White Rose Carbon Capture and Storage (CCS)

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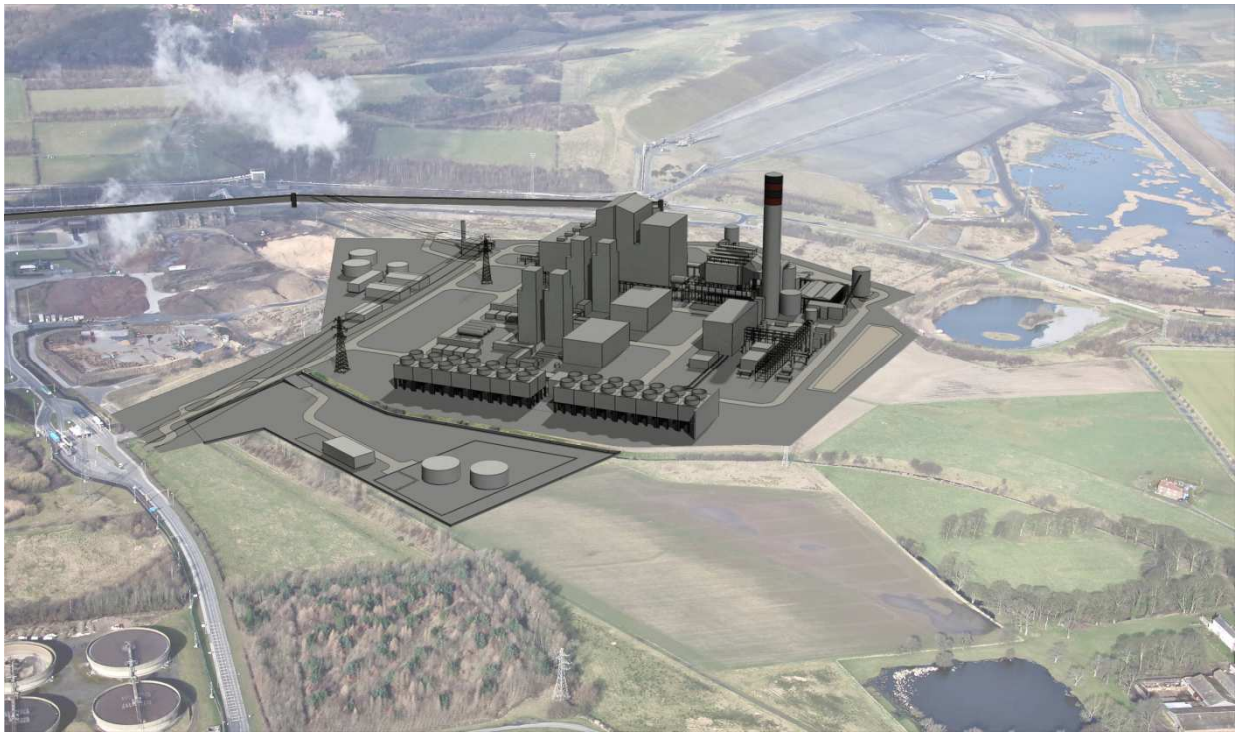
The White Rose CCS (Generating Station) Order

Land adjacent to and within the Drax Power Station, Drax, near Selby, North Yorkshire

Environmental Statement - Traffic Sensitivity Test

The Planning Act 2008

The Infrastructure Planning (Applications: Prescribed Forms and Procedure)



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Revision History

Revision No.	Date	Reason for Revision	Authorised By
01	10.04.2015	PIC Review	KJM

Glossary

CRTN	Calculation of Road Traffic Noise
CPL	Capture Power Ltd
DCO	Development Consent Order
DMRB	Design Manual for Roads and Bridges
EIA	Environmental Impact Assessment
ES	Environmental Statement
HGV	Haevy Good Vehicle
PINS	The Planning Inspectorate
SDC	Selby District Council
TA	Traffic Assessment

1 EXECUTIVE SUMMARY

The White Rose CCS Project ('the Project') is a 448 MWe gross coal fired power station with carbon capture equipment, situated on land adjacent to the Drax Power Station. A Development Consent Order (DCO) application was submitted in November 2014, and accepted for examination by The Planning Inspectorate (PINS) in December 2014.

The Environmental Impact Assessment accompanying the DCO application contained, amongst other sections, details on the traffic and transportation during construction, operation and decommissioning and presented this information within a Transport Assessment.

Subsequent to the application, Capture Power Ltd identified that there was a small underestimation of the number of Heavy Goods Vehicles (HGVs) generated during the operational phase; biomass will be imported by road and had not been included within the operational HGV traffic numbers. Assuming the plant fired at the defined theoretical maximum of 15% biomass the design burn rate is 35 t/hr which equates to two HGV per hour, or 31 HGVs per day onto the site

This Note has been produced in order to explain the level of underestimation, and evaluate and present any change to the assessment of the revised operational impacts of the Project (to that presented in the ES) and adopts the following structure:

- *Section 2 – Traffic* details changes to operational traffic flows and their significance;
- *Section 3 – Emissions to Atmosphere* assesses implications for the operational air quality assessment and separately considers an issue in relation to assignment of certain traffic to the baseline rather than to the Project; and
- *Section 4 - Noise* assesses implications for the operartional noise impact assessment.

Based on revised calculations of traffic flows, and therefore also emissions to atmosphere (both in terms of air quality and noise), it is considered that the revised HGV numbers (i.e including the road importation of operational biomass requirements) do not alter the assessment methodology, overall findings or conclusions of the original DCO submission work. The predicted levels of impact are the same as those assessed in the DCO environmental statement. The same conclusion is reached in relation to construction stage air quality impacts.

2 RATIONALE FOR THE IMPORT OF BIOMASS VIA ROAD

2.1 LOGISTICAL CONSIDERATIONS

Drax Power Station is in the process of converting three of its six units to biomass. These conversions are reliant on a rail delivery system which provides bulk delivery in specifically designed biomass wagons (1,700 tonnes per train) and the co-firing rail unloading facility represents a strategic asset in implementing those conversions. The rail unloading facility would also assist with the future conversion of further Drax unit(s) should levels of financial support for renewables be confirmed and made available.

The Rail unloading facility is designed for the receipt of bulk loads of a single biomass type. This results in biomass being sourced from locations which can both grow and source the material as well as process it as well as having access to a suitable rail head and loading infrastructure. There are a number of different types of indigenous biomass fuels which can be sourced relatively locally or regionally and processed onsite (at Drax Power Station) or at Drax's pelleting plant located in Goole. These types of suppliers of relatively low volumes of biomass would not have the ability to invest in rail loading infrastructure. Goole pelleting plant has a capacity of around 80,000 tonnes per annum (one of the largest facilities of this type in the UK) and this would equate to 47 trains per annum or just under one train every eight days. This would mean that biomass would be sitting in a silo for at least a week before being transported onto a train; for smaller suppliers this period of time would increase, potentially making the biomass unusable.

Fuel flexibility, regardless of fuel type is generally considered critical to any pulverised fuel fired power station and this remains the case for biomass fuels where multiple sources and suppliers may have seasonal windows for growing, harvesting and cropping their products. Reliance on a single fuel source or indeed a small number of fuel sources would represent a significant risk to the business should prices suddenly change or the fuel source become unavailable.

The benefits of fuel flexibility regarding boiler operations are also clear. Different biomass types will have different chemistries which will interact in a number of ways within a boiler. Boiler chemistry and its control is used to optimise combustion but also to reduce corrosion of the metal within the boiler and associated systems.

It is imperative that this flexibility is maintained so that those biomass types which may be problematic can be identified or indeed their impacts mitigated through modification of boiler conditions or levels of co-firing, for example, a reduced percentage compared to the coal combusted.

Unlike rail, supply via road is feasible and effective for all suppliers of biomass. Due to the relatively low volumes of biomass required for the WRCCS plant, road transport and delivery allows for far greater fuel flexibility to be realised than bulk delivery by rail. This would allow a number of different types of biomass from a range of different suppliers to be tested in the facility.

From an operational perspective, receipt of biomass by road can be managed in the individual silos allowing a number of fuels to be delivered and stocked at the same time. The rail unloading facility does not provide this optionality. Drax have previously explored and identified the benefits of fuel flexibility, particularly with regional fuels when originally investigating biomass co-firing in the existing Drax boilers. The same rationale will be applied to the WRCCS project in terms of fuel flexibility and investigating local and regional supply options

3 TRAFFIC

3.1 INTRODUCTION

The Traffic Assessment (*Volume 2, Section E* of the submitted Environmental Statement (ES)) described the potential supply of operational material to and removal of residual substances from the site by road. The following paragraph identified the level of HGV traffic expected to be generated by the operational phase:

"Operational HGV movements are expected to be limited in number, particularly with the potential to transport some material by rail also. As a worst case estimate, 86 HGVs per day have been calculated associated with the export of pulverised fuel ash (PFA) (47 HGVs per day), furnace bottom ash (FBA) (14 HGVs per day) and gypsum (up to 25 HGVs per day) would be expected should there be no transport of these materials by rail."

The figures above were used in the Development Consent Order (DCO) application, therefore providing a total of 172 HGV movements per day (86 HGVs, each with an inbound and an outbound journey).

Information received from Capture Power Ltd (CPL) post DCO submission clarified that in addition to the movements previously assessed and included in the DCO submission, an additional 31 HGVs could travel to and from the site (62 total movements) in order to transfer biomass to the completed Project, should the Project be implemented as a co-firing facility. This level of additional traffic assumes that the biomass would be up to defined 15% maximum of plant feedstock (the rest being coal).

Therefore, the total number of HGVs expected for the operational phase of the Project is now considered to be 117 HGVs per day (86 HGVs already analysed within the DCO submission plus the 31 outlined above, each with an inbound and an outbound movement creating 234 individual HGV trips per day).

3.2 ANALYSING THE SCALE OF CHANGE

It is understood that HGV movements to Drax are not restricted, but that in reality most deliveries and export movements occur for operational purposes over a 12 hour period (7am to 7pm).

HGV deliveries are managed in order to ensure that they are adequately spaced by Drax's operational managers so that the material or commodities

arriving are expected and can be utilised as quickly as possible. It is therefore reasonable to assume that the HGVs associated with the Project would also be planned and managed by Drax so that the HGVs were spread out throughout the 12 hour delivery period.

The TA used a robust level of HGV trips in order to assess the impacts of the operational phase. Whilst above it is understood that a 12 hour pattern of deliveries occurs, the TA assumed that these figures would be condensed over a 10 hour period.

Therefore, the approach taken in the TA resulted in 9 arrival HGVs and 9 departure HGVs an hour across a 10 hour period outside of the AM and PM peak hours.

Through the above approach the analysis work within the TA has added robustness in its assessment of operational HGV traffic.

The revised calculation of HGVs for the operational phase results in 234 HGV movements per day (117 arrivals, and 117 departures). Based on this, and using the same methodology over a condensed 10 hour period as before, results in 24 HGV movements per hour (12 arrivals and 12 departures). When comparing these figures to the original analysis, this results in an additional 3 HGV movements in and 3 HGV movements out of the Project per hour that have not previously been analysed. This equates to an additional 1 HGV every 20 minutes in each direction.

All HGVs are assumed to use the dedicated HGV route in place along the A645 to Junction 36 of the M62.

3.3 COMPARING THE OPERATIONAL EFFECTS TO THOSE OF THE CONSTRUCTION STAGE

The TA considered that the effects of the construction stage of the Project would be the most severe on the local highway network, and again a robust approach was taken in the assessment.

The methodology involved the use of the peak month of construction activity as the point of analysis, when some 1,700 vehicle arrivals, and 1,700 vehicle departures per day would be made on the local highway network by construction staff and contractors.

The construction stage also used values of 12 HGV arrivals and 12 HGV departures within the peak hours assessed.

These figures were also combined with the peak month of an outage period, which occur at the existing Drax facility on an annual basis. Outages involve an additional 1,000 contractor workers being on site to undertake maintenance works and assessment of the existing stacks. Again, the assessment included vehicles associated with outage contractors being on the road network.

Finally, growth rates from the TEMPRO database were applied to the local highway network in order to generate 2020 future year assessments.

The environmental impacts of the peak construction element of the Project identified negligible impact (less than 30% increase in traffic) on all local highway roads other than New Road adjacent to the Project access, which had a Major impact (over 90% increase in traffic).

Assessment of the operational phase was based on 60 arrivals and 60 departures in the peak hours in order to represent the staffing level of the operational facility. This again was a robust assessment, assuming every staff journey was undertaken in single occupancy cars and that all vehicles arrived and departed in one hour periods that coincided with the peak traffic periods on the highway network.

The operational element of the Project as assessed in the DCO submission had a negligible environmental impact on all identified links [see Table 4.2 of TA].

It is therefore clear that the construction peak assessed significantly more traffic from staff vehicles (1700 arrivals in the morning split across 3 hours) compared to 60 staff vehicle arrivals in one hour for the operational phase of the Project. Indeed, the construction phase also considered 12 HGV arrivals and 12 HGV departures during the peak periods, whilst the operational phase only 9 HGVs per hour would arrive and depart during each day. Therefore, the traffic effects of the peak construction phase are far in excess of the operational element, and only New Road was found to have anything other than a negligible environmental impact during the peak construction phase.

3.4 REVIEWING THE CAPACITY OF THE NETWORK

Turning to the pure capacity of the local highway network taking into account the additional HGV traffic that has been identified, once again, the operational phase of the Project when analysed resulted in local highway junctions operating with significant levels of reserve capacity and little alteration from the baseline scenarios.

This is due to the significantly lower level of traffic that is generated when compared with the construction peak phase.

Tables 4.4 to 4.15 of the TA showed the various scenarios analysed within the DCO submission, and in each one of the operational scenarios each of the junctions had large levels of reserve capacity and limited queuing.

In order to provide an analysis of the potential impacts of the operational HGVs, the full 12 arrival and departure HGVs have been applied to the peak hour movements of the highest identified peak from the ATC data along the designated HGV route. For the AM peak, the most intense hour was 0800 – 0900, and the PM peak was 1700 – 1800.

Table 3.1 ***Arcady Summary Table of the Revised Analysis of the Main Road / New Road / A645 Roundabout***

Peak	Arm A		Arm B		Arm C		Arm D		Arm E	
	RFC	Q	RFC	Q	RFC	Q	RFC	Q	RFC	Q
AM (0800 – 0900)	0.097	0.1	0.144	0.2	0.499	1.0	0.00	0.0	0.338	0.5
PM (1700 – 1800)	0.560	1.3	0.089	0.1	0.323	0.5	0.00	0.0	0.315	0.5

This junction is the confluence of the principal road network feeding into the existing Drax Power Station as well as the initial key junction of the Project site.

Even with the figure of 12 HGVs rather than 9 HGVs originally assessed applied to the relevant turning movement of arms at the roundabout, the roundabout is still expected to operate with significant levels of reserve capacity and little queuing in the operational phase. Detail of the Arcady outputs for these scenario runs are contained at *Appendix A* of this report.

The second key junction on the immediate local highway network is the northern dumbbell roundabout that connects the Drax HGV route to the M62. This roundabout within the DCO application analysis was the roundabout that had capacity levels closest to saturation, particularly in the construction period.

Applying the HGVs to the peak hours at this junction results in the following analysis present in *Table 5.2*.

Table 3.2 *Arcady Summary Table of the Revised Analysis of the M62 Junction 36 Northern Dumbbell Roundabout*

Peak	Arm A		Arm B		Arm C		Arm D		Arm E	
	RFC	Q	RFC	Q	RFC	Q	RFC	Q	RFC	Q
AM (0800 – 0900)	0.468	0.9	0.440	0.8	0.525	1.1	0.468	0.9	0.440	0.8
PM (1700 – 1800)	0.468	0.9	0.457	0.8	0.784	3.5	0.468	0.9	0.457	0.8

As with the first junction, the M62 Junction 36 Northern Dumbbell roundabout also works within capacity and has limited queuing.

Arcady results of the M62 northern dumbbell roundabout are contained at *Appendix B*.

As within the TA, it should be noted that all analyses are run using the ODTAB parameter which synthesises a more intensive peak of traffic, and represents a more rigorous test of capacity level.

3.5 CONCLUSION

Based upon the analysis contained within this note, and the information provided regarding the level of increase of operational HGVs expected to be produced by the Project, it is considered that the increase in traffic would not alter the conclusions of the DCO environmental statement.

The reasons for this are as follows:

1) The assumptions made within the original DCO submission are robust and can be considered to be a worst-case scenario. Additional levels of robustness have been added to the analysis throughout the assessment process in order to provide a very onerous test of the local highway network.

2) In comparison with the construction traffic scenario, the operational level of traffic is very small, with just 60 staff-related vehicles and 9 HGVs being generated in an hour compared with 566 vehicles in the peak construction hour (1,700 over a 3 hour period) and 12 HGVs. The conclusion of the DCO application was that all local highway links had a negligible level of impact in the construction phase other than New Road which is adjacent to the Project site which had a major impact. All links in the operational phase were assessed to have a negligible environmental impact (i.e. changes of less than 30% in traffic flow daily).

3) As a robust assumption, the DCO submission assumed that 9 HGV arrivals and 9 HGV departures would travel to and from the site each hour of the day outside of the peak hours over a condensed 10 hour period rather than the more likely 12 hour period. This resulted in the assessment which rounded the numbers to use 180 total vehicle movements which is slightly in excess of the calculated level of operational 86 HGV vehicles (172 movements), and therefore built additional robustness into the analysis process. This equated to a heavy goods vehicle arrival and departure every 7 minutes on average across the day.

4) The revised figures to include biomass deliveries total 234 HGV movements per day (117 arrivals, and 117 departures). Based on the 10 hour condensed period (rather than the 12 hour potential delivery window) this would be around 12 arrivals and 12 departures in an hour. This level of impact has a limited increase in traffic on the network with an extra 3 HGV arrivals and 3 HGV departures per hour than previously analysed, or an extra vehicle every 20 minutes. In comparison to point 3 above, this results in a total operational vehicle arrival and departure pattern of a vehicle every 5 minutes inbound and outbound of the operational facility.

Where possible, CPL will seek to minimise trips and manage deliveries in order to reduce impacts on the local highway network.

It is therefore considered that the revised HGV data used to inform this Sensitivity Test Note does not alter the assessment methodology, overall findings or conclusions of the original DCO environmental statement.

4 EMISSIONS TO ATMOSPHERE

4.1 BACKGROUND

The assessment of the potential impacts due to the increased traffic in the environmental statement was undertaken for a number of receptors for the worst case construction and operation year. Links that were identified as meeting the UK Highways Agency Design Manual for Roads and Bridges (DMRB) threshold for assessment were included, and the closest receptor to those roads identified.

Subsequent to this assessment, two changes were identified which required the assessment to be revisited. These changes are a result of the following:

- CPL highlighted that the original traffic data supplied to ERM slightly underestimated the number of HGVs required during the operational phase of the development. As a result of this underestimation, it was considered necessary to revisit the assessment and to establish whether the increase in predicted HGVs would result in any significant impact to air quality at sensitive receptors; and

- It was recognised that the approach taken to assess outages as part of the air quality impact assessment was not aligned with the assumptions made in the Transport Assessment (Volume 2, Section E). Outages are annual events that require a large amount of contractors on site for a period of two to three months. These are estimated to peak at around 1000 additional cars accessing site during the busiest month. As part of the original air quality assessment, outages were considered to be traffic associated with the Project, therefore their contribution to air quality was excluded from the baseline scenario. It has since been acknowledged that outages are related to the existing Drax plant and thus should be considered as part of the baseline to account for cumulative impacts from the existing plant. This change results in higher baseline concentrations of NO_x, PM_{10} and $PM_{2.5}$, therefore affecting the magnitude of change when considering impacts from construction and operational traffic from the Project.

4.2 ADDITIONAL ASSESSMENT

The assessment of potential impacts has been revisited for both the operational and construction scenario and specifically includes the following changes:

- Construction Phase:
  - The Do nothing (baseline) scenario was reassessed to include additional traffic associated with outages.
  - The Do something scenario remains unchanged.

- Operational Phase:
  - The Do nothing (baseline) scenario was reassessed to include additional traffic associated with outages; and
  - The Do something (operational) scenario was reassessed to include additional HGV movements.

4.3 TRAFFIC IMPACT ASSESSMENT

The following tables set out the change in impacts at relevant receptors for NO_2, PM_{10} and $PM_{2.5}$. The magnitude and significance of impacts are based upon the IAQM guidance as used in the Environmental Statement (see Emissions to Atmosphere Volume 2, Section A).

4.3.1 Construction Traffic

The process contribution from additional construction traffic movements from the proposed Project site does not change when compared to the previous assessment. The magnitude of impacts at receptors decreases as a result of additional traffic movements associated with outages being captured within the baseline scenario. No significant impacts have been found for any of the pollutants considered.

4.3.2 Operational Traffic

Due to an increase in HGVs on certain roads, the revised assessment considers additional roads to those previously assessed. No significant impacts have been found for any of the pollutants considered.

Table 3.3 Summary of Road Traffic Impacts for Construction Year 2020 - NO_2

Link	Receptor grid reference (x,y)	Air quality standard	Baseline	Do Nothing (PC)	Do Something (PC)	Change	PEC With Scheme	Magnitude	Significance
		µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	IAQM	IAQM
New Road	466670, 426395	40	15.0	0.320	0.550	0.230	15.6	Negligible	Not Significant
A645 (towards M62)	470233, 423866	40	12.0	2.11	2.60	0.490	14.6	Small	Not Significant
A645 (towards Camlesforth)	465332, 425931	40	11.6	3.25	3.57	0.320	15.2	Negligible	Not Significant
A614 - Rawcliffe Road (towards M62)	470718, 423915	40	15.9	5.32	5.57	0.250	21.5	Negligible	Not Significant
A645	470233, 423866	40	15.9	1.99	2.49	0.500	18.4	Small	Not Significant
A1041 (towards Selby)	464645, 425767	40	11.8	4.16	4.49	0.330	16.3	Negligible	Not Significant
A645 (towards Drax)	465020, 426711	40	11.5	3.08	3.41	0.330	15.0	Negligible	Not Significant
A1041 (towards Camblesforth)	462731, 428223	40	14.8	5.86	5.99	0.130	20.8	Negligible	Not Significant
A614 (towards Drax)	470717, 423913	40	15.9	7.17	7.44	0.270	23.4	Negligible	Not Significant

Table 3.4 Summary of Road Traffic Impacts for Construction Year 2020 - PM_{10}

Link	Receptor grid reference (x,y)	Air quality standard	Baseline	Do Nothing (PC)	Do Something (PC)	Change	PEC With Scheme	Magnitude	Significance
		µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	IAQM	IAQM
New Road	466670, 426395	40	16.9	0.0479	0.0837	0.0359	17.0	Negligible	Not Significant
A645 (towards M62)	470233, 423866	40	18.9	0.423	0.521	0.0982	19.4	Negligible	Not Significant
A645 (towards Camlesforth)	465332, 425931	40	16.3	0.830	0.915	0.0847	17.2	Negligible	Not Significant
A614 - Rawcliffe Road (towards M62)	470718, 423915	40	20.4	1.26	1.32	0.0599	21.7	Negligible	Not Significant
A645	470233, 423866	40	20.4	0.395	0.494	0.0994	20.9	Negligible	Not Significant
A1041 (towards Selby)	464645, 425767	40	17.0	0.993	1.07	0.0816	18.1	Negligible	Not Significant

Link	Receptor grid reference (x,y)	Air quality standard	Baseline	Do Nothing (PC)	Do Something (PC)	Change	PEC With Scheme	Magnitude	Significance
A645 (towards Drax)	465020, 426711	40	16.3	0.600	0.665	0.0650	16.9	Negligible	Not Significant
A1041 (towards Camblesforth)	462731, 428223	40	18.2	1.62	1.66	0.0367	19.9	Negligible	Not Significant
A614 (towards Drax)	470717, 423913	40	20.4	1.46	1.52	0.0562	21.9	Negligible	Not Significant

Table 3.5 Summary of Road Traffic Impacts for Construction Year 2020 – $PM_{2.5}$

Link	Receptor grid reference (x,y)	Air quality standard	Baseline	Do Nothing (PC)	Do Something (PC)	Change	PEC With Scheme	Magnitude	Significance
		µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	IAQM	IAQM
New Road	466670, 426395	20	11.1	0.0479	0.0837	0.0359	11.2	Negligible	Not Significant
A645 (towards M62)	470233, 423866	20	11.1	0.423	0.521	0.0982	11.7	Negligible	Not Significant
A645 (towards Camlesforth)	465332, 425931	20	10.6	0.830	0.915	0.0847	11.5	Negligible	Not Significant
A614 - Rawcliffe Road (towards M62)	470718, 423915	20	12.1	1.26	1.32	0.0599	13.5	Negligible	Not Significant
A645	470233, 423866	20	12.1	0.395	0.494	0.0994	12.6	Negligible	Not Significant
A1041 (towards Selby)	464645, 425767	20	10.7	0.993	1.07	0.0816	11.8	Negligible	Not Significant
A645 (towards Drax)	465020, 426711	20	10.6	0.600	0.665	0.0650	11.3	Negligible	Not Significant
A1041 (towards Camblesforth)	462731, 428223	20	11.2	1.62	1.66	0.0367	12.9	Negligible	Not Significant
A614 (towards Drax)	470717, 423913	20	12.1	1.46	1.52	0.0562	13.6	Negligible	Not Significant

Table 3.6 Summary of Road Traffic Impacts during Operation – NO_2

Link	Receptor grid reference (x,y)	Air quality standard	Baseline	Do Nothing (PC)	Do Something (PC)	Change	PEC With Scheme	Magnitude	Significance
		µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	IAQM	IAQM
New Road	466670, 426395	40	15.0	0.320	0.410	0.0900	15.4	Negligible	Not Significant
A645 (towards M62)	470233, 423866	40	12.0	2.11	2.44	0.330	14.5	Negligible	Not Significant
A614 - Rawcliffe Road (towards M62)	470718, 423915	40	15.9	5.32	5.78	0.460	21.7	Small	Not Significant
A645	470233, 423866	40	15.9	1.99	2.32	0.330	18.2	Negligible	Not Significant
A645 (towards Drax)	465020, 426711	40	15.9	7.17	7.55	0.380	23.5	Negligible	Not Significant

Table 3.7 Summary of Road Traffic Impacts during Operation – PM_{10}

Link	Receptor grid reference (x,y)	Air quality standard	Baseline	Do Nothing (PC)	Do Something (PC)	Change	PEC With Scheme	Magnitude	Significance
		µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	IAQM	IAQM
New Road	466670, 426395	40	16.9	0.0479	0.0557	7.88×10^{-3}	17.0	Negligible	Not Significant
A645 (towards M62)	470233, 423866	40	18.9	0.423	0.452	0.0298	19.3	Negligible	Not Significant
A614 - Rawcliffe Road (towards M62)	470718, 423915	40	20.4	1.26	1.30	0.0366	21.7	Negligible	Not Significant
A645	470233, 423866	40	20.4	0.395	0.425	0.0302	20.8	Negligible	Not Significant
A645 (towards Drax)	465020, 426711	40	20.4	1.46	1.49	0.0309	21.9	Negligible	Not Significant

Table 3.8 Summary of Road Traffic Impacts during Operation – $PM_{2.5}$

Link	Receptor grid reference (x,y)	Air quality standard	Baseline	Do Nothing (PC)	Do Something (PC)	Change	PEC With Scheme	Magnitude	Significance
		µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	IAQM	IAQM
New Road	466670, 426395	20	11.1	0.0479	0.0557	7.88 x10^{-3}	11.1	Negligible	Not Significant
A645 (towards M62)	470233, 423866	20	11.1	0.423	0.452	0.0298	11.6	Negligible	Not Significant
A614 - Rawcliffe Road (towards M62)	470718, 423915	20	12.1	1.26	1.30	0.0366	13.4	Negligible	Not Significant
A645	470233, 423866	20	12.1	0.395	0.425	0.0302	12.6	Negligible	Not Significant
A645 (towards Drax)	465020, 426711	20	12.1	1.46	1.49	0.0309	13.6	Negligible	Not Significant

5 NOISE

5.1 INTRODUCTION

Within Section 1 of this Sensitivity Note an assessment of the traffic increase arising during the operational stage has been undertaken.

All traffic from the Project site will travel along New Road; however no noise sensitive receptors are close to the road in this location.

A summary of the predicted road traffic noise level increases for construction and operations are summarised in *Table 3.9*.

There are no significant changes to construction traffic flows and hence there is no change in the noise impact. The summary of noise impacts are reiterated in this note for completeness.

5.2 METHODOLOGY

Changes in road traffic noise levels resulting from construction of the scheme have been calculated using the methods contained in *Calculation of Road Traffic Noise (CRTN)* - Department of Transport, Welsh Office.

5.3 CONSTRUCTION TRAFFIC

For construction traffic, there are two main traffic routes between the site and the M62 motorway:

- Cars accessing the site are expected to split between the routes in the proportions 67% and 33%; and
- The HGVs will follow a designated route along New Road, the A645 and the A614 to Junction 36 of the M62.

Predicted construction related road traffic noise level increases are no more than 1 dB(A) on any other road link which is used by construction traffic. Hence, as predicted increases in road traffic noise levels are below the criterion of 3 dB(A) no significant effect is predicted.

5.4 OPERATIONAL TRAFFIC

Predicted operational stage related road traffic noise level increases are no more than 1.3 dB(A) on any road link. Hence, as predicted increases in road traffic noise levels are below the criterion of 3 dB(A) no significant effect is predicted.

Table 3.9 Summary Revised Predicted Road Traffic Noise Levels for Construction and Operation

Route	Road	Baseline Noise Level	Construction Noise Level	Operation Noise Level	Original 2014 Construction Noise Level Increase above Baseline	Revised 2015 Construction Noise Level Increase above Baseline	Operation Noise Level Increase above Baseline
New Road / A645 Roundabout	New Road	64.7	67.6	66.0	2.9	2.9	1.3
	Main Road (Drax Village)	59.8	59.8	59.8	0.0	0.0	0.0
	A645 (towards M62)	68.2	69.2	68.8	1.0	1.0	0.6
	A645 (towards Camblesforth)	67.7	68.1	67.7	0.4	0.4	0.0
Rawcliffe Road / A645 Roundabout	A614-Rawcliffe Road (to M62)	70.4	70.9	70.8	0.5	0.5	0.4
	A614-Rawcliffe Road (to R'cliffe)	66.0	66.0	66.0	0.0	0.0	0.0
	A645	68.0	69.0	68.6	1.0	1.0	0.7
A1041 / A645 Roundabout	A1041 (towards Selby)	68.3	68.6	68.3	0.4	0.4	0.0
	A614 - Station Road (towards Carlton)	66.9	66.9	66.9	0.0	0.0	0.0
	A645 (towards Drax)	67.5	68.0	67.5	0.5	0.5	0.0

A1041 / A63 Roundabout	A1041 - Bawtry Road (to Selby)	69.7	69.8	69.7	0.1	0.1	0.0
	A63 - (towards Barlby)	69.8	69.9	69.8	0.1	0.1	0.0
	A63 (to Hambleton)	69.7	69.8	69.7	0.1	0.1	0.0
	A1041 (to Camblesforth)	70.0	70.2	70.0	0.2	0.2	0.0
M62 Northern Dumbell Roundabout	A614 (towards Drax)	72.2	72.6	72.4	0.4	0.4	0.3
	M62 on-slip	64.8	65.2	65.3	0.4	0.4	0.5
	A614 (between dumbell roundabouts)	72.1	72.4	72.4	0.3	0.3	0.3
	M62 off-slip	68.6	68.8	68.9	0.2	0.2	0.3
M62 Southern Dumbell Roundabout	A614 (towards Goole)	72.5	72.6	72.5	0.1	0.1	0.0
	M62 on-slip	68.6	68.8	68.9	0.2	0.2	0.4
	A614 (between dumbell roundabouts)	72.3	72.5	72.5	0.3	0.3	0.3
	M62 off-slip	64.3	64.8	64.9	0.5	0.5	0.6

Appendix A

Arcady Results of New Road / Main Road Roundabout

ARCADY 6

ASSESSMENT OF ROUNDABOUT CAPACITY AND DELAY

Analysis Program: Release 7.0 (FEBRUARY 2010)

For sales and distribution information,
program advice and maintenance, contact:

TRL Limited Tel: +44 (0) 1344 770758
Crowthorne House Fax: +44 (0) 1344 770356
Nine Mile Ride Email: software@trl.co.uk
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RG40 3GA,UK

Run with file:-
"k:\Projects\CIV13924\DESIGN\ARCADY\09.09.14 - DCO Submission Runs\
Operation HGV Sensitivity Tests - Erratum Note\New Road_A645 Roundabout PM Peak 2020 Outage + Operational.vai"
(drive-on-the-left) at 18:04:03 on Wednesday, 25 March 2015

FILE PROPERTIES

RUN TITLE: A645/New Road Roundabout
LOCATION: Drax
DATE: 09/09/14
CLIENT: Capture Power Ltd
ENUMERATOR: BDDGM [BD-44]
JOB NUMBER: CIV13924
STATUS:
DESCRIPTION:

INPUT DATA

ARM A - New Road
ARM B - Main Road
ARM C - A645 South
ARM D - Drax Golf Club
ARM E - A645 West

GEOMETRIC DATA

ARM	V (M)	E (M)	L (M)	R (M)	D (M)	PHI (DEG)	SLOPE	INTERCEPT (PCU/MIN)
ARM A	3.75	7.50	28.00	35.00	55.00	22.0	0.657	33.762
ARM B	3.00	8.00	25.00	22.50	55.00	28.0	0.616	30.924
ARM C	4.00	7.50	20.00	10.00	55.00	53.0	0.540	27.472
ARM D	3.25	3.25	0.00	10.00	55.00	71.0	0.367	13.275
ARM E	3.50	7.50	28.00	45.00	55.00	28.0	0.640	32.613

V = approach half-width L = effective flare length D = inscribed circle diameter
E = entry width R = entry radius PHI = entry angle

TRAFFIC DEMAND DATA

Only sets included in the current run are shown

SCALING FACTORS

T13

ARM	FLOW SCALE(%)
A	100
B	100
C	100
D	100
E	100

TIME PERIOD BEGINS(16.45)AND ENDS(18.15)

LENGTH OF TIME PERIOD -(90) MINUTES

LENGTH OF TIME SEGMENT - (15) MINUTES

DEMAND FLOW PROFILES ARE SYNTHESISED FROM THE TURNING COUNT DATA

DEMAND SET TITLE: 2020 Base + Outage + Operational

T15

ARM	NUMBER OF MINUTES FROM START WHEN FLOW STARTS TO RISE	NUMBER OF MINUTES FROM START WHEN TOP OF PEAK IS REACHED	NUMBER OF MINUTES FROM START WHEN FLOW STOPS FALLING	RATE OF FLOW (VEH/MIN) BEFORE PEAK	RATE OF FLOW (VEH/MIN) AT TOP OF PEAK	RATE OF FLOW (VEH/MIN) AFTER PEAK
ARM A	15.00	45.00	75.00	10.51	15.77	10.51
ARM B	15.00	45.00	75.00	1.04	1.56	1.04
ARM C	15.00	45.00	75.00	5.21	7.82	5.21
ARM D	15.00	45.00	75.00	0.00	0.00	0.00
ARM E	15.00	45.00	75.00	6.68	10.01	6.68

DEMAND SET TITLE: 2020 Base + Outage + Operational

T33

TIME	FROM/T	ARM A	ARM B	ARM C	ARM D	ARM E
16.45 - 18.15	ARM A	0.000	0.005	0.611	0.000	0.384
		0.0	4.0	514.0	0.0	323.0
		(0.0)	(0.0)	(0.0)	(0.0)	(0.0)
	ARM B	0.000	0.000	0.301	0.000	0.699
		0.0	0.0	25.0	0.0	58.0
		(0.0)	(0.0)	(0.0)	(0.0)	(0.0)
	ARM C	0.261	0.043	0.000	0.000	0.695
		109.0	18.0	0.0	0.0	290.0
		(0.0)	(0.0)	(0.0)	(0.0)	(0.0)
	ARM D	0.000	0.000	0.000	0.000	0.000
		0.0	0.0	0.0	0.0	0.0
		(0.0)	(0.0)	(0.0)	(0.0)	(0.0)
	ARM E	0.071	0.204	0.725	0.000	0.000
		38.0	109.0	387.0	0.0	0.0
		(0.0)	(0.0)	(0.0)	(0.0)	(0.0)

TURNING PROPORTIONS
TURNING COUNTS
(PERCENTAGE OF H.V.S)

QUEUE AND DELAY INFORMATION FOR EACH 15 MIN TIME SEGMENT

T70

TIME	DEMAND (VEH/MIN)	CAPACITY (VEH/MIN)	DEMAND/ CAPACITY (RFC)	PEDESTRIAN FLOW (PEDS/MIN)	START QUEUE (VEHS)	END QUEUE (VEHS)	DELAY (VEH.MIN/ TIME SEGMENT)	GEOMETRIC DELAY (VEH.MIN/ TIME SEGMENT)	AVERAGE DELAY PER ARRIVING VEHICLE (MIN)
16.45-17.00									
ARM A	10.55	29.54	0.357	- - -	0.0	0.6	8.1	-	0.052
ARM B	1.04	21.49	0.048	- - -	0.0	0.1	0.7	-	0.049
ARM C	5.23	24.90	0.210	- - -	0.0	0.3	3.9	-	0.051
ARM D	0.00	9.61	0.000	- - -	0.0	0.0	0.0	-	0.000
ARM E	6.70	31.60	0.212	- - -	0.0	0.3	4.0	-	0.040
17.00-17.15									
ARM A	12.60	28.71	0.439	- - -	0.6	0.8	11.4	-	0.062
ARM B	1.24	19.64	0.063	- - -	0.1	0.1	1.0	-	0.054
ARM C	6.25	24.40	0.256	- - -	0.3	0.3	5.1	-	0.055
ARM D	0.00	8.89	0.000	- - -	0.0	0.0	0.0	-	0.000
ARM E	8.00	31.40	0.255	- - -	0.3	0.3	5.1	-	0.043
17.15-17.30									
ARM A	15.43	27.57	0.560	- - -	0.8	1.3	18.3	-	0.082
ARM B	1.52	17.11	0.089	- - -	0.1	0.1	1.4	-	0.064
ARM C	7.65	23.71	0.323	- - -	0.3	0.5	7.0	-	0.062
ARM D	0.00	7.90	0.000	- - -	0.0	0.0	0.0	-	0.000
ARM E	9.80	31.12	0.315	- - -	0.3	0.5	6.8	-	0.047
17.30-17.45									
ARM A	15.43	27.57	0.560	- - -	1.3	1.3	18.9	-	0.082
ARM B	1.52	17.09	0.089	- - -	0.1	0.1	1.5	-	0.064
ARM C	7.65	23.70	0.323	- - -	0.5	0.5	7.1	-	0.062
ARM D	0.00	7.89	0.000	- - -	0.0	0.0	0.0	-	0.000
ARM E	9.80	31.12	0.315	- - -	0.5	0.5	6.9	-	0.047
17.45-18.00									
ARM A	12.60	28.70	0.439	- - -	1.3	0.8	12.1	-	0.062
ARM B	1.24	19.60	0.063	- - -	0.1	0.1	1.0	-	0.054
ARM C	6.25	24.38	0.256	- - -	0.5	0.3	5.3	-	0.055
ARM D	0.00	8.87	0.000	- - -	0.0	0.0	0.0	-	0.000
ARM E	8.00	31.39	0.255	- - -	0.5	0.3	5.2	-	0.043
18.00-18.15									
ARM A	10.55	29.52	0.357	- - -	0.8	0.6	8.5	-	0.053
ARM B	1.04	21.45	0.049	- - -	0.1	0.1	0.8	-	0.049
ARM C	5.23	24.89	0.210	- - -	0.3	0.3	4.1	-	0.051
ARM D	0.00	9.59	0.000	- - -	0.0	0.0	0.0	-	0.000
ARM E	6.70	31.59	0.212	- - -	0.3	0.3	4.1	-	0.040

QUEUE AT ARM A

TIME SEGMENT ENDING	NO. OF VEHICLES IN QUEUE	
17.00	0.6	*
17.15	0.8	*
17.30	1.3	*
17.45	1.3	*
18.00	0.8	*
18.15	0.6	*

QUEUE AT ARM B

TIME SEGMENT ENDING	NO. OF VEHICLES IN QUEUE
17.00	0.1
17.15	0.1
17.30	0.1
17.45	0.1
18.00	0.1
18.15	0.1

QUEUE AT ARM C

TIME SEGMENT ENDING	NO. OF VEHICLES IN QUEUE
17.00	0.3
17.15	0.3
17.30	0.5
17.45	0.5
18.00	0.3
18.15	0.3

QUEUE AT ARM D

TIME SEGMENT ENDING	NO. OF VEHICLES IN QUEUE
17.00	0.0
17.15	0.0
17.30	0.0
17.45	0.0
18.00	0.0
18.15	0.0

QUEUE AT ARM E

TIME SEGMENT ENDING	NO. OF VEHICLES IN QUEUE
17.00	0.3
17.15	0.3
17.30	0.5
17.45	0.5
18.00	0.3
18.15	0.3

QUEUEING DELAY INFORMATION OVER WHOLE PERIOD

ARM	TOTAL DEMAND		* QUEUEING * DELAY *		* INCLUSIVE QUEUEING * DELAY *		T75
	(VEH)	(VEH/H)	(MIN)	(MIN/VEH)	(MIN)	(MIN/VEH)	
A	1157.6	771.7	77.4	0.07	77.4	0.07	
B	114.2	76.2	6.5	0.06	6.5	0.06	
C	574.0	382.6	32.4	0.06	32.4	0.06	
D	0.0	0.0	0.0	0.00	0.0	0.00	
E	735.0	490.0	32.0	0.04	32.0	0.04	
ALL	2580.8	1720.5	148.2	0.06	148.2	0.06	

* DELAY IS THAT OCCURRING ONLY WITHIN THE TIME PERIOD.
* INCLUSIVE DELAY INCLUDES DELAY SUFFERED BY VEHICLES WHICH ARE STILL QUEUEING AFTER THE END OF THE TIME PERIOD.
* THESE WILL ONLY BE SIGNIFICANTLY DIFFERENT IF THERE IS A LARGE QUEUE REMAINING AT THE END OF THE TIME PERIOD.

END OF JOB

========== end of file ==========

Printed at 14:32:55 on 10/04/2015]

ARCADY 6

ASSESSMENT OF ROUNDABOUT CAPACITY AND DELAY

Analysis Program: Release 7.0 (FEBRUARY 2010)

For sales and distribution information,
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Run with file:-
"k:\Projects\CIV13924\DESIGN\ARCADY\09.09.14 - DCO Submission Runs\
Operation HGV Sensitivity Tests - Erratum Note\New Road_A645 Roundabout AM Peak 2020 Outage + Operational.vai"
(drive-on-the-left) at 18:02:32 on Wednesday, 25 March 2015

FILE PROPERTIES

RUN TITLE: A645/New Road Roundabout
LOCATION: Drax
DATE: 09/09/14
CLIENT: Capture Power Ltd
ENUMERATOR: BDDGM [BD-44]
JOB NUMBER: CIV13924
STATUS:
DESCRIPTION:

INPUT DATA

ARM A - New Road
ARM B - Main Road
ARM C - A645 South
ARM D - Drax Golf Club
ARM E - A645 West

GEOMETRIC DATA

ARM	V (M)	E (M)	L (M)	R (M)	D (M)	PHI (DEG)	SLOPE	INTERCEPT (PCU/MIN)
ARM A	3.75	7.50	28.00	35.00	55.00	22.0	0.657	33.762
ARM B	3.00	8.00	25.00	22.50	55.00	28.0	0.616	30.924
ARM C	4.00	7.50	20.00	10.00	55.00	53.0	0.540	27.472
ARM D	3.25	3.25	0.00	10.00	55.00	71.0	0.367	13.275
ARM E	3.50	7.50	28.00	45.00	55.00	28.0	0.640	32.613

V = approach half-width L = effective flare length D = inscribed circle diameter
E = entry width R = entry radius PHI = entry angle

TRAFFIC DEMAND DATA

Only sets included in the current run are shown

SCALING FACTORS

T13

ARM	FLOW SCALE(%)
A	100
B	100
C	100
D	100
E	100

TIME PERIOD BEGINS(07.45)AND ENDS(09.15)

LENGTH OF TIME PERIOD -(90) MINUTES

LENGTH OF TIME SEGMENT - (15) MINUTES

DEMAND FLOW PROFILES ARE SYNTHESISED FROM THE TURNING COUNT DATA

DEMAND SET TITLE: 2020 Base + Outage + Operational

T15

ARM	NUMBER OF MINUTES FROM START WHEN FLOW STARTS TO RISE	NUMBER OF MINUTES FROM START WHEN TOP OF PEAK IS REACHED	NUMBER OF MINUTES FROM START WHEN FLOW STOPS FALLING	RATE OF FLOW (VEH/MIN) BEFORE PEAK	RATE OF FLOW (VEH/MIN) AT TOP OF PEAK	RATE OF FLOW (VEH/MIN) AFTER PEAK
ARM A	15.00	45.00	75.00	2.03	3.04	2.03
ARM B	15.00	45.00	75.00	2.63	3.94	2.63
ARM C	15.00	45.00	75.00	8.63	12.94	8.63
ARM D	15.00	45.00	75.00	0.00	0.00	0.00
ARM E	15.00	45.00	75.00	6.26	9.39	6.26

DEMAND SET TITLE: 2020 Base + Outage + Operational

T33

TURNING PROPORTIONS
TURNING COUNTS
(PERCENTAGE OF H.V.S)

TIME	FROM/T	ARM A	ARM B	ARM C	ARM D	ARM E
07.45 - 09.15	ARM A	0.000	0.037	0.623	0.000	0.340
		0.0	6.0	101.0	0.0	55.0
		(0.0)	(0.0)	(0.0)	(0.0)	(0.0)
	ARM B	0.019	0.000	0.252	0.000	0.729
		4.0	0.0	53.0	0.0	153.0
		(0.0)	(0.0)	(0.0)	(0.0)	(0.0)
	ARM C	0.658	0.001	0.000	0.000	0.341
		454.0	1.0	0.0	0.0	235.0
		(0.0)	(0.0)	(0.0)	(0.0)	(0.0)
	ARM D	0.000	0.000	0.000	0.000	0.000
		0.0	0.0	0.0	0.0	0.0
		(0.0)	(0.0)	(0.0)	(0.0)	(0.0)
	ARM E	0.495	0.066	0.439	0.000	0.000
		248.0	33.0	220.0	0.0	0.0
		(0.0)	(0.0)	(0.0)	(0.0)	(0.0)

QUEUE AND DELAY INFORMATION FOR EACH 15 MIN TIME SEGMENT

T70

TIME	DEMAND (VEH/MIN)	CAPACITY (VEH/MIN)	DEMAND/ CAPACITY (RFC)	PEDESTRIAN FLOW (PEDS/MIN)	START QUEUE (VEHS)	END QUEUE (VEHS)	DELAY (VEH.MIN/ TIME SEGMENT)	GEOMETRIC DELAY (VEH.MIN/ TIME SEGMENT)	AVERAGE DELAY PER ARRIVING VEHICLE (MIN)
07.45-08.00									
ARM A	2.03	31.67	0.064	- - -	0.0	0.1	1.0	-	0.034
ARM B	2.63	28.03	0.094	- - -	0.0	0.1	1.5	-	0.039
ARM C	8.66	26.04	0.332	- - -	0.0	0.5	7.3	-	0.057
ARM D	0.00	9.13	0.000	- - -	0.0	0.0	0.0	-	0.000
ARM E	6.29	28.94	0.217	- - -	0.0	0.3	4.1	-	0.044

TIME	DEMAND (VEH/MIN)	CAPACITY (VEH/MIN)	DEMAND/ CAPACITY (RFC)	PEDESTRIAN FLOW (PEDS/MIN)	START QUEUE (VEHS)	END QUEUE (VEHS)	DELAY (VEH.MIN/ TIME SEGMENT)	GEOMETRIC DELAY (VEH.MIN/ TIME SEGMENT)	AVERAGE DELAY PER ARRIVING VEHICLE (MIN)
08.00-08.15									
ARM A	2.43	31.26	0.078	- - -	0.1	0.1	1.2	-	0.035
ARM B	3.15	27.46	0.115	- - -	0.1	0.1	1.9	-	0.041
ARM C	10.34	25.76	0.401	- - -	0.5	0.7	9.8	-	0.065
ARM D	0.00	8.31	0.000	- - -	0.0	0.0	0.0	-	0.000
ARM E	7.51	28.21	0.266	- - -	0.3	0.4	5.3	-	0.048

TIME	DEMAND (VEH/MIN)	CAPACITY (VEH/MIN)	DEMAND/ CAPACITY (RFC)	PEDESTRIAN FLOW (PEDS/MIN)	START QUEUE (VEHS)	END QUEUE (VEHS)	DELAY (VEH.MIN/ TIME SEGMENT)	GEOMETRIC DELAY (VEH.MIN/ TIME SEGMENT)	AVERAGE DELAY PER ARRIVING VEHICLE (MIN)
08.15-08.30									
ARM A	2.97	30.70	0.097	- - -	0.1	0.1	1.6	-	0.036
ARM B	3.85	26.68	0.144	- - -	0.1	0.2	2.5	-	0.044
ARM C	12.66	25.37	0.499	- - -	0.7	1.0	14.4	-	0.078
ARM D	0.00	7.20	0.000	- - -	0.0	0.0	0.0	-	0.000
ARM E	9.19	27.23	0.338	- - -	0.4	0.5	7.5	-	0.055

TIME	DEMAND (VEH/MIN)	CAPACITY (VEH/MIN)	DEMAND/ CAPACITY (RFC)	PEDESTRIAN FLOW (PEDS/MIN)	START QUEUE (VEHS)	END QUEUE (VEHS)	DELAY (VEH.MIN/ TIME SEGMENT)	GEOMETRIC DELAY (VEH.MIN/ TIME SEGMENT)	AVERAGE DELAY PER ARRIVING VEHICLE (MIN)
08.30-08.45									
ARM A	2.97	30.70	0.097	- - -	0.1	0.1	1.6	-	0.036
ARM B	3.85	26.67	0.144	- - -	0.2	0.2	2.5	-	0.044
ARM C	12.66	25.37	0.499	- - -	1.0	1.0	14.8	-	0.079
ARM D	0.00	7.19	0.000	- - -	0.0	0.0	0.0	-	0.000
ARM E	9.19	27.22	0.338	- - -	0.5	0.5	7.6	-	0.055

TIME	DEMAND (VEH/MIN)	CAPACITY (VEH/MIN)	DEMAND/ CAPACITY (RFC)	PEDESTRIAN FLOW (PEDS/MIN)	START QUEUE (VEHS)	END QUEUE (VEHS)	DELAY (VEH.MIN/ TIME SEGMENT)	GEOMETRIC DELAY (VEH.MIN/ TIME SEGMENT)	AVERAGE DELAY PER ARRIVING VEHICLE (MIN)
08.45-09.00									
ARM A	2.43	31.26	0.078	- - -	0.1	0.1	1.3	-	0.035
ARM B	3.15	27.45	0.115	- - -	0.2	0.1	2.0	-	0.041
ARM C	10.34	25.76	0.401	- - -	1.0	0.7	10.4	-	0.065
ARM D	0.00	8.30	0.000	- - -	0.0	0.0	0.0	-	0.000
ARM E	7.51	28.20	0.266	- - -	0.5	0.4	5.5	-	0.048

TIME	DEMAND (VEH/MIN)	CAPACITY (VEH/MIN)	DEMAND/ CAPACITY (RFC)	PEDESTRIAN FLOW (PEDS/MIN)	START QUEUE (VEHS)	END QUEUE (VEHS)	DELAY (VEH.MIN/ TIME SEGMENT)	GEOMETRIC DELAY (VEH.MIN/ TIME SEGMENT)	AVERAGE DELAY PER ARRIVING VEHICLE (MIN)
09.00-09.15									
ARM A	2.03	31.67	0.064	- - -	0.1	0.1	1.0	-	0.034
ARM B	2.63	28.02	0.094	- - -	0.1	0.1	1.6	-	0.039
ARM C	8.66	26.04	0.333	- - -	0.7	0.5	7.7	-	0.058
ARM D	0.00	9.11	0.000	- - -	0.0	0.0	0.0	-	0.000
ARM E	6.29	28.92	0.217	- - -	0.4	0.3	4.2	-	0.044

QUEUE AT ARM A

TIME SEGMENT ENDING	NO. OF VEHICLES IN QUEUE	
08.00	0.1	
08.15	0.1	
08.30	0.1	
08.45	0.1	
09.00	0.1	
09.15	0.1	

QUEUE AT ARM B

TIME SEGMENT ENDING	NO. OF VEHICLES IN QUEUE	
08.00	0.1	
08.15	0.1	
08.30	0.2	
08.45	0.2	
09.00	0.1	
09.15	0.1	

QUEUE AT ARM C

TIME SEGMENT ENDING	NO. OF VEHICLES IN QUEUE	
08.00	0.5	
08.15	0.7	*
08.30	1.0	*
08.45	1.0	*
09.00	0.7	*
09.15	0.5	*

QUEUE AT ARM D

TIME SEGMENT ENDING	NO. OF VEHICLES IN QUEUE	
08.00	0.0	
08.15	0.0	
08.30	0.0	
08.45	0.0	
09.00	0.0	
09.15	0.0	

QUEUE AT ARM E

TIME SEGMENT ENDING	NO. OF VEHICLES IN QUEUE	
08.00	0.3	
08.15	0.4	
08.30	0.5	*
08.45	0.5	*
09.00	0.4	
09.15	0.3	

QUEUEING DELAY INFORMATION OVER WHOLE PERIOD

ARM	TOTAL DEMAND		* QUEUEING * DELAY *		* INCLUSIVE QUEUEING * DELAY *	
	(VEH)	(VEH/H)	(MIN)	(MIN/VEH)	(MIN)	(MIN/VEH)
A	223.0	148.7	7.8	0.03	7.8	0.03
B	289.0	192.7	12.0	0.04	12.0	0.04
C	949.7	633.2	64.3	0.07	64.3	0.07
D	0.0	0.0	0.0	0.00	0.0	0.00
E	689.6	459.7	34.3	0.05	34.3	0.05
ALL	2151.4	1434.2	118.4	0.06	118.4	0.06

T75

* DELAY IS THAT OCCURRING ONLY WITHIN THE TIME PERIOD.
* INCLUSIVE DELAY INCLUDES DELAY SUFFERED BY VEHICLES WHICH ARE STILL QUEUEING AFTER THE END OF THE TIME PERIOD.
* THESE WILL ONLY BE SIGNIFICANTLY DIFFERENT IF THERE IS A LARGE QUEUE REMAINING AT THE END OF THE TIME PERIOD.

END OF JOB

========== end of file ==========

Printed at 14:32:40 on 10/04/2015]

Appendix B

Arcady Results for Northern M62 Dumbbell Roundabout (Junction 36)

ARCADY 6

ASSESSMENT OF ROUNDABOUT CAPACITY AND DELAY

Analysis Program: Release 7.0 (FEBRUARY 2010)

For sales and distribution information,
program advice and maintenance, contact:

TRL Limited Tel: +44 (0) 1344 770758
Crowthorne House Fax: +44 (0) 1344 770356
Nine Mile Ride Email: software@trl.co.uk
Wokingham, Berks. Web: www.trlsoftware.co.uk
RG40 3GA,UK

Run with file:-
"k:\Projects\CIV13924\DESIGN\ARCADY\09.09.14 - DCO Submission Runs\
Operation HGV Sensitivity Tests - Erratum Note\
A614_M62 Eastbound Northern Roundabout PM Peak 2020 Outage + Operational.vai"
(drive-on-the-left) at 18:07:04 on Wednesday, 25 March 2015

FILE PROPERTIES

RUN TITLE: A614/M62 J36 Northern Roundabout
LOCATION: Drax
DATE: 09/09/14
CLIENT: Capture Power Ltd
ENUMERATOR: BDDGM [BD-44]
JOB NUMBER: CIV13924
STATUS:
DESCRIPTION:

INPUT DATA

ARM A - A614 South
ARM B - M62 Eastbound Exit Slip
ARM C - A614 North
ARM D - M62 Eastbound Entry Slip

GEOMETRIC DATA

ARMD IS JUNCTION EXIT ONLY

ARM	V (M)	E (M)	L (M)	R (M)	D (M)	PHI (DEG)	SLOPE	INTERCEPT (PCU/MIN)
ARM A	3.90	6.00	12.00	76.00	64.00	6.0	0.578	29.654
ARM B	8.40	8.50	1.00	22.00	69.00	35.0	0.639	42.250
ARM C	3.90	9.20	19.00	20.00	69.00	45.0	0.533	32.075

V = approach half-width L = effective flare length D = inscribed circle diameter
E = entry width R = entry radius PHI = entry angle

TRAFFIC DEMAND DATA

Only sets included in the current run are shown

SCALING FACTORS

T13

ARM	FLOW SCALE(%)
A	100
B	100
C	100
D	100

TIME PERIOD BEGINS(16.45)AND ENDS(18.15)

LENGTH OF TIME PERIOD -(90) MINUTES

LENGTH OF TIME SEGMENT - (15) MINUTES

DEMAND FLOW PROFILES ARE SYNTHESISED FROM THE TURNING COUNT DATA

DEMAND SET TITLE: 2020 Base + Outage + Operational

T15

ARM	NUMBER OF MINUTES FROM START WHEN FLOW STARTS TO RISE	NUMBER OF MINUTES FROM START WHEN TOP OF PEAK IS REACHED	NUMBER OF MINUTES FROM START WHEN FLOW STOPS FALLING	RATE OF FLOW (VEH/MIN) BEFORE PEAK	RATE OF FLOW (VEH/MIN) AT TOP OF PEAK	RATE OF FLOW (VEH/MIN) AFTER PEAK
ARM A	15.00	45.00	75.00	9.45	14.17	9.45
ARM B	15.00	45.00	75.00	10.40	15.60	10.40
ARM C	15.00	45.00	75.00	14.19	21.28	14.19

DEMAND SET TITLE: 2020 Base + Outage + Operational

T33

TIME	FROM/T	TURNING PROPORTIONS / TURNING COUNTS (PERCENTAGE OF H.V.S) ARM A	ARM B	ARM C	ARM D
16.45 - 18.15	ARM A	0.000	0.000	0.835	0.165
		0.0	0.0	631.0	125.0
		(0.0)	(0.0)	(0.0)	(0.0)
	ARM B	0.526	0.000	0.474	0.000
		438.0	0.0	394.0	0.0
		(0.0)	(0.0)	(0.0)	(0.0)
	ARM C	0.741	0.000	0.000	0.259
		841.0	0.0	0.0	294.0
		(0.0)	(0.0)	(0.0)	(0.0)

QUEUE AND DELAY INFORMATION FOR EACH 15 MIN TIME SEGMENT

T70

TIME	DEMAND (VEH/MIN)	CAPACITY (VEH/MIN)	DEMAND/ CAPACITY (RFC)	PEDESTRIAN FLOW (PEDS/MIN)	START QUEUE (VEHS)	END QUEUE (VEHS)	DELAY (VEH.MIN/ TIME SEGMENT)	GEOMETRIC DELAY (VEH.MIN/ TIME SEGMENT)	AVERAGE DELAY PER ARRIVING VEHICLE (MIN)
16.45-17.00									
ARM A	9.49	29.65	0.320	- - -	0.0	0.5	6.9	-	0.049
ARM B	10.44	36.20	0.288	- - -	0.0	0.4	6.0	-	0.039
ARM C	14.24	28.32	0.503	- - -	0.0	1.0	14.5	-	0.070

TIME	DEMAND (VEH/MIN)	CAPACITY (VEH/MIN)	DEMAND/ CAPACITY (RFC)	PEDESTRIAN FLOW (PEDS/MIN)	START QUEUE (VEHS)	END QUEUE (VEHS)	DELAY (VEH.MIN/ TIME SEGMENT)	GEOMETRIC DELAY (VEH.MIN/ TIME SEGMENT)	AVERAGE DELAY PER ARRIVING VEHICLE (MIN)
17.00-17.15									
ARM A	11.33	29.65	0.382	- - -	0.5	0.6	9.1	-	0.055
ARM B	12.47	35.01	0.356	- - -	0.4	0.6	8.1	-	0.044
ARM C	17.01	27.58	0.617	- - -	1.0	1.6	22.9	-	0.094

TIME	DEMAND (VEH/MIN)	CAPACITY (VEH/MIN)	DEMAND/ CAPACITY (RFC)	PEDESTRIAN FLOW (PEDS/MIN)	START QUEUE (VEHS)	END QUEUE (VEHS)	DELAY (VEH.MIN/ TIME SEGMENT)	GEOMETRIC DELAY (VEH.MIN/ TIME SEGMENT)	AVERAGE DELAY PER ARRIVING VEHICLE (MIN)
17.15-17.30									
ARM A	13.87	29.65	0.468	- - -	0.6	0.9	12.8	-	0.063
ARM B	15.27	33.39	0.457	- - -	0.6	0.8	12.3	-	0.055
ARM C	20.83	26.57	0.784	- - -	1.6	3.5	47.5	-	0.167

TIME	DEMAND (VEH/MIN)	CAPACITY (VEH/MIN)	DEMAND/ CAPACITY (RFC)	PEDESTRIAN FLOW (PEDS/MIN)	START QUEUE (VEHS)	END QUEUE (VEHS)	DELAY (VEH.MIN/ TIME SEGMENT)	GEOMETRIC DELAY (VEH.MIN/ TIME SEGMENT)	AVERAGE DELAY PER ARRIVING VEHICLE (MIN)
17.30-17.45									
ARM A	13.87	29.65	0.468	- - -	0.9	0.9	13.1	-	0.063
ARM B	15.27	33.38	0.457	- - -	0.8	0.8	12.6	-	0.055
ARM C	20.83	26.57	0.784	- - -	3.5	3.5	52.5	-	0.174

TIME	DEMAND (VEH/MIN)	CAPACITY (VEH/MIN)	DEMAND/ CAPACITY (RFC)	PEDESTRIAN FLOW (PEDS/MIN)	START QUEUE (VEHS)	END QUEUE (VEHS)	DELAY (VEH.MIN/ TIME SEGMENT)	GEOMETRIC DELAY (VEH.MIN/ TIME SEGMENT)	AVERAGE DELAY PER ARRIVING VEHICLE (MIN)
17.45-18.00									
ARM A	11.33	29.65	0.382	- - -	0.9	0.6	9.5	-	0.055
ARM B	12.47	35.00	0.356	- - -	0.8	0.6	8.5	-	0.044
ARM C	17.01	27.57	0.617	- - -	3.5	1.6	25.8	-	0.097

TIME	DEMAND (VEH/MIN)	CAPACITY (VEH/MIN)	DEMAND/ CAPACITY (RFC)	PEDESTRIAN FLOW (PEDS/MIN)	START QUEUE (VEHS)	END QUEUE (VEHS)	DELAY (VEH.MIN/ TIME SEGMENT)	GEOMETRIC DELAY (VEH.MIN/ TIME SEGMENT)	AVERAGE DELAY PER ARRIVING VEHICLE (MIN)
18.00-18.15									
ARM A	9.49	29.65	0.320	- - -	0.6	0.5	7.2	-	0.050
ARM B	10.44	36.18	0.289	- - -	0.6	0.4	6.2	-	0.039
ARM C	14.24	28.31	0.503	- - -	1.6	1.0	15.8	-	0.071

QUEUE AT ARM A

TIME SEGMENT ENDING	NO. OF VEHICLES IN QUEUE	
17.00	0.5	
17.15	0.6	*
17.30	0.9	*
17.45	0.9	*
18.00	0.6	*
18.15	0.5	

QUEUE AT ARM B

TIME SEGMENT ENDING	NO. OF VEHICLES IN QUEUE	
17.00	0.4	
17.15	0.6	*
17.30	0.8	*
17.45	0.8	*
18.00	0.6	*
18.15	0.4	

QUEUE AT ARM C

TIME SEGMENT ENDING	NO. OF VEHICLES IN QUEUE	
17.00	1.0	*
17.15	1.6	**
17.30	3.5	***
17.45	3.5	****
18.00	1.6	**
18.15	1.0	*

QUEUEING DELAY INFORMATION OVER WHOLE PERIOD

ARM	TOTAL DEMAND		* QUEUEING * DELAY *		* INCLUSIVE QUEUEING * DELAY *	
	(VEH)	(VEH/H)	(MIN)	(MIN/VEH)	(MIN)	(MIN/VEH)
A	1040.6	693.7	58.6	0.06	58.6	0.06
B	1145.2	763.5	53.6	0.05	53.6	0.05
C	1562.2	1041.5	179.1	0.11	179.1	0.11
ALL	3748.0	2498.7	291.3	0.08	291.3	0.08

T75

* DELAY IS THAT OCCURRING ONLY WITHIN THE TIME PERIOD.
* INCLUSIVE DELAY INCLUDES DELAY SUFFERED BY VEHICLES WHICH ARE STILL QUEUEING AFTER THE END OF THE TIME PERIOD.
* THESE WILL ONLY BE SIGNIFICANTLY DIFFERENT IF THERE IS A LARGE QUEUE REMAINING AT THE END OF THE TIME PERIOD.

END OF JOB

========== end of file ==========

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ARCADY 6

ASSESSMENT OF ROUNDABOUT CAPACITY AND DELAY

Analysis Program: Release 7.0 (FEBRUARY 2010)

For sales and distribution information,
program advice and maintenance, contact:

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Crowthorne House Fax: +44 (0) 1344 770356
Nine Mile Ride Email: software@trl.co.uk
Wokingham, Berks. Web: www.trlsoftware.co.uk
RG40 3GA,UK

Run with file:-
"k:\Projects\CIV13924\DESIGN\ARCADY\09.09.14 - DCO Submission Runs\
Operation HGV Sensitivity Tests - Erratum Note\
A614_M62 Eastbound Northern Roundabout AM Peak 2020 Outage + Operational.vai"
(drive-on-the-left) at 18:05:53 on Wednesday, 25 March 2015

FILE PROPERTIES

RUN TITLE: A614/M62 J36 Northern Roundabout
LOCATION: Drax
DATE: 09/09/14
CLIENT: Capture Power Ltd
ENUMERATOR: BDDGM [BD-44]
JOB NUMBER: CIV13924
STATUS:
DESCRIPTION:

INPUT DATA

ARM A - A614 South
ARM B - M62 Eastbound Exit Slip
ARM C - A614 North
ARM D - M62 Eastbound Entry Slip

GEOMETRIC DATA

ARMD IS JUNCTION EXIT ONLY

ARM	V (M)	E (M)	L (M)	R (M)	D (M)	PHI (DEG)	SLOPE	INTERCEPT (PCU/MIN)
ARM A	3.90	6.00	12.00	76.00	64.00	6.0	0.578	29.654
ARM B	8.40	8.50	1.00	22.00	69.00	35.0	0.639	42.250
ARM C	3.90	9.20	19.00	20.00	69.00	45.0	0.533	32.075

V = approach half-width L = effective flare length D = inscribed circle diameter
E = entry width R = entry radius PHI = entry angle

TRAFFIC DEMAND DATA

Only sets included in the current run are shown

SCALING FACTORS

T13

ARM	FLOW SCALE(%)
A	100
B	100
C	100
D	100

TIME PERIOD BEGINS(07.45)AND ENDS(09.15)

LENGTH OF TIME PERIOD -(90) MINUTES

LENGTH OF TIME SEGMENT - (15) MINUTES

DEMAND FLOW PROFILES ARE SYNTHESISED FROM THE TURNING COUNT DATA

DEMAND SET TITLE: 2020 Base + Outage + Operational

T15

ARM	NUMBER OF MINUTES FROM START WHEN FLOW STARTS TO RISE	NUMBER OF MINUTES FROM START WHEN TOP OF PEAK IS REACHED	NUMBER OF MINUTES FROM START WHEN FLOW STOPS FALLING	RATE OF FLOW (VEH/MIN) BEFORE PEAK	RATE OF FLOW (VEH/MIN) AT TOP OF PEAK	RATE OF FLOW (VEH/MIN) AFTER PEAK
ARM A	15.00	45.00	75.00	9.45	14.17	9.45
ARM B	15.00	45.00	75.00	10.00	15.00	10.00
ARM C	15.00	45.00	75.00	9.70	14.55	9.70

DEMAND SET TITLE: 2020 Base + Outage + Operational

T33

TIME	FROM/T	TURNING PROPORTIONS / TURNING COUNTS (PERCENTAGE OF H.V.S) ARM A	ARM B	ARM C	ARM D
07.45 - 09.15	ARM A	0.000	0.000	0.873	0.127
		0.0	0.0	660.0	96.0
		(0.0)	(0.0)	(0.0)	(0.0)
	ARM B	0.511	0.000	0.489	0.000
		409.0	0.0	391.0	0.0
		(0.0)	(0.0)	(0.0)	(0.0)
	ARM C	0.726	0.000	0.000	0.274
		563.0	0.0	0.0	213.0
		(0.0)	(0.0)	(0.0)	(0.0)

QUEUE AND DELAY INFORMATION FOR EACH 15 MIN TIME SEGMENT

T70

TIME	DEMAND (VEH/MIN)	CAPACITY (VEH/MIN)	DEMAND/ CAPACITY (RFC)	PEDESTRIAN FLOW (PEDS/MIN)	START QUEUE (VEHS)	END QUEUE (VEHS)	DELAY (VEH.MIN/ TIME SEGMENT)	GEOMETRIC DELAY (VEH.MIN/ TIME SEGMENT)	AVERAGE DELAY PER ARRIVING VEHICLE (MIN)
07.45-08.00									
ARM A	9.49	29.65	0.320	- - -	0.0	0.5	6.9	-	0.049
ARM B	10.04	36.20	0.277	- - -	0.0	0.4	5.6	-	0.038
ARM C	9.74	28.71	0.339	- - -	0.0	0.5	7.5	-	0.053

TIME	DEMAND (VEH/MIN)	CAPACITY (VEH/MIN)	DEMAND/ CAPACITY (RFC)	PEDESTRIAN FLOW (PEDS/MIN)	START QUEUE (VEHS)	END QUEUE (VEHS)	DELAY (VEH.MIN/ TIME SEGMENT)	GEOMETRIC DELAY (VEH.MIN/ TIME SEGMENT)	AVERAGE DELAY PER ARRIVING VEHICLE (MIN)
08.00-08.15									
ARM A	11.33	29.65	0.382	- - -	0.5	0.6	9.1	-	0.055
ARM B	11.99	35.01	0.342	- - -	0.4	0.5	7.7	-	0.043
ARM C	11.63	28.04	0.415	- - -	0.5	0.7	10.3	-	0.061

TIME	DEMAND (VEH/MIN)	CAPACITY (VEH/MIN)	DEMAND/ CAPACITY (RFC)	PEDESTRIAN FLOW (PEDS/MIN)	START QUEUE (VEHS)	END QUEUE (VEHS)	DELAY (VEH.MIN/ TIME SEGMENT)	GEOMETRIC DELAY (VEH.MIN/ TIME SEGMENT)	AVERAGE DELAY PER ARRIVING VEHICLE (MIN)
08.15-08.30									
ARM A	13.87	29.65	0.468	- - -	0.6	0.9	12.8	-	0.063
ARM B	14.68	33.39	0.440	- - -	0.5	0.8	11.5	-	0.053
ARM C	14.24	27.14	0.525	- - -	0.7	1.1	15.9	-	0.077

TIME	DEMAND (VEH/MIN)	CAPACITY (VEH/MIN)	DEMAND/ CAPACITY (RFC)	PEDESTRIAN FLOW (PEDS/MIN)	START QUEUE (VEHS)	END QUEUE (VEHS)	DELAY (VEH.MIN/ TIME SEGMENT)	GEOMETRIC DELAY (VEH.MIN/ TIME SEGMENT)	AVERAGE DELAY PER ARRIVING VEHICLE (MIN)
08.30-08.45									
ARM A	13.87	29.65	0.468	- - -	0.9	0.9	13.1	-	0.063
ARM B	14.68	33.38	0.440	- - -	0.8	0.8	11.7	-	0.054
ARM C	14.24	27.13	0.525	- - -	1.1	1.1	16.4	-	0.078

TIME	DEMAND (VEH/MIN)	CAPACITY (VEH/MIN)	DEMAND/ CAPACITY (RFC)	PEDESTRIAN FLOW (PEDS/MIN)	START QUEUE (VEHS)	END QUEUE (VEHS)	DELAY (VEH.MIN/ TIME SEGMENT)	GEOMETRIC DELAY (VEH.MIN/ TIME SEGMENT)	AVERAGE DELAY PER ARRIVING VEHICLE (MIN)
08.45-09.00									
ARM A	11.33	29.65	0.382	- - -	0.9	0.6	9.5	-	0.055
ARM B	11.99	35.00	0.343	- - -	0.8	0.5	8.0	-	0.044
ARM C	11.63	28.04	0.415	- - -	1.1	0.7	10.9	-	0.061

TIME	DEMAND (VEH/MIN)	CAPACITY (VEH/MIN)	DEMAND/ CAPACITY (RFC)	PEDESTRIAN FLOW (PEDS/MIN)	START QUEUE (VEHS)	END QUEUE (VEHS)	DELAY (VEH.MIN/ TIME SEGMENT)	GEOMETRIC DELAY (VEH.MIN/ TIME SEGMENT)	AVERAGE DELAY PER ARRIVING VEHICLE (MIN)
09.00-09.15									
ARM A	9.49	29.65	0.320	- - -	0.6	0.5	7.2	-	0.050
ARM B	10.04	36.18	0.277	- - -	0.5	0.4	5.9	-	0.038
ARM C	9.74	28.69	0.339	- - -	0.7	0.5	7.9	-	0.053

QUEUE AT ARM A

TIME SEGMENT ENDING	NO. OF VEHICLES IN QUEUE	
08.00	0.5	
08.15	0.6	*
08.30	0.9	*
08.45	0.9	*
09.00	0.6	*
09.15	0.5	

QUEUE AT ARM B

TIME SEGMENT ENDING	NO. OF VEHICLES IN QUEUE	
08.00	0.4	
08.15	0.5	*
08.30	0.8	*
08.45	0.8	*
09.00	0.5	*
09.15	0.4	

QUEUE AT ARM C

TIME SEGMENT ENDING	NO. OF VEHICLES IN QUEUE	
08.00	0.5	*
08.15	0.7	*
08.30	1.1	*
08.45	1.1	*
09.00	0.7	*
09.15	0.5	*

QUEUEING DELAY INFORMATION OVER WHOLE PERIOD

T75

ARM	TOTAL DEMAND		* QUEUEING * DELAY *		* INCLUSIVE QUEUEING * DELAY *	
	(VEH)	(VEH/H)	(MIN)	(MIN/VEH)	(MIN)	(MIN/VEH)
A	1040.6	693.7	58.6	0.06	58.6	0.06
B	1101.1	734.1	50.3	0.05	50.3	0.05
C	1068.1	712.1	69.0	0.06	69.0	0.06
ALL	3209.8	2139.9	177.9	0.06	177.9	0.06

* DELAY IS THAT OCCURRING ONLY WITHIN THE TIME PERIOD.
* INCLUSIVE DELAY INCLUDES DELAY SUFFERED BY VEHICLES WHICH ARE STILL QUEUEING AFTER THE END OF THE TIME PERIOD.
* THESE WILL ONLY BE SIGNIFICANTLY DIFFERENT IF THERE IS A LARGE QUEUE REMAINING AT THE END OF THE TIME PERIOD.

END OF JOB

========== end of file ==========

Printed at 14:32:11 on 10/04/2015]