

CONTENTS

1. Introduction.....	1
2. Methodology used in the Study.....	1
2.1 General.....	1
2.2 Collection and Review of Data.....	1
2.3 Data Processing and Reporting.....	1
3. Background.....	2
3.1 General.....	2
3.2 Road Network in the Area.....	2
3.3 Site of the Bridge.....	4
3.4 Proposed Bridge.....	4
4. Existing and Predicted Traffic.....	5
4.1 Existing Traffic.....	5
4.2 Predicted traffic.....	6
4.2.1 Traffic resulting from the Ingula Bridge Project.....	6
4.2.2 Normal traffic growth.....	6
5. Potential Traffic Impacts of Ingula Bridge.....	7
5.1 General.....	7
5.2 Traffic Capacity.....	7
5.3 Safety and Speed.....	7
5.4 Other Peripheral Issues.....	7
6. Conclusions and Recommendations.....	7

LIST OF TABLES

Table 4-1: Traffic Counted on Road D474 5
Table 4-2: Traffic Growth Scenarios on Road D474..... 6

LIST OF FIGURES

Figure 3-1: Locality Plan showing site of proposed Bridge 3
Figure 3-2 Road D474 Approaching the Bridge Site from the West..... 4
Figure 3-3 Road D474 crossing the Bridge Site and proceeding North-East..... 4
Figure 3-4: Layout Plan of the Proposed Ingula Bridge..... 5

LIST OF ABBREVIATIONS

AADT	Average annual daily traffic
EIA	Environmental Impact Assessment
SSI	SSI Engineers and Environmental Consultants (Pty) Ltd
TIA	Traffic Impact Assessment
vpd	vehicles per day
v/hr	vehicles per hour

1. INTRODUCTION

The Ingula Pumped Storage Scheme comprises two reservoirs (referred to as upper and lower reservoirs, respectively), underground powerhouse complex, waterway tunnels linking the reservoirs with the powerhouse complex, access roads and transmission lines. Part of the scheme includes the construction of a new bridge to carry an existing gravel road over the Braamhoekspruit, as the existing bridge may become inundated for longer periods due to the flood management within the Scheme. This new bridge is referred to as the Ingula Bridge.

In June 2008 Zitholele Consulting was commissioned by Eskom to carry out a Basic Environmental Assessment of the proposed Ingula Bridge. Zitholele Consulting requested SSI Engineers and Environmental Consultants (Pty) Ltd to carry out the Traffic Impact Assessment as part of this Assessment. This report provides results of the Traffic Impact Assessment.

2. METHODOLOGY USED IN THE STUDY

2.1 General

The Project is specifically designed to benefit the traffic using the exiting road and although some additional delays and disruption may occur during the construction of the proposed Bridge, the general result of the Project will be positive, when compared with the existing situation. The Project in itself has no propensity to generate traffic and although the proposed bridge may improve this route which could attract some traffic from other routes, the possibility for this to happen is small. The scope of the traffic impact assessment was therefore limited to determining the existing and predicted future traffic and assessing the general impact of the project on this traffic.

2.2 Collection and Review of Data

Data relating to the Project was obtained mainly from the Detailed Design Report Volume 1: Access Roads for the Braamhoek Pumped Storage Scheme (Eskom Holdings Limited, prepared by Braamhoek Consultants Joint Venture) September 2006. This information was supplemented by information from site, maps, drawings provided by ESKOM and general information on the project.

2.3 Data Processing and Reporting

The data collected was then processed to provide the following, which forms the basis for this report:

- General background description of the Ingula Bridge Project (given in Section 3).
- Existing and Predicted Traffic (Section 4).
- Potential traffic impacts of the Proposed Ingula Bridge (Section 5).
- Conclusions and recommendations (Section 6).

3. BACKGROUND

3.1 General

The Ingula Pumped Storage Scheme comprises two reservoirs (referred to as upper and lower reservoirs, respectively), underground powerhouse complex, waterway tunnels linking the reservoirs with the powerhouse complex, access roads and transmission lines. The lower reservoir is located on the Braamhoekspruit. The schemes received an authorisation in 2004, and the access roads in April 2006.

A gravel road crosses the Braamhoekspruit via a low water bridge, located approximately 2 km downstream of the lower reservoir. The gravel road is used frequently by the local communities and other road users. This bridge gets flooded when there are heavy rains because of its technical design and specification. Although the magnitude of flood peaks downstream of the lower reservoir will be reduced, the duration of these reduced peaks will be over a longer period due to the attenuation effect and release system of the reservoir. This could result in longer duration of overtopping of the low water bridge than is experienced without the lower reservoir. To mitigate this extended period of overtopping, a normal bridge with adequate opening to accommodate large flows without overtopping is to be constructed as part of the scheme.

3.2 Road Network in the Area

The gravel road crossing the proposed bridge is identified as Provincial Road D474. Some of the roads in the area surrounding the site are being upgraded as part of the Scheme and several of these will become surfaced roads, to provide access to the Ingula PSS developments. Although part of this road was considered to be upgraded, it is not one that finally formed part of the access network to the PSS. It has therefore not received any upgrading under the main Scheme.

The D474 connects into the D48 at its southern end, which in turn links into the general road network providing access from the area into firstly Peace Town, and then Ladysmith as the regional service centre. From the junction with the D48 the D474 proceeds to the bridge site and then extends in a north-easterly direction to serve the farming community in the area, and ultimately linking back into the road network serving Lucitania and Driefontein, which ultimately link back to Ladysmith directly.

From the existing mapping the main farms served by the bridge on this road are Zaaifontein, Kruisfontein and Rooikop. However there is the possibility of through traffic using the route to access the main N3 National Route, to travel to Durban, Johannesburg or other national destinations.

The location of the site of the Bridge, the surrounding roads and the Ingula PSS is shown in the following plan:

3.3 Site of the Bridge

The following photographs show the site of the bridge and illustrate the standard of the existing road.

Figure 3-2 Road D474 Approaching the Bridge Site from the West



Figure 3-3 Road D474 crossing the Bridge Site and proceeding North-East

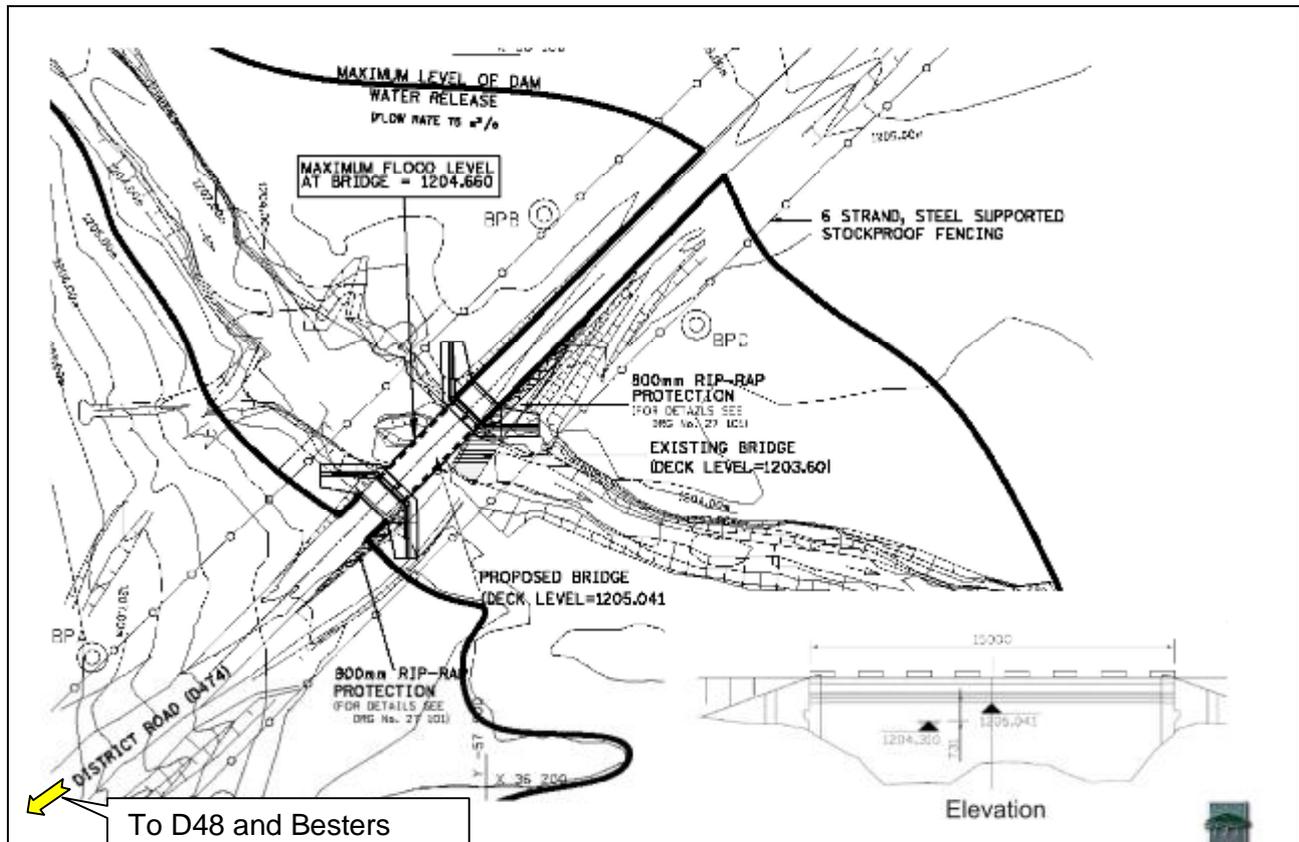


The existing road is a gravel road of approximately 7 – 8 metres in width. For a gravel road it is in fair to good condition, although with some signs of wear from traffic. The existing crossing of the Braamhoekspruit is a 5 metre wide (single lane) low level bridge, which is placed at right angles to the stream flow, resulting in rather poor horizontal alignment of the approaches to the crossing.

3.4 Proposed Bridge

The proposed bridge is to be a single 15 m span structure of the same width as the existing, constructed with a finished deck level approximately 1.4 m above the existing deck level. This will be constructed on an improved alignment, to remove the curves on the approaches to the Bridge. A sketch plan of the proposed layout is shown in the following figure.

Figure 3-4: Layout Plan of the Proposed Ingula Bridge.



The proposed bridge will improve the capacity of the structure considerably, thus addressing the main objective to reduce delays due to inundation of the structure. It will also provide benefits in terms of improved road alignment

4. EXISTING AND PREDICTED TRAFFIC

4.1 Existing Traffic

From the Kwa-zulu Natal Department of Transport the following traffic figures for the D474 were obtained:

Table 4-1: Traffic Counted on Road D474

Annual Average Daily Traffic (AADT)	98 vpd
Percentage heavy vehicles	15%
Year of count	1999

The location of this traffic count is close to the intersection with the D48, at the southern end of the road.

Traffic on the D48 to the north of the intersection with the D474 was counted at 59 vpd with 29% heavy vehicles in 2004.

4.2 Predicted traffic

4.2.1 Traffic resulting from the Ingula Bridge Project

The Ingula Bridge project itself will not result in the generation of any new traffic, other than a small amount of construction traffic. This construction traffic will be specific to the construction period and will not result in any long term change to the normal traffic patterns. There is no real potential for diversion of traffic resulting from the construction of the Bridge itself.

4.2.2 Normal traffic growth

The normal growth in traffic in a well established rural area (i.e. where agricultural potential has already been developed) can be lower than national norms. In an area where a change in land use is likely, then traffic growth rates can be considerably higher than normal. With the development of the Ingula PSS the land use in the area will change but the traffic growth on the D474 specifically is unlikely to be significantly affected, as it is not anticipated that either work/production or commuting trips would use this road link. However the fact that higher standard access roads, such as the D48, will be constructed in the area, may mean that some traffic from the area travelling to destinations in other parts of the country may find this link attractive to get onto the national network.

As no other information was available to estimate the traffic growth on the road, four scenarios were tested, with growth at 2%, 3%, 4% and 5% per year were calculated. Applying this growth to the above traffic results in the following likely traffic flows:

Table 4-2: Traffic Growth Scenarios on Road D474

YEAR	2% GROWTH		3% GROWTH		4% GROWTH		5% GROWTH	
	Est. AADT vpd	Est. Peak Hour vphr	Est. AADT vpd	Est. Peak Hour vphr	Est. AADT vpd	Est. Peak Hour vphr	Est. AADT vpd	Est. Peak Hour vphr
1999	98	8	98	8	98	8	98	8
2008	117	10	128	11	139	12	152	13
2010	122	10	136	11	150	13	168	14
2030	181	15	245	20	329	27	445	37

This table shows that traffic on the D474 road in 2008 between 117 and 152 vehicles per day. If traffic grows at 2% per year, by 2030 traffic will be at a level of 181 vehicles per day, while if it grows at 5% per year, then it will reach 445 vpd by that date.

5. POTENTIAL TRAFFIC IMPACTS OF INGULA BRIDGE

5.1 General

The potential traffic impacts of the Ingula Bridge are all entirely positive. The main aspect of the project is to address the potential delay due to the extended flooding of the Braamhoekspruit, as a result of the water release management practiced in controlling the out flow from the lower reservoir of the Ingula PSS. These delays could have affected all traffic on the road for as much as several hours. The proposed Ingula Bridge will at least reduce the occurrence of these delays to exceptional flood circumstances (>1:50 year flows). There are no direct adverse impacts for or from traffic resulting from the project, as the project itself does not generate traffic. The normal criteria are briefly reflected in the following paragraphs.

5.2 Traffic Capacity

The theoretical traffic capacity of the proposed Bridge is the same as the existing, based upon the geometric size of the structure. However the actual capacity is improved due to improved horizontal and vertical alignment of the approaches to the bridge, and improved visibility of the structure.

The traffic capacity of a single lane bridge depends upon the length of the structure, but is in excess of 500 vehicles per hour. The traffic figures in the previous paragraph indicate that traffic volumes will not reach this level within the 20 years assessed, even if the traffic grows at the higher rate.

5.3 Safety and Speed

The proposed Ingula Bridge has significantly improved alignment of the approaches, when compared to the existing bridge. On geometric characteristics alone, the likely hood of traffic accidents should be reduced. The improved alignments may, however, lead to an increase in the general speed of traffic, which may create a dangerous situation where traffic approaching the bridge may have to stop to allow on-coming traffic to clear the single lane structure before proceeding. The following traffic signs must be provided as a minimum:

- Advance warning signs for a narrow bridge ahead must be placed 200 m away from bridge on both approaches. This is the stopping sight distance required for a vehicle travelling at 100 km/h on a 5% downgrade.
- “Yield to on-coming traffic” signs must be placed on both ends of the structure. Vehicles approaching the structure must give way to other vehicles already on the structure.
- 60 km/h speed limit control signs should be placed 100 m from the structure on both approaches to the proposed Bridge.

5.4 Other Peripheral Issues

The Ingula Bridge Project does not generate any traffic in itself, and any change in factors such as air pollution, noise, dust and visual intrusion will be extremely minor. The rural environment of the site, with relatively little human habitation, implies that the surroundings are not sensitive to this degree of change in traffic characteristics.

6. CONCLUSIONS AND RECOMMENDATIONS

The conclusions of the study can be summarised as follows:

- The impact of the proposed Ingula Bridge Project on traffic is generally positive resulting from:

-
- Reduced delays to all traffic, as a result of less frequent flooding of the road;
 - Improved road alignment providing:
 - § Improved geometric safety and visibility.
 - § Improved capacity of the river crossing.
 - § Higher operating speed.
 - The main negative impact is due to the higher operating speed of traffic in a situation where it may be necessary for a vehicle to stop, due to on-coming traffic being on the single lane structure at the time. This negative impact is mitigated by the improved visibility on the approaches, which will allow drivers to take appropriate action if this circumstance arises. This negative impact is further mitigated by ensuring the appropriate road signs are installed to alert drivers to the possible need to stop.

The recommendation of the Traffic Impact Assessment for the proposed Ingula Bridge is that, from a traffic point of view, the project should proceed as soon as possible. The only requirement for mitigation measures is the installation of appropriate traffic signage, as suggested in Section 5, on the approaches to the new bridge.