APPENDIX N: TRAFFIC IMPACT ASSESSMENT REPORT

SLR Ref. 755.03048.00001
Report No.1

ENVIRONMENTAL IMPACT ASSESSMENT AND
ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT
FOR THE DEVELOPMENT OF THE PROPOSED COZA
(JENKINS SECTION) MINE

April 2016

TRAFFIC INVESTIGATION OF THE PROPOSED JENKINS IRON ORE MINE

TRAFFIC IMPACT STATEMENT

FINAL REPORT

MARCH 2016

Completed by:

TTTAfrica
Transportation & Traffic Technology Africa (Pty) Ltd

TTTAfrica

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Job No:	Project:
81170	Jenkins Iron Ore Mine

Description/Synopsis:
TTT Africa was appointed to carry out a Traffic Impact Study for Jenkins Iron Ore Mine

Keywords:	Version:
Traffic and Transportation: Traffic Engineering	**FINAL**

Client Name(s):	Organization:
Chiara Kotze	SLR Consulting

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Verification	Name	Signature	Date
Project Leader/ Author(s)	Ms Thato Mariti (B.Sc.Eng)		31.03.2016
Project Director	Mr A J Joubert (Pr Eng)		31.03.2016

Copy Nos	Name	Organization	Delivery Method	Date
1		TTT Africa	Office Copy	31.03.2016
2	Ms Chiara Kotze	SLR Consulting	email	31.03.2016
3				

Retain unbound original and at least one bound copy on project file. This is copy no …. of …

SPECIALIST REPORTING REQUIREMENTS AS PER APPENDIX 6 OF THE EIA REGULATIONS 2014

This letter has been prepared to report on the compliance of (Transportation and Traffic Technology TTT Africa (Pty) Ltd) as part of the specialist reporting requirements listed in Appendix 6 of the Environmental Impact Assessment Regulations, 2014 from the National Environmental Management Act, 1998 (Act no. 107 of 1999).

1.(a)(i) Details of the specialist who prepared the report

Name: Andries, Surname: Joubert, Qualification: M.Eng (Transportation)

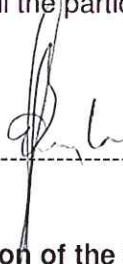**1.(a).(ii) The expertise of that specialist to compile a specialist report including a curriculum vitae**

Company of Specialist:	Transportation and Traffic Technology Africa (PTY) LTD		
Name / Contact person:	Andries Joubert		
Postal address:	P.O. Box 1109, Sunninghill, Johannesburg, Gauteng		
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Qualifications	*B.Sc (Civil Eng), B.Eng. (Hons) (Transportation), M.Eng (Transportation)*		
Registration / Associations	Professional Engineer, ECSA Registration No.:830576 Fellow of the South African Institution of Civil Engineers		

1.(b) a declaration that the specialist is independent in a form as may be specified by the competent authority

I, Andries Joubert, declare that -

- I act as the independent specialist in this application;

- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;

- I declare that there are no circumstances that may compromise my objectivity in performing such work;

- I have expertise in conducting the specialist report relevant to this application, including knowledge of the relevant legislation and any guidelines that have relevance to the proposed activity;

- I will comply with the applicable legislation;

- I have no, and will not engage in, conflicting interests in the undertaking of the activity;

- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;

- All the particulars furnished by me in this form are true and correct

----

1.(c) an indication of the scope of, and the purpose for which, the report was prepared

Refer to Section 2 for the scope of the report. The study investigates the impact of additional traffic by Jenkins mine on the surrounding road network and intersections, and make recommendations on mitigation measures.

1.(d) the date and season of the site investigation and the relevance of the season to the outcome of the assessment

Site visit/investigation: The site visit was conducted in November 2013 for Driehoekspan 435 and Doornpan 445 studies on R325 Route. The road characteristics are still the same.
Date: November 2013
Season: Normal weekday traffic survey
Relevance of the season to the outcome of the assessment: This is the critical season with high volumes on the road.

1.(e) A description of the methodology adopted in preparing the report or carrying out the specialised process

The study looked at the existing background traffic volumes, the current operations at the local intersections and road network. An annual growth rate was assigned to the background traffic volumes to estimate the future horizon year traffic volumes. Site generated trips were assigned to the road network based on the existing travel patterns and also added to the future traffic volumes. Analysis of the local intersections and accesses were conducted. The safety of the mine access was evaluated from the traffic volumes and road survey. Conclusions and recommendations were made based on the analysis.

1.(o) A description of any consultation process that was undertaken during the course of preparing the specialist report;

Consultation with the SLR project manager

1.(p) A summary and copies of any comments received during any consultation process and where applicable all responses thereto
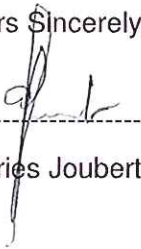
Not Required

1.(q) any other information requested by the competent authority.

No information requested however, Improvement to access and intersection on Route R325 to be done to Northern Cape Provincial Roads standards.

If you have any queries regarding the above, please do not hesitate to contact me.

Yours Sincerely

Andries Joubert Pr. Eng

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APPENDICES/ANNEXURES

APPENDIX A: LOCALITY PLAN AND SITE DEVELOPMENT PLAN, LEVEL OF SERVICE RESULTS

1   INTRODUCTION

Traffic and Transportation Technology (TTT) Africa (Pty) Ltd was appointed by Ms Chiara Kotze of SLR consulting to conduct a traffic impact assessment for the Iron Ore Mining on Farm Jenkins 562, North-West. The study is done in accordance with the *Manual of Traffic Impact Studies published by the Department of Transport, 1995.*

The proposed Jenkins mine is one of the COZA Iron Ore Project which involves the mining of iron ore from three Farms namely Driehoekspan 435 (Remaining Extent), Doornpan 445 (Portion 1) and Jenkins 562 (Portion 1 and Remaining Extent). TTT Africa was previously involved in the investigation of the other two Farms Doornpan and Driehoekspan.

The proposed site for Jenkins mine will straddle the existing R325 provincial road (although all mining activities are expected to take place to the north of the R325). The study investigates the impact of additional traffic by Jenkins mine on the surrounding road network and intersections. In terms of the guideline, a full traffic impact analysis is required to be carried out if more than 150 vehicle trips per hour will be generated by any development. This should include conducting vehicle count surveys, conflicting turning movement analysis, and intersection performance analysis and road safety assessment if applicable. Jenkins mine study will generate less than 150 vehicle trips per hour and therefore; will only require a traffic impact statement.

2   SCOPE OF THE STUDY

- Collection of background traffic information to determine the status quo;
- Determination of the trip generation resulting from the activities of the mine, during construction and full operation of the mine. Distribute and assign the site generated traffic on the local road network and intersections.
- Assessing the impact of transportation aspects related to the mining activities; the capacity analysis of the Route R325 (Postmasburg -Sishen), including the intersection analysis.
- Identify the traffic safety aspects on the local routes, intersections and accesses.
- Determine the effect of additional traffic on the existing road pavements for maintenance needs
- Present the traffic impact study results in the report

3   LOCATION OF SITE

The Farm Jenkins 562 is located approximately 40 km north of Postmasburg Town in the Tsantsabane Local Municipality of the Northern Cape Province. This proposed mining project will be an addition to two other sister mines on Farms Driehoekspan 435 and Doornpan 445, also north of Postmasburg Town. A layout showing the locality map of the project area is shown in **Figure 1** below.
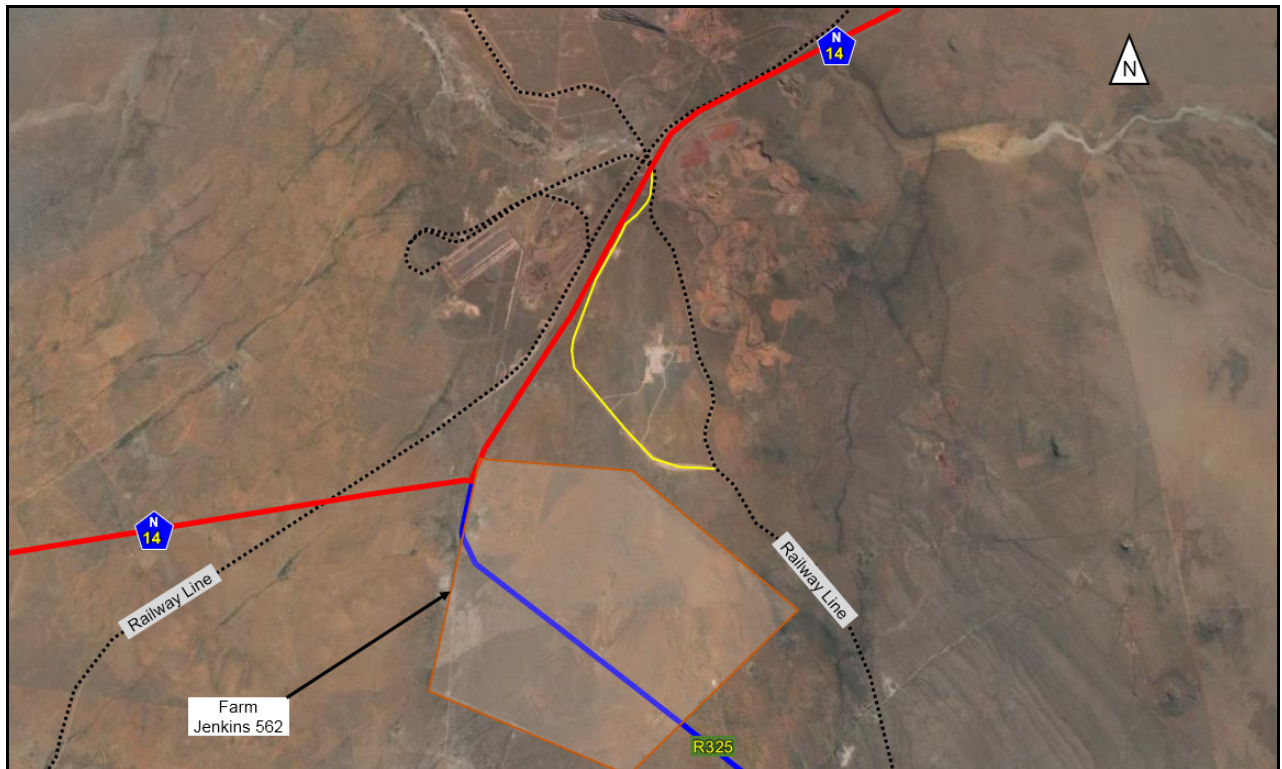
 FIGURE 1:   **Locality Plan**

4   LAYOUT OF MINE

4.1   Mine Boundary

The proposed development will comprise iron ore mining, adding to other existing iron ore mines in the local area. The mining for rights at Jenkins will be held by COZA Iron Ore Project and the project will be a 5Mtpa open pit mine. Other mining infrastructure includes on site crushing and screening facilities, topsoil, product and waste rock stockpiles as well as a rail loop connecting the site to the main Transnet Freight Line. **Figure 2** below shows the proposed Jenkins Mining Right Boundaries.
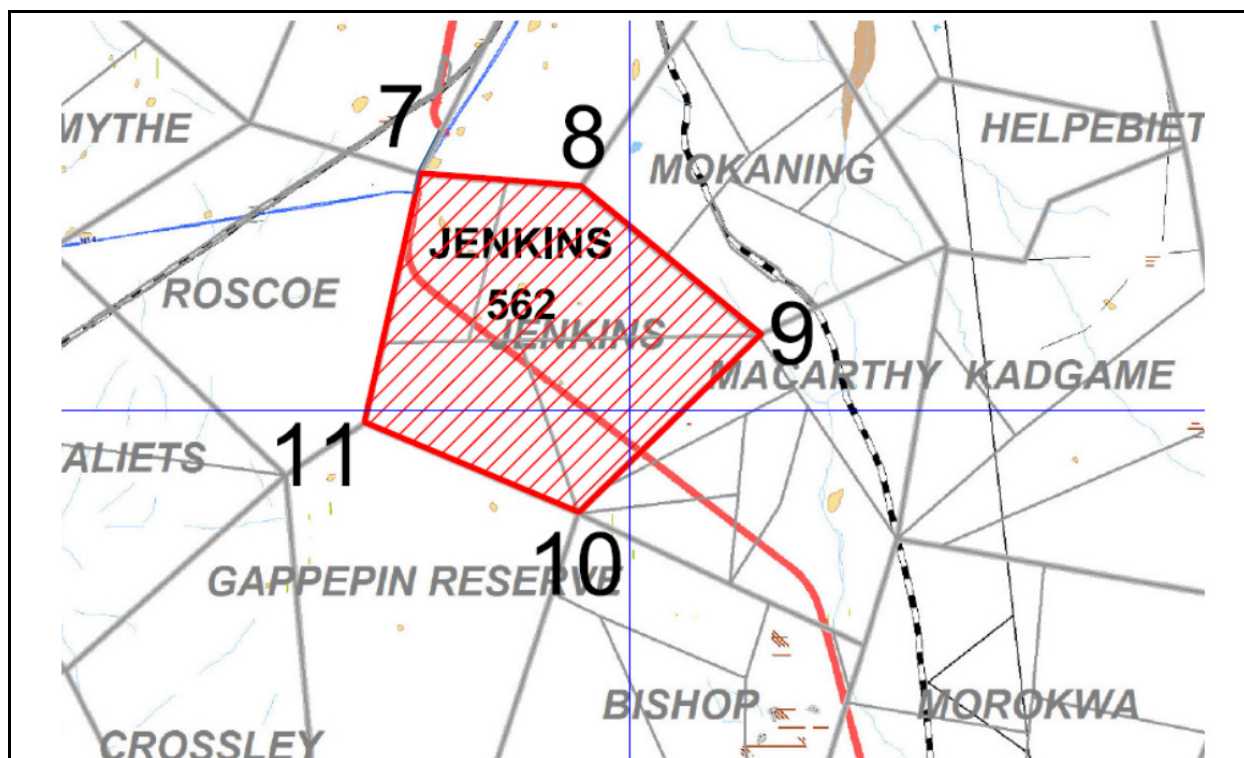
FIGURE 2:   Proposed Jenkins Mining Right Boundaries

4.2   Existing and Proposed Land Use

The site is currently used for Farming and it is proposed to be rezoned for mining activities. The mine will be an open pit operation undertaken by means of truck and shovel. The mining operations will include planning, drilling, blasting, loading and hauling. The mine is planned to operate 299 days per annum allowing for public holidays and Sundays. The mine will operate on a 24 hour basis with two 10 hour shifts and it is expected to be operational for approximately seven years.

5   EXISTING ROAD NETWORK

The existing and future road network in the surrounding area can be described as follows:

- **N14** – is a national road running in an east-west and then north-south direction past the northern boundary of the proposed mine. It is a two lane road with a single lane per direction. It passes through the towns of Upington to the west and Vryburg to the east.
- **R325** – is a major provincial road to Postmasburg, and the farm Jenkins 562 straddles the road. It is a two lane road with a single lane per direction. It should be noted that proposed mining operations will take place to the north of the R325 only, even though the road bisects the farm Jenkins.

6   TRAFFIC VOLUMES

6.1   Traffic Counts

Vehicle traffic counts for the previous and recent studies were used for the current investigation. The counts were conducted on 26 and 27 November 2013 at the accesses of Farm Driehoekspan 435 and Doornpan 445 along the R325. 12 Hour classified manual counts were done during the normal weekday between 06h00 to 18h00. The vehicles were classified as either light vehicles or heavy vehicles. The critical count was for 27 November 2013 with higher traffic volumes. Therefore; this count was used for this study.

Due to the closure of some of the local mines, traffic on the local road network has reduced. However, a more conservative traffic growth rate has been applied to the 2013 traffic counts. A growth rate of five percent per annum was applied to these counts to allow for the background traffic growth along the R325.

6.2   Background Traffic Volumes

Table 6-1 below shows the projected 2016 background traffic volumes passing through Jenkins farm on the R325 route. The morning peak hour occurred between 06h00 and 07h00. The afternoon peak hour occurred between 15h45 and 16h45. There are approximately 323 two-way vehicles during the morning peak hour and 493 two-way vehicles during the afternoon peak hour. The highest 12 hour volume was 3 629 two-way vehicles.

A factor of 1.21 was applied to the 12 hour volume to estimate the Average Daily Traffic (ADT) passing by the proposed site and a total of 4 393 two-way vehicles was estimated.

Table 6-1: Traffic on R325 past the Proposed Jenkins Mine Site

Peak Hour	Time		Traffic Volumes Per Direction		
			To North	To South	Two-way
AM Peak	05:45	06:45	216	107	323
Off Peak	13:00	14:00	201	128	329
PM Peak	15:45	16:45	304	189	493
12 Hour			2 213	1 416	3 629
ADT (Estimated)			2 679	1 714	4 393

7   ACCESS

Access to the Jenkins 562 mine will be via the existing access from the R325 as shown on **Plan A** below (Picture from Google Earth). The site has a gravel access road forming a T-intersection with the major R325 road. For heavy vehicles which require a longer time of 12 seconds to pull away and turn from stop, longer clear sight distances are necessary. The

alignment of the main road is straight and flat at the access position. Good and adequate sight-distance in excess of 300 m is available on the main road and from the mine access in all directions. It is proposed that the existing access location remain.

PLAN A: Existing Access to Jenkins 562 Mine (Google Earth Photo)

It would be advisable to surface at least the bell-mouth section of the gravel roads leading into the intersection. This prevents gravel being spilled onto the main road which could lead to skidding and loss of control of high speed vehicles on the main road.

8   TRIP GENERATION

The proposed iron ore mine will generate traffic in two phases, during the construction of the mine and the actual operation of the mine.

Construction Phase

The construction phase is expected to generate fairly lower trips compared to the operational phase. The construction phase will take place over a relatively short period of time and only the contractor(s) with limited workforces will work on site during this phase. Therefore; the analysis and traffic assessment is based on the operational phase as it is considered the most critical with higher traffic volumes.

Operational Phase:

The South African Trip Generation rates manual, 1995, does not have trip generation rates for the mine land use. A trip generation was based on the expected number of mine employees. According to the *specialist information document* from SLR Consulting, the mine will have 108 production personnel, 54 permanent managing staff and 20 contracted supporting staff, adding to a total of 182 employees. The mine will provide an 85 seater bus for transporting some of the mine employees.

It is expected that 90% of the general workforce will make use of the bus transport provided by the mine. The work shifts at Jenkins 562 mine will be as follows:

- 1 day shift per day for specialists and administration staff
- 2 shifts per day for the mining staff, one during the day and the other during the night

The two shifts for administration staff and mining staff will overlap during the morning peak hour and it was therefore considered the most critical peak. The trip generation is thus based on the morning peak hour. **Table 8-1** below shows the expected Jenkins mine trip generation. It was assumed that 100% of the general workforce travel during the peak hours, and 90% of the senior staff travel during the peak hours. It has been estimated that the workshop and vehicle maintenance will require 9 vehicle trips in the peak hour and at least one Fuel tanker delivery can be expected during the peak hour.

Table 8-1: Peak Hour Trip Generation for the Proposed Jenkins Mine

Workers	Modal Split (Person Trips)			Vehicle Trips			Total Trips		
	Bus (85 Seater)	Bakkie (2 Seater)	Car (1 Seater)	Bus (85 Seater)	Bakkie (2 Seater)	Car (1 Seater)	In	Out	Total
139	81	48	10	1	24	10	26	9	35
Workshop, Fuel and Maintenance Trips							6	4	10
Ore Trucks from Driehoekspan and Doornpan							4	4	8
Total Vehicles							**32**	**13**	**45**

The iron ore material from Driehoekspan and Doornpan will be trucked to Jenkins 562 for final processing and distribution via the railway. According to the *specialist information document*, the trucking of iron ore to Jenkins will only be done during the day shift. The expected number of truckloads per day is 69 trucks from both Driehoekspan and Doornpan to Jenkins crushing and screening plant. This equates to approximately 8 trips per peak hour. A cycle time of 97 minutes and 166 minutes per truck of 33.5 tonne was estimated for Driehoekspan 435 and Doornpan 445 respectively. It was also estimated that a fleet of 18 trucks will be required for transporting this iron ore material to Jenkins.

9 TRIP DISTRIBUTION AND ASSIGNMENT

9.1 Trip Distribution

The vehicle trips generated by the additional new Jenkins mine were assigned on the local road network based on the current traffic flow patterns. The route split applied to the mine trips at the intersection of R325 with the Mine access is described and shown below.

Inbound

- 80% of the site trips will be from the north along R325 route turning left into Jenkins Mine access road.

- 20% of the site trips will be from the south along R325 route turning right into Jenkins Mine access road.

Outbound

- 80% of the site trips will be to the north turning right into R325 route from Jenkins Mine access road.

- 20% of the site trips will be to the south turning left into R325 route from Jenkins Mine access road.

9.2 Trip Assignment

The peak hour trips to be generated by Jenkins mine were assigned to the local road network based on the expected trip distribution.

10 TRAFFIC ANALYSIS

The traffic volumes shown in **Table 6-1** above were accepted as the 2016 base year traffic volumes. Auto J was used for the intersection analysis, to determine the intersection's levels-of-service "LOS", average delays and volume to capacity ratios. Auto Junction (Auto J) is an in-

house program which is used for intersection analysis. The output results include, Level-of-service, Average delays per vehicle, queue lengths and volume to capacity ratios for all control devices.

Based on the capacity analysis, the intersection of R325 with Jenkins mine access will operate at acceptable levels-of-service during the critical morning peak hour. The traffic volumes on R325 route are relatively low and the side road traffic is provided with adequate gaps to join the main stream traffic. The intersection will operate at acceptable "LoS A" and average delay of 9.0 seconds per vehicle for the westbound approach. The analysis shows that the site generated trips will have very little traffic impact on the surrounding intersection and road network.

10.1   Pavement Design

To estimate the number of E80s for the use of R325 by ore trucks from Driehoekspan and Doornpan mines to the processing plant at Jenkins mine, it was assumed that 1 truck is equivalent to 4 E80s. The specialist report made an estimate of 260 operating days per year and a payload of 33.5 tonnes per truck. **Table 10.1** below shows the number of truck trips that will be generated in transporting ROM by R325.

Table 10-1: Expected Number of Truck trips from Driehoekspan and Doornpan Mines

	Mine	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Total
ROM Tonnage	Driehoekspan	0	0	0	8 332	605 100	251 101	4 811	869 344
	Doornpan	0	0	0	0	0	171 258	155 740	326 998
Total		**0**	**0**	**0**	**8 332**	**605 100**	**422 359**	**160 551**	**1 196 342**
Trucks Per Year		0	0	0	32	2 327	1 624	618	4 601
Trucks Per Day		0	0	0	1	71	49	19	
Number of E80s		0	0	0	128	9 309	6 498	2 470	18 405
Note: 1 truck considered as 4 E80s									

Technical Recommendations for Highways TRH4 shows that the total lifespan of a Class B road in a dry region will be approximately 800 000 E80s. Table 10.1 above shows that the additional E80s from Driehoekspan and Doornpan mines will total 18 405 E80s over a lifespan of 7 years, which is only 2.3% of the expected pavement lifespan of R325. Therefore, the additional mine traffic should have an insignificant impact on the expected pavement life of R325.

11   TRAFFIC SAFETY

Traffic turning left from the side road at Jenkins Mine access

The heavy vehicle coming out from delivering iron ore to the beneficiation plant at Jenkins mine will have to turn left into R325 from the side road at the mine access. This intersection will be stop controlled and therefore the driver would have to wait for gaps from the southbound through traffic to enter the main stream traffic. A heavy vehicle needs approximately 12 seconds to execute a turning movement. Based on the background traffic the afternoon peak hour is the most critical peak in the site vicinity. There are about 189 vehicles per hour travelling to the south in the afternoon peak hour. This translates to one vehicle every 19 seconds on average, which exceeds the 12 seconds required for a turn. It is clear that there will be adequate gaps in the R325 traffic stream to allow heavy vehicles to join the mainstream traffic with ease. The good sight distance at the access should assist vehicles to safely execute the left-turn.

Traffic turning right from the main road at Jenkins Mine access

The right-turning vehicles from the main road into the access will have to wait for gaps from the southeast bound through traffic stream (the existing gap of which is 19 seconds on average). The 69 ore trucks per day will be fully laden, making this right-turn especially hazardous. In the northwest bound direction, approximately 304 vehicles per hour travel past the site during the afternoon peak hour. This results in an average of one vehicle every 12 seconds which equals the time required to execute a turning movement for heavy vehicles. The low position of the setting sun could affect the forward visibility of these motorists during certain seasons, increasing the risk of a head-to-rear collision between a northbound through vehicle and a right-turning truck.

For safety reasons, a right turn refuge lane together with a northbound bypass lane is proposed on R325 to reduce the risk of head to rear collisions on the main road. The right-turn lane should be provided according to the Northern Cape provincial road standards

Safety and Maintenance Considerations on R325

The main road R325 is a provincial two-lane arterial road that carries about 20% heavy vehicles during peak periods. The two-lane road has recently been upgraded by the Province with paved shoulders. It is expected that approximately 69 trucks will transport iron ore to Jenkins mine from Driehoekspan and Doornpan mines per day. Except for the proposed upgrading of the intersection at the Mine Access, no further improvements to the R325 road are proposed.

12   CONCLUSIONS AND RECOMMENDATIONS

This study looked at the traffic impact assessment of the proposed Jenkins Iron Ore located in the Northern Cape. The mine is one of the three projects under COZA mine iron ore projects. TTT Africa previously conducted traffic impact studies for the other two mines, Driehoekspan and Doornpan mines. The following conclusions are drawn from the findings in Jenkins mine study:
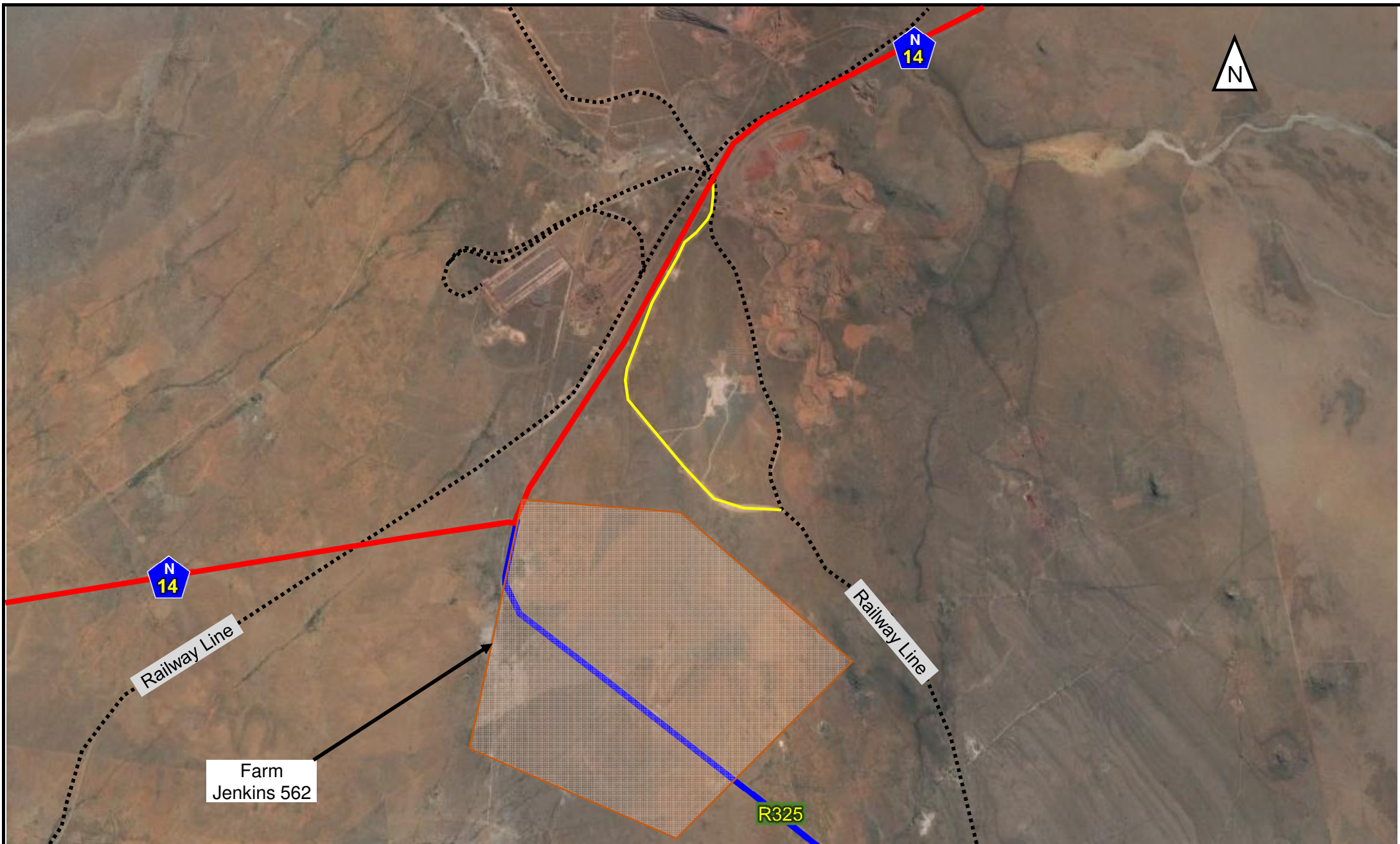
- The Jenkins mine will employ a total of 182 workers, some of which will be specialists, technicians, administration personnel and staff from the general workforce. The proposed Jenkins mine will generate in the region of 53 vehicle trips during the peak hour. In terms of this low volume, the Guidelines for traffic Impact studies would require a traffic impact statement, and not a full traffic impact study. For the purposes of this project however, a full traffic impact study was done to address and cover capacity, access and road safety issues as part of the Environmental Impact Assessment process.

- Traffic counts on the R325 were conducted in November 2013 for the Driehoekspan and Doornpan mines. These were inflated by five percent per annum to arrive at the 2016 background traffic volumes. The traffic volumes are relatively low and provide plenty of spare capacity on the local road.

- The proposed development will gain access off R325 road. The access will be stop controlled on the Jenkins mine access road and free flow on the R325 route. The existing access to the Jenkins mine on the R325 is safe and suitable as an access to the proposed mine. It would be advisable to surface at least the bell-mouth area of the gravel roads leading into the intersection. It is also proposed that a right-turn refuge lane with a by-pass lane be provided on the provincial R325 road to improve safety. The right-turn lane should be built according to the Northern Cape provincial road standards.

- The proposed Jenkins mine will generate a total of 53 vehicle two-way trips during the peak hour, including the delivery trucks from the Driehoekspan and Doornpan mines. The 2016 background traffic analysis shows that the Jenkins Access Road intersection with the R325 is currently operating at acceptable "LOS A" during both the morning and afternoon peak hours. The side road traffic will experience average delays of 9.0 seconds per vehicle. The low volumes of traffic using the access during the peak periods will easily be accommodated at the intersection. The intersection would operate at a volume to capacity level of 0.12 or better, indicating almost 90% spare capacity. The analysis shows that the additional Jenkins mine traffic will have little impact on the surrounding road network and intersections. The additional heavy vehicle traffic from

Driehoekspan and Doornpan mines will have insignificant impact on the pavement lifespan of R325.

- The mine will provide an 85 seater bus to transport mine workers between the habitable area and the mine.

- It is recommended that the proposed Jenkins Iron Ore mine be approved from a traffic point of view.

APPENDIX A

LOCALITY PLAN
JENKINS MINING RIGHTS BOUNDARIES
LEVEL OF SERVICE RESULTS

N
14

N

N
14

Railway Line

Railway Line

Farm
Jenkins 562

R325

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TRAFFIC IMPACT STUDY FOR JENKINS IRON ORE MINE

Locality Plan

FIGURE 1

SMYTHE

HELPEBIET

7

8

MOKANING

JENKINS

ROSCOE

562

JENKING

9

MACARTHY KADGAME

11

ALIETS

10

GAPPEPIN RESERVE

BISHOP

MOROKWA

CROSSLEY
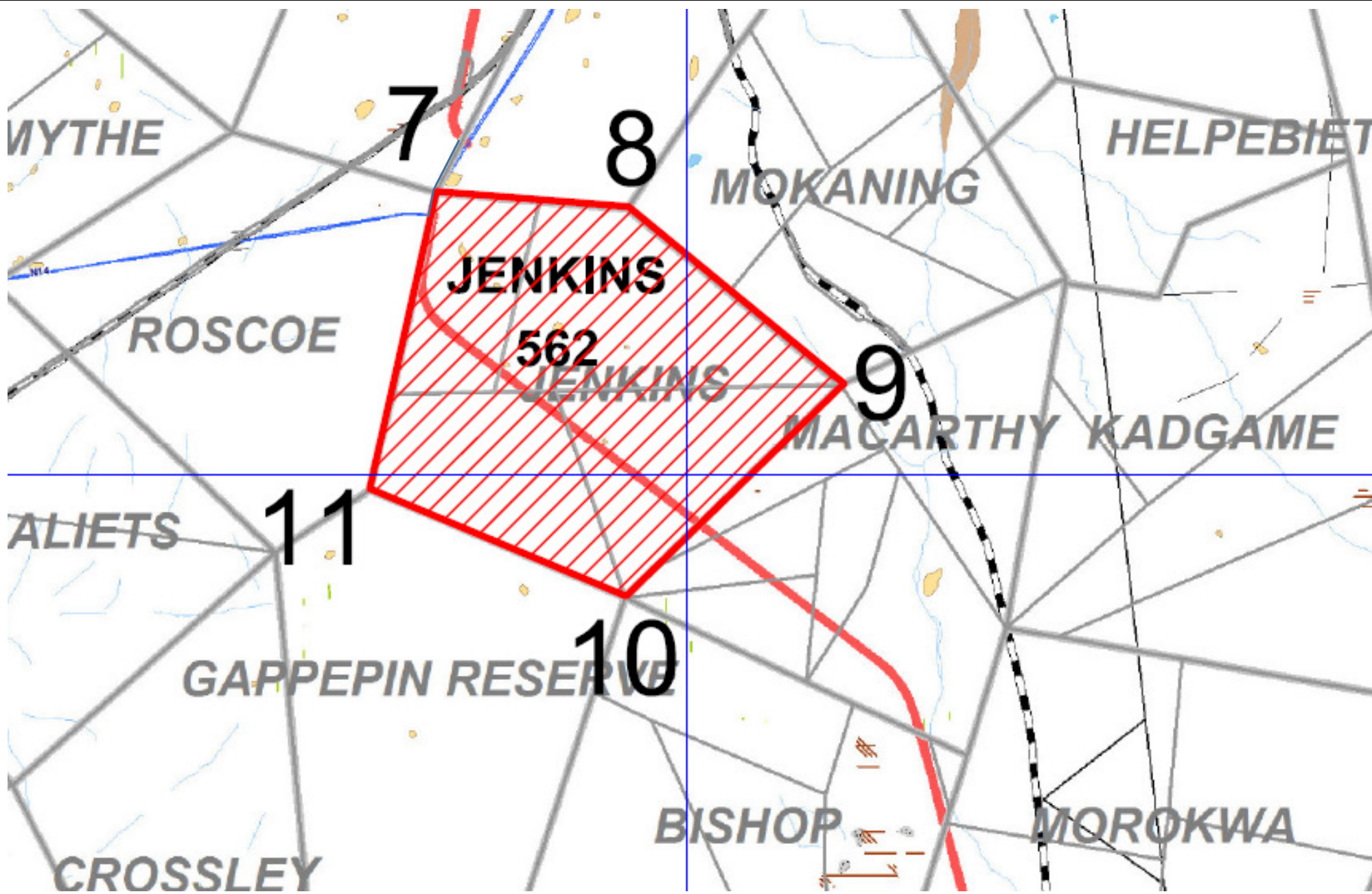
TRAFFIC IMPACT STUDY FOR JNEKINS IRON ORE MINE

Mine Boundaries and Authorization Area

FIGURE 2

TTTAfrica

Transportation & Traffic Technology Africa (Pty) Ltd
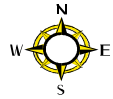
AutoJ   **R325**   **Jenkins Access**

Jenkins, Potmasburg

		type	i/s V/C		i/s delay	PI
	best	Xwe	0.15		9	96%

Volume (evu/hr)

	from North					from South					from West					from East					intersection
	peds	left	str	right	**L+S+R**	peds	left	str	right	**L+S+R**	peds	left	str	right	**L+S+R**	peds	left	str	right	**L+S+R**	total
AM	21	130			**151**			224	5	**229**							2		7	**9**	**389**
off			127		**127**			202		**202**							1		1	**2**	**331**
PM		7	196		**203**			327	2	**329**							5		21	**26**	**559**

Shared lane volumes

shared lanes L:S or S:R = 0.5:0.5; L:S:R = 0.3:0.4:0.3

	L~	L (SR)	S (LR)	R (LS)		L~	L (SR)	S (LR)	R (LS)		L~	L (SR)	S (LR)	R (LS)		L~	L (SR)	S (LR)	R (LS)
# lanes		0.5	0.5					0.5	0.5								0.3	0.4	0.3
AM		151	151					229	229								9	9	9
off		127	127					202	202								2	2	2
PM		203	203					329	329								26	26	26

Control

	from North					from South					from West					from East			
	peds	left	str	right		peds	left	str	right		peds	left	str	right		peds	left	str	right
																		stop		stop

Volume to Capacity ratio (V/C)

LOS A<0.5, B<0.8, C<0.9, D<0.95, E<0.99   Ped LOS A<0.1, B<0.3, C<0.4, D<0.6, E<0.97, F=0.97+

A-B	C-D	E	F

	V/C from North					V/C from South					V/C from West					V/C from East					V/C	
	peds	left	str	right	**L+S+R**	peds	left	str	right	**L+S+R**	peds	left	str	right	**L+S+R**	peds	left	str	right	**L+S+R**	max	**overall**
AM		0.08	0.08		**0.08**			0.13	0.13	**0.13**							0.01		0.01	**0.01**	0.13	0.10
off			0.06		**0.06**			0.11		**0.11**							0.00		0.00	**0.00**	0.11	0.09
PM		0.10	0.10		**0.10**			0.18	0.18	**0.18**							0.05		0.05	**0.05**	0.18	0.15

Average Delay per Vehicle (seconds)

LOS A<10, B<15, C<25, D<35, E<50   Ped LOS A<10, B<15, C<25, D<35, E<50, F=50+

A-B	C-D	E	F

	delay from North					delay from South					delay from West					delay from East					delay / veh	
	peds	left	str	right	**L+S+R**	peds	left	str	right	**L+S+R**	peds	left	str	right	**L+S+R**	peds	left	str	right	**L+S+R**	max	**overall**
AM		0	0		0			1	1	1							8		9	9	9	1
off			0		0			0		0							8		9	8	9	0
PM		0	0		0			1	1	1							8		9	9	9	1

Average Queue Length (veh) (= total delay veh-hrs / hr)

Q <4 = OK, <10 = WARN, 10+ = POOR

OK	WARN	POOR

	Q from North					Q from South					Q from West					Q from East					Queue	
	peds	left	str	right	**L+S+R**	peds	left	str	right	**L+S+R**	peds	left	str	right	**L+S+R**	peds	left	str	right	**L+S+R**	max	**total**
AM		0.0	0.0		**0.0**			0.0	0.0	**0.0**							0.0		0.0	**0.0**	0.0	**0.1**
off			0.0		**0.0**			0.0		**0.0**							0.0		0.0	**0.0**	0.0	**0.0**
PM		0.0	0.0		**0.0**			0.1	0.0	**0.1**							0.0		0.1	**0.1**	0.1	**0.2**

Professional: Jenkins Mine   copyright:

Date: print: 31-03-2016   Dr John Sampson