on the R27 at the Koeberg access are well below the capacity of this type of facility, i.e. ± 1 600 vehicles per hour per lane for a "rural primary arterial". The relatively low flows are to be expected given this location on the periphery of the Cape Town metro area.

- To the north of the access, the peak direction of travel is clearly southbound in the morning, as well as in the afternoon, but less so. This reverses to the south of the access, with a distinct northbound peak direction of travel in the mornings (and clearly southbound in the afternoons). This reflects the strong influence of the power station on traffic patterns in its vicinity.

- Traffic flow comparisons over the 10 year period show interesting trends; whereas traffic has remained largely constant in the AM peak hour, they have declined in the PM peak hour, e.g. to the north of the Koeberg access, traffic flows have decreased by 24% (from 898 veh/hr to 684 veh/hr). This is contrary to the general trend of increased traffic during peak periods. Two factors may contribute, i.e. a declining attraction of industry in Atlantis, and a possible modal shift from private to public transport following the introduction of the Integrated Rapid Transit (IRT) system, which includes Atlantis. This is of significance insofar as the operation of the access intersection serving Atlantis is concerned, in that the lower flows on the R27 in the PM peak hour in particular, creates more capacity for vehicles entering the R27 from the Main Access.

The following aspects related to peak hour traffic operations related to KNPS itself are noted:

- A distinctly tidal movement into the Koeberg complex in the mornings, and out in the afternoons, can be observed (93% in AM; 94% in PM).

- Peak hour traffic flows generated by the power station are 761 veh/hr in the AM peak hour, and 564 veh/hr in the PM peak hour. The higher flows in mornings can be ascribed to the close correspondence in starting times between office workers (07h30) and shift workers (07h00). In the afternoons, leaving times do not coincide, with office workers leaving at 16h35, while shift workers leave before 15h00, when the next shift starts.

- The origins or destinations of a significant proportion of vehicles are to the north of Koeberg, more so in the mornings (27%) than in the afternoons (15%). This may be due to a relatively higher proportion of shift and contract workers residing in Atlantis, whose times of leaving in the afternoons generally do not coincide with the peak hour.

- Although the main access on the R27 is the most important point of entry for workers at KNPS, with 69% (AM) and 62% (PM) of vehicles, the Duynefontein access fulfils an important function. Of the vehicles accessing KNPS from the south 58% do so via the main access in the AM peak hour, and 55% do so leaving in the PM peak hour. This consistency indicates that those whose preference is to gain entry via the main access, are also able to exit via this in the afternoons, without undue delays.

- The number of peak hour vehicles has increased fairly significantly over the 10 year period from 2007, inbound in the mornings from 552 to 680 veh/hr (23% increase) and by 28% outbound in the afternoons from 412 to 528 veh/hr.

- The increase in traffic results from the extension of administrative offices and establishment of training facilities, while the same proportional increase between peak hour entering and exiting traffic indicates that the balance of office and shift workers, as well as contract workers at the power station has remained similar in this period.

2.4 TRAFFIC OPERATIONS (AND PARKING REQUIREMENTS) RELATED TO OUTAGE PERIODS

The table below indicates the different categories of workers at KNPS and their numbers during normal (outside or outage) periods, short duration outages and long duration outages. The incidence of the outages are outlined in Section 1.1.

TABLE 2.2 : WORKER PROFILE AT KNPS RELATED TO OUTAGE OPERATIONS

Operational Period	Eskom Staff		Contract Workers	Total Workers
	Office Workers	Shift Workers		
Out of Outage	1 646	200	1 112	2 758
Short Duration Outage	1 332	514	1 988	3 834
Long Duration Outage	1 332	514	2 621	4 467

It is clear that the employee profiles change mainly due to the increased number of contract workers during outage periods. In order to calculate the increase in peak period operations, the distribution of contract worker activities is important. According to the KNPS Environmental Management office, during out of outage periods, an estimated 80% of contractors work normal office hours, while only 20% of the additional contractors do so during outage periods. This serves to distribute traffic operations related to the power station more evenly throughout the day, with less distinct (normal commuter) peaks in the mornings and afternoons.

Table 2.3 below calculates the number of workers (employees and contract) accessing the facility during normal commuter peak periods for the different operational periods.

TABLE 2.3 : KNPS WORKERS DURING COMMUTER PEAK PERIODS

Operational Period	Eskom Staff		Contract Workers	Total Workers
	Office Workers	Shift Workers[1]		
Out of Outage	1 646	40	890	2 576
Short Duration Outage	1 332	103	1 065	2 500
Long Duration Outage	1 332	103	1 191	2 626

Notes
1 : 20% of shift workers work during commuter peaks.
2 : 80% of contract workers work during commuter peaks outside outages, 20% of additional contract workers during outages.

It is clear from the table that the total number of workers entering or leaving the KNPS site during commuter peak periods remain largely constant, irrespective of the outage period. This is mainly because the majority of additional contract workers (80%) working in shifts outside of commuter peak periods, is offset by an increased number of employees (314) working shifts during outage periods, also mainly (80%) outside commuter periods.

It follows from the above that despite the increased activity at the power station during outage periods, their net impact on traffic operations during commuter peak periods is likely to be limited.

3.0 TRAFFIC IMPACT ASSESSMENT

3.1 INTRODUCTION

The traffic impact of the operations at Koeberg during outage periods is briefly assessed in this section. The functioning of the main access intersection on the R27 is assessed during weekday AM and PM peak hours, for the existing situation, and for the long outage periods, when there will be marginally more traffic routed through the intersection.

The intersection is currently priority controlled, i.e. stop controls on the minor street (main access) approach, and the main facility (R27) with free-flow conditions. During previous investigations, notably into the then considered new administration offices and training centre (Ref 2), it was proposed to signalise the intersection, as it would not have been able to accommodate the increases with the current controls in place. The Western Cape Government in response objected to the installation of signals, due to mobility restrictions and safety concerns, and proposed a grade separation alternative solution. This was assessed in a subsequent report (Ref 4).

3.2 TRAFFIC ANALYSIS

3.2.1 Introduction

The performance of the intersection has been assessed using procedures from the 2000 Highway Capacity Manual (Ref 5). A computerised version of the Manual, Highway Capacity Software HCS+ (Version 5.21) (Ref 6) has been used to facilitate the analysis.

A summary of the results of the analyses are given in Tables 3.1, and full details of the results are included in Appendix A.

TABLE 3.1: WEST COAST ROAD (R27)/ KOEBERG ACCESS ROAD : UNSIGNALISED ANALYSIS RESULTS

SCENARIO	PERFORMANCE MEASURE	AM PEAK HOUR			PM PEAK HOUR		
		EBRT	EBLT	SBRT	EBRT	EBLT	SBRT
Existing (2017)	Delay	22.9	10.3	10.1	27.5	10.2	8.0
	V/C Ratio[1]	0.08	0.02	0.18	0.64	0.10	0.02
	LOS[2]	C	B	B	D	B	A
Long Outage Period	Delay	22.9	10.3	10.2	30.7	10.2	8.0
	V/C Ratio	0.08	0.02	0.18	0.68	0.10	0.02
	LOS	C	B	B	D	B	A

Notes
1 : Volume/capacity ratio
2 : Level of Service

The analysis indicates that the results of the existing situation and the projected results when a long duration outage is in operation, are virtually identical. Given that the incremental additional demand during peak periods is so limited (2 626 vs 2 576), based on the calculations and assumptions in the previous section, this is to be expected.

The critical movement is the eastbound right turn from the access into the R27 southbound lane. The analysis indicates that it experiences on average reasonably long delays (around 28 sec/vehicle)

in the PM peak hour, but still operates at an acceptable level of service (LOS D). From observations in the field, the longest delays were experienced over a ½ hour period between 16h00 and 16h30 (average queue length around 10 vehicles).

From the analysis, it is unlikely that alternative intersection controls will be required to accommodate traffic operations during outage periods. More significant additional demand is likely to follow increased operational activity at Koeberg, which is likely to then require substantial upgrading to the access intersection.

It is noted that the speed limit on the R27 in the vicinity of the Koeberg access is 120km/hr, and that there is hence no moderation of speeds that would facilitate safer traffic operations at the access. This may have to be re-assessed if there are any concerns regarding the operation of the access.

3.3 PARKING

3.3.1 Parking Demand

The demand for parking outside and during outage periods at Access Control Point 1 (ACP1) is estimated in Table 3.2, as provided by the Environmental Manager at Eskom.

TABLE 3.2 : PARKING DEMAND RELATED TO OUTAGE OPERATIONS

Factor	Outside of Outages	Short Duration Outage	Long Duration Outage
Eskom Staff[1]	1046	732	732
Contractors	1112	1988	2621
Parking Need	1049	1322	1629
Available	1159	1159	1159
Shortfall	-110	163	470

Note
1 : Parking demand for only a portion of Eskom staff at ACP1, remaining outside.

With more workers on site throughout the day, the demand for parking increases substantially, hence the need identified by the utility to increase their main parking area.

The combined current parking supply at the facility is 1 159 bays, of which 1 015 is within the main consolidated parking area just outside the plant control point. A survey of the parking area on the day the traffic counts were undertaken, the maximum demand was for 790 bays, i.e. 78% utilisation, a surplus of 225 bays. This is somewhat more than the current surplus of 110 bays in the above table.

As indicated in the extract in Section 1, the projected shortfall of 470 bays is proposed to be accommodated through the extension of the existing parking area for an additional 206 permanent (paved) and 212 temporary (gravel) parking bays.

4.0 CONCLUSIONS

This report has investigated the traffic impact associated with the extension of the main parking area at Koeberg Nuclear Power Station, to provide a 418 bays, in order to accommodate a surplus demand for parking during outage periods. The analysis based on information supplied by KNPS indicates that the net impact of the expansion of the parking area on peak hour traffic operations at the main access intersection with the R27 will be negligible, and that the current priority intersection control has sufficient capacity to accommodate the limited increase in traffic demand.

Safety considerations may require the lowering of the speed limit from 120 km/h in the vicinity of the Koeberg access, regardless of the capacity available to accommodate limited traffic flow increases.

5.0 REFERENCES

1. ***Communique from Advision*** *(Mr Ryan Jonas)**.***

2. ***Koeberg Administrative Complex & Training Centre Campus***, TIA prepared for Eskom Holdings Ltd by HHO Africa. Cape Town, September 2007.

3. ***Communiques from Nuclear Environmental Manager, Nuclear Support*** *(Mr Deon Jeannes).*

4. ***Koeberg Nuclear Power Station : R27/ Main Access Intersection Investigation***, TIA prepared for Eskom Holdings Ltd by HHO Africa. Cape Town, August 2008.

5. ***Highway Capacity Manual HCM2000"***. Transport Research Board. National Research Council. Washington DC. 2000.

6. ***"Highway Capacity Software : Version 5.2"***. Transport Research Centre, University of Florida. Gainesville. 2000.

APPENDICES

A : RESULTS OF INTERSECTION ANALYSES

APPENDIX A

RESULTS OF INTERSECTION ANALYSIS :

R27/ KOEBERG MAIN ACCESS

A1 : AM PEAK HOUR : EXISTING SITUATION

A2 : AM PEAK HOUR : LONG DURATION OUTAGE PERIOD

A3 : PM PEAK HOUR : EXISTING SITUATION

A4 : PM PEAK HOUR : LONG DURATION OUTAGE PERIOD

Note : HCS analysis reflect US (right hand drive) conditions. To read for South Africa, reverse east and west, as well as left and right

TWO-WAY STOP CONTROL SUMMARY

Analyst: BD
Agency/Co.: HHO
Date Performed: 27/03/2017
Analysis Time Period: AM Peak Hour
Intersection:
Jurisdiction:
Units: U. S. Metric
Analysis Year:
Project ID: 7324 : Existing
East/West Street: Koeberg Access
North/South Street: West Coast Rd (R27)
Intersection Orientation: NS Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume		329	323	145	312	
Peak-Hour Factor, PHF		0.92	0.92	0.92	0.92	
Hourly Flow Rate, HFR		357	351	157	339	
Percent Heavy Vehicles		--	--	9	--	--
Median Type/Storage	Undivided		/			
RT Channelized?			No			
Lanes		1	1	1	1	
Configuration		T	R	L	T	
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	17		16			
Peak Hour Factor, PHF	0.92		0.92			
Hourly Flow Rate, HFR	18		17			
Percent Heavy Vehicles	0		0			
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			/
Lanes	1		1			
Configuration	L		R			

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config		L	L		R			
v (vph)		157	18		17			
C(m) (vph)		859	219		692			
v/c		0.18	0.08		0.02			
95% queue length		0.67	0.27		0.08			
Control Delay		10.1	22.9		10.3			
LOS		B	C		B			
Approach Delay				16.8				
Approach LOS				C				

TWO-WAY STOP CONTROL SUMMARY

Analyst: BD
Agency/Co.: HHO
Date Performed: 27/03/2017
Analysis Time Period: AM Peak Hour
Intersection: R27/ Koeberg Main Access
Jurisdiction:
Units: U. S. Metric
Analysis Year:
Project ID: 7324 : Future (Long Duration Outage)
East/West Street: Koeberg Access
North/South Street: West Coast Rd (R27)
Intersection Orientation: NS Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume		329	329	145	312	
Peak-Hour Factor, PHF		0.92	0.92	0.92	0.92	
Hourly Flow Rate, HFR		357	357	157	339	
Percent Heavy Vehicles		--	--	9	--	--
Median Type/Storage	Undivided		/			
RT Channelized?			No			
Lanes		1	1	1	1	
Configuration		T	R	L	T	
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	17		16			
Peak Hour Factor, PHF	0.92		0.92			
Hourly Flow Rate, HFR	18		17			
Percent Heavy Vehicles	0		0			
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			/
Lanes	1		1			
Configuration	L		R			

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config		L	L		R			
v (vph)		157	18		17			
C(m) (vph)		855	219		692			
v/c		0.18	0.08		0.02			
95% queue length		0.67	0.27		0.08			
Control Delay		10.2	22.9		10.3			
LOS		B	C		B			
Approach Delay				16.8				
Approach LOS				C				

TWO-WAY STOP CONTROL SUMMARY

Analyst: BD
Agency/Co.: HHO
Date Performed: 27/03/2017
Analysis Time Period: PM Peak Hour
Intersection: R27/ Koeberg Main Access
Jurisdiction:
Units: U. S. Metric
Analysis Year:
Project ID:
East/West Street: Koeberg Main Access
North/South Street: West Coast Rd (R27)
Intersection Orientation: NS Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume		243	6	18	351	
Peak-Hour Factor, PHF		0.92	0.92	0.92	1.00	
Hourly Flow Rate, HFR		264	6	19	351	
Percent Heavy Vehicles		--	--	14	--	--
Median Type/Storage	Undivided		/			
RT Channelized?			No			
Lanes		1	1	1	1	
Configuration		T	R	L	T	
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	252		72			
Peak Hour Factor, PHF	0.92		0.92			
Hourly Flow Rate, HFR	273		78			
Percent Heavy Vehicles	2		2			
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			/
Lanes	1		1			
Configuration	L		R			

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config		L	L		R			
v (vph)		19	273		78			
C(m) (vph)		1227	425		775			
v/c		0.02	0.64		0.10			
95% queue length		0.05	4.38		0.33			
Control Delay		8.0	27.5		10.2			
LOS		A	D		B			
Approach Delay				23.6				
Approach LOS				C				

HCS+: Unsignalized Intersections Release 5.3

TWO-WAY STOP CONTROL SUMMARY

Analyst: BD
Agency/Co.: HHO
Date Performed: 27/03/2017
Analysis Time Period: PM Peak Hour
Intersection: R27/ Koeberg Main Access
Jurisdiction:
Units: U. S. Metric
Analysis Year:
Project ID: 7324 : Future (Long Duration Outage)
East/West Street: Koeberg Access
North/South Street: West Coast Rd
Intersection Orientation: NS Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume		243	6	18	351	
Peak-Hour Factor, PHF		0.92	0.92	0.92	0.92	
Hourly Flow Rate, HFR		264	6	19	381	
Percent Heavy Vehicles		--	--	14	--	--
Median Type/Storage	Undivided		/			
RT Channelized?			No			
Lanes		1	1	1	1	
Configuration		T	R	L	T	
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	257		73			
Peak Hour Factor, PHF	0.92		0.92			
Hourly Flow Rate, HFR	279		79			
Percent Heavy Vehicles	2		2			
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			/
Lanes	1		1			
Configuration	L		R			

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config		L	L		R			
v (vph)		19	279		79			
C(m) (vph)		1227	409		775			
v/c		0.02	0.68		0.10			
95% queue length		0.05	4.94		0.34			
Control Delay		8.0	30.7		10.2			
LOS		A	D		B			
Approach Delay				26.2				
Approach LOS				D				