Technical Note

FABER MAUNSELL | AECOM

Project:	**Whitby Park and Ride Site Assessment**	Job No:	**60041470**
Subject:	**Assessment of North Yorkshire County Council Revised Planning Application**		
Prepared by:	**Clive Staples**	Date:	**29th September 2008**
Checked by:	**Simon Pratt**	Date:	**29th September 2008**
Approved by:	**Simon Pratt**	Date:	**29th September 2008**

Introduction

In February 2008, North York Moors National Park Authority (NYMNPA) commissioned Faber Maunsell to conduct a study to determine the viability of an alternative park and ride site from that proposed by North Yorkshire County Council (NYCC) in their planning application. This study demonstrated that an alternative site outside of the National Park boundary was a viable alternative to the proposal.

This planning application was refused permission as no strategic case was proven for a site within the National Park and that unsatisfactory landscape mitigation measures were included. NYCC have now resubmitted a revised planning application, giving further justification for the proposed site over other possible sites.

NYMNPA have commissioned Faber Maunsell to review the transportation planning issues arising from the revised planning application. This note provides an assessment of the NYCC Design and Access Statements, The Whitby Park & Ride Supporting Statement, and the Planning Application Supplementary Supporting Statement. It makes particular reference to the advantages and disadvantages tables within the Supplementary Supporting Statement.

Option Appraisal

NYCC have considered all options that were outlined in our previous note, but have primarily considered Option 3, as it was concluded in our note that this was the most favourable option for creating access to an alternative park and ride site. This note considers the application proposals and the option 3 alternative from our previous note.

Routing of the Shuttle Service

NYCC consider that the routing for buses will be in a clockwise direction, using the B1460 for its journey towards the town centre, and returning via Prospect Hill and the A171. They consider that gives advantage for operating bus services through the junction, as they will have a left turn exit from the site to the B1460, and an easier return access to the park and ride site than alternative options.

The delay experienced by traffic approaching a roundabout is a function of the circulating flow past the entry of the roundabout. The lower the circulating flow, the more gaps that are available for traffic to enter the roundabout. When considering the circulating flow across the entry to the park and ride site, the circulating flow is 910 vehicles with the application site and 807 with the Option 3 proposals, some 13% higher. This would suggest that park and ride users and bus services will experience more delay leaving the application site than with Option 3 proposals.

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The circulating flow across the A171 westbound entry is 227 with the application site and 253 with the Option 3 proposals, approximately 10% better in the application site. This would suggest that returning bus services will experience slightly more delay with the option 3 proposals than with the application site. However, the circulatory flows are only 25% of those passing the site access, thus more gaps will be available for traffic, so minimising the delay, and these delays would not be noticeable on-site.

If it is considered that the bus service operates in an anti-clockwise direction, rather than the proposed clockwise direction, further improvements to the operation of a bus service through the junction can be experienced with Option 3 proposals. Buses leaving the park and ride site would need to turn left at the roundabout, onto the A171 eastbound and would return via the B1460, where they would turn left into the park and ride site. Left turns are generally easier to perform at a roundabout, with more gap opportunities.

If the bus routing was to follow this direction, it may also afford more operational benefits at the Prospect Hill junction. The bus service would be turning left at the traffic signals, rather than right with the application routing. It is generally easier to provide additional capacity for left turning traffic at signals installations, as the flow impacts less on other turning movements through the junction. Right turning traffic has the heaviest impact on other movements through a signal controlled junction. The proposed routing would require buses to turn right at the signals which, during the PM peak when most traffic is leaving Whitby, will be heavily used. This is likely to result in more delay to bus services than if buses were operating in an anti-clockwise direction, and it is less likely that measures could be introduced to assist buses without affecting the capacity of the junction to cater for other movements.

Junction Design

NYCC have placed considerable emphasis on the junction design as a justification for their proposal for a park and ride site within the National Park boundary. However, they have only conducted a rough appraisal of alternatives for comparison. It should be noted also that the junction design options considered in our previous technical note were not designed with the benefit of forecast traffic flows, but were meant to show that alternative options for the park and ride facility exist.

NYCC have stated in the Site Location Selection document that 'Site 2 has insufficient frontage to provide a suitable roundabout'. The design shown as Option 3 in our previous report, and with the redesigned Option 3 as outlined below, shows that a suitable roundabout can be accommodated on this frontage.

NYCC have provided additional information to assist the design of a junction. This includes information on the proposed routes for the park and ride bus service to and from the town centre, and forecast traffic flows at the junction for 2023 Saturday and Weekday PM peak periods. NYCC have provided ARCADY assessments for these periods, for the application site roundabout and for the proposed Options 3 site roundabout. However the ARCADY assessment they have conducted for Option 3 does not use the design included within out previous technical note, but just superimposes the geometry for the application site, and adjusts the traffic flows to suit the change in configuration of the roundabout arms.

They state in the disadvantages for Option 3 that a roundabout in this location can be expected to have up to 10% more delays than the application roundabout. Taken from their assessments, the additional queuing delay for the Option 3 roundabout equates to 6%.

A review of the geometric inputs that NYCC have used to assess the application roundabout reveal some differences between the input values to the ARCADY assessments and those measured from the design shown in their drawing 'Site layout Revision A'. When the measured values are used, the

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application roundabout performs significantly worse than stated in the ARCADY results. When the worst case time period is assessed, i.e. 2023 Saturday PM peak period, the A171 east arm of the junction is shown to be overcapacity with an RFC value of 0.997, and a maximum queue length of 23 vehicles. ARCADY uses Ratio of Flow to Capacity (RFC) to measure the capacity of the junction. RFC values of 0.85 or less are usually considered to indicate acceptable operation of the junction. Table 1 below gives the summary results from this assessment.

All ARCADY outputs are contained within **Appendix B** to this note.

Table 1: 2023 Saturday PM peak – Application Site Roundabout – Measured Values

Junction Arm	Max. RFC	Max. Queue Length	Average Delay per Arriving Vehicle (min)
B1460	0.193	0.2	0.09
A171 (East)	0.997	22.7	1.23
A171 (West)	0.521	1.1	0.07
Park & Ride	0.199	0.2	0.10
Total Junction Inclusive Queuing Delay		**Min**	**Min / Veh**
		798.1	0.27

When the Option 3 design as shown in our previous assessment is considered using measured geometric inputs to ARCADY, and the same time period and bus routing is used, better results are obtained for the junction as a whole and for the A171 east arm. These are displayed in Table 2 below. It can be seen that the A171 east arm is still over capacity, but delay and queuing at the junction is reduced.

Table 2: 2023 Saturday PM peak – Option 3 Roundabout – Measured Values

Junction Arm	Max. RFC	Max. Queue Length	Average Delay per Arriving Vehicle (min)
B1460	0.185	0.2	0.09
Park & Ride	0.192	0.2	0.10
A171 (East)	0.937	11.3	0.65
A171 (West)	0.622	1.6	0.10
Total Junction Inclusive Queuing Delay		**Min**	**Min / Veh**
		547.4	0.18

NYCC have made comments regarding the Option 3 design falling outside design standards, particularly the requirement for reverse curvature on the A171 westbound approach. To address this issue, and, with the advent of traffic flow information, to adapt the design of the roundabout to cater for the demand flows, a further design for a possible roundabout at this location has been undertaken. This is shown at **Appendix A** to this note, in Drawing No. 60041470-P-003 Rev A. The revisions to the layout include for a 510m radius curve on the A171 westbound approach to the junction (a suitable standard for the design speed of the A171), changes to the A171 westbound entry to the roundabout, slight realignment of the park and ride access at the roundabout, and realignment and tie-in to the existing B1460 carriageway.

The results of an ARCADY assessment for the same Saturday traffic flows and with the same bus routing is shown in Table 3 below.

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Table 3: 2023 Saturday PM peak – Option 3 Revised roundabout – Measured Values

Junction Arm			Average Delay per Arriving Vehicle (min)
B1460	0.73	0.2	0.08
Park & Ride	0.202	0.3	0.10
A171 (East)	0.810	4.1	0.23
A171 (West)	0.567	1.3	0.08
Total Junction Inclusive Queuing Delay		**Min**	**Min / Veh**
		317.7	0.11

These results indicate that the junction is within capacity on all arms and the queues and delays are significantly reduced from that proposed by NYCC. In fact, the assessment results are better than the assessment conducted by NYCC for the application site.

When considering the routing of the bus service as described in the previous section of this note, the operation of the redesigned Option 3 roundabout as detailed above can be further improved if the routing of the bus service is considered in an anti-clockwise direction. This would allow the bus a left turn from the roundabout to the A171, and a left turn into the site from the B1460. When this operational change is modelled in ARCADY, the resulting improvements in the junction performance can be seen in Table 4 below. This shows further improvements over the assessment of the application site roundabout.

Table 4: 2023 Saturday PM peak – Option 3 revised roundabout – Anti-clockwise bus service

Junction Arm			Average Delay per Arriving Vehicle (min)
B1460	0.185	0.2	0.08
A171 (East)	0.202	0.3	0.10
A171 (West)	0.790	3.6	0.20
Park & Ride	0.558	1.3	0.08
Total Junction Inclusive Queuing Delay		**Min**	**Min / Veh**
		299.2	0.10

In summary, this assessment shows that it is feasible for the operation of a junction to access the alternative park and ride site to the east of the B1460 to work. In fact, significant improvements to all road users will be realised as a result of implementing a design such as considered in the revised Option 3 design when compared to the proposed access roundabout to the application site.

Traffic Signing

NYCC state in their advantages for the application site that the site will be relatively visible for drivers travelling east on the A171 and would therefore require only minimum level of signing within the National Park to inform the approaching drivers. However, the photomantages included in the Addendum to the Environmental Statement, particularly Figure 7.3, shows that the site would not be visible from the A171.

Notwithstanding this, an assessment of the signing requirements for either the application site or for a facility on site 2 would show no difference in the signing requirements, with advance signing required on the approaches to the A171/A169 roundabout and on the approaches to and at the site access roundabout.

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Construction Costs

In the disadvantages for the option 3 design, NYCC state that 'this option requires significant additional new road construction near the boundary of the national Park', and in the advantages for the application site that 'the use of the site while just inside the North York Moors National Park will minimise the construction of lengths of new highway.

It should be noted that all additional new carriageway to be built with the application proposals are within the National Park boundary, whereas all new carriageway construction for the Option 3 proposals are outside of the National Park boundary.

When considering the differences in new construction required for both options, the main difference in construction is that required for the realignment of the B1460, and for the roundabout. Taken from the input to the ARCADY analysis, the application site roundabout has an ICD of 44m. The Option 3 proposal roundabout has an ICD of 40m. This equates to an additional 265 sq.m of new carriageway construction for the application proposal, equivalent to 36m of 7.3m wide carriageway construction.

For the application proposal, it is necessary to realign the B1460 at its entry and exit to the new roundabout. This would result in approximately 60m of 7.3m carriageway to be constructed. For the Option 3 proposal, it will be necessary to construct approximately 120m of new 7.3m carriageway. This equates to an additional 60m of new carriageway construction for the Option 3 proposal.

The difference between these areas is equivalent to 24m of new 7.3m wide carriageway construction. Using generalised highway construction cost rates for Rural All Purpose 7.3m wide carriageway construction taken from Spon's Civil Engineering and Highway Works Price Book 2008, an overall budget cost of between £1,206 and £1,471 per metre length can be expected, equating to an additional £30,000 to £35,000 for construction of the Option 3 proposals. The overall construction costs for the application proposals are expected to be approximately £1.4million. The overall construction costs for Option 3 can be expected to be some 2 to 2.5% higher than the application proposal.

Site Area

In the 'Assessment' section (page 7) of the Design Statement for the site (04/08/2008), the opening statement starts 'The 3.4 hectare site....'. The site area for the application site and for the Option 3 site have been measured using Ordnance Survey base mapping for the area concerned. The application site is measured at 4.5 hectares, not the 3.4 hectares shown in the report. For the Option 3 site, if both fields are required, this would give a site area of 5.2 hectares, 0.7 hectares higher than the application proposal.

The internal layout of the alternative site has not been investigated, as this assessment is only meant to prove that a viable alternative exists for providing park and ride facilities outside the National Park boundary. It is assumed that if a full design of the site was developed, the design would focus on developing the park and ride facilities close to the A171 boundary, and land to the north of the site not required to accommodate the park and ride site would be available as an extension to the field immediately to the north of the Option 3 proposal fields.

Visual Impact

NYCC state in their Design Statement that the application site will have less visual impact than some other potential sites, and that the views towards Whitby and the sea from Cross Butts Farm and the garden centre will not be interrupted by the park and ride. They also state in their supplementary Supporting Statement that the visual impact of the site on the surrounding environment will be similar

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regardless of whether it is located on site 1, site 2, or any of the alternative sites considered by Faber Maunsell on the north side of the A171, particularly when viewed from a distance.

Whilst it is accepted that there will be more impact on views towards the sea and Whitby from the garden centre, it is also true that there will be more impact upon views towards the National Park from the garden centre with the application proposals. This is highlighted by the photomontages contained within the Environmental Statement showing the proposed screening effect of planting along the south and east boundaries of the application site. It is assumed that similar landscaping could be incorporated into the design of the alternative park and ride site to mitigate the visual impact of the site.

NYCC also state in their Design Statement that 'when motorists arrive on the site and note the proximity of both garden centre and popular restaurant they may wish to visit these in addition to travelling on the shuttle bus to Whitby'. Whilst this may not be a material planning consideration, it should also be noted that this also holds true for the alternative site, and may even generate more business as the garden centre and restaurant could be more visible from the alternative park and ride site than the application site.

Access to Garden Centre

In the disadvantages for Option 3, NYCC state that the 'need for additional carriageway and a footway link to the garden centre and the restaurant could render the scheme uneconomic from the County Council's perspective'. The proposals for the link to the garden centre would use the existing section of B1460, and would require only marginal additional carriageway construction, to provide the access from the realigned B1460. There is no cost estimate provided within the documentation to comment on the economic viability of the proposal.

Whilst it is accepted that access to the garden centre is via a cul-de sac, providing the access away from the entry/exit to the proposed roundabout, as with the application proposal, potentially reduces the risk of accidents in the vicinity of the junction. The access to the garden centre as seen in the alternative proposals is placed on the outside of the bend on the realigned B1460, giving clear visibility in both directions.

Conclusions

The assessment of the application proposals and those for the Option 3 proposals can be summarised as:

- The additional assessment and redesign of the access roundabout for the Option 3 design shows that the junction will operate within capacity and will in fact operate better than the proposed design for the application site. The junction assessments also reveal that the stated advantages of the bus routing upon the operation of the park and ride bus service at the junction and beyond may be further realised with Option 3 proposals than with the application proposals.

- The requirements for traffic signing will be the same for each of the proposals and can therefore not be stated as an advantage or disadvantage for either option.

- As stated in our previous assessment, there will be additional construction costs associated with the Option 3 proposals, but these are estimated to be not as great as estimated by NYCC (£30k - £35k, not £200k).

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- The overall site area for the two fields for Option 3 is greater than the measured site area for the application proposal, but if a detailed design of the site were to be undertaken, it is felt that the additional land would not be 'blighted', as suggested in the NYCC appraisal, but could be returned to farming land to the north of the site.

- Access to the garden centre and restaurant would be more circuitous with the option 3 proposals than with the application proposals, but the access from the B1460 is deemed safer as it will be located away from the main junction with the A171.

- It is deemed that the visual impact of the option 3 proposals could be mitigated by employing similar landscaping as shown for the application site.

This assessment shows that, based on the further information that has been made available to inform this assessment, the Option 3 proposals are a viable alternative to the application site proposals outside the National Park boundary and as such, the application site does not satisfy the planning condition 'that there are no reasonable alternative sites outside the National Park..'.

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Appendix A

Alternative Park and Ride Site

Redesigned Access Drawing

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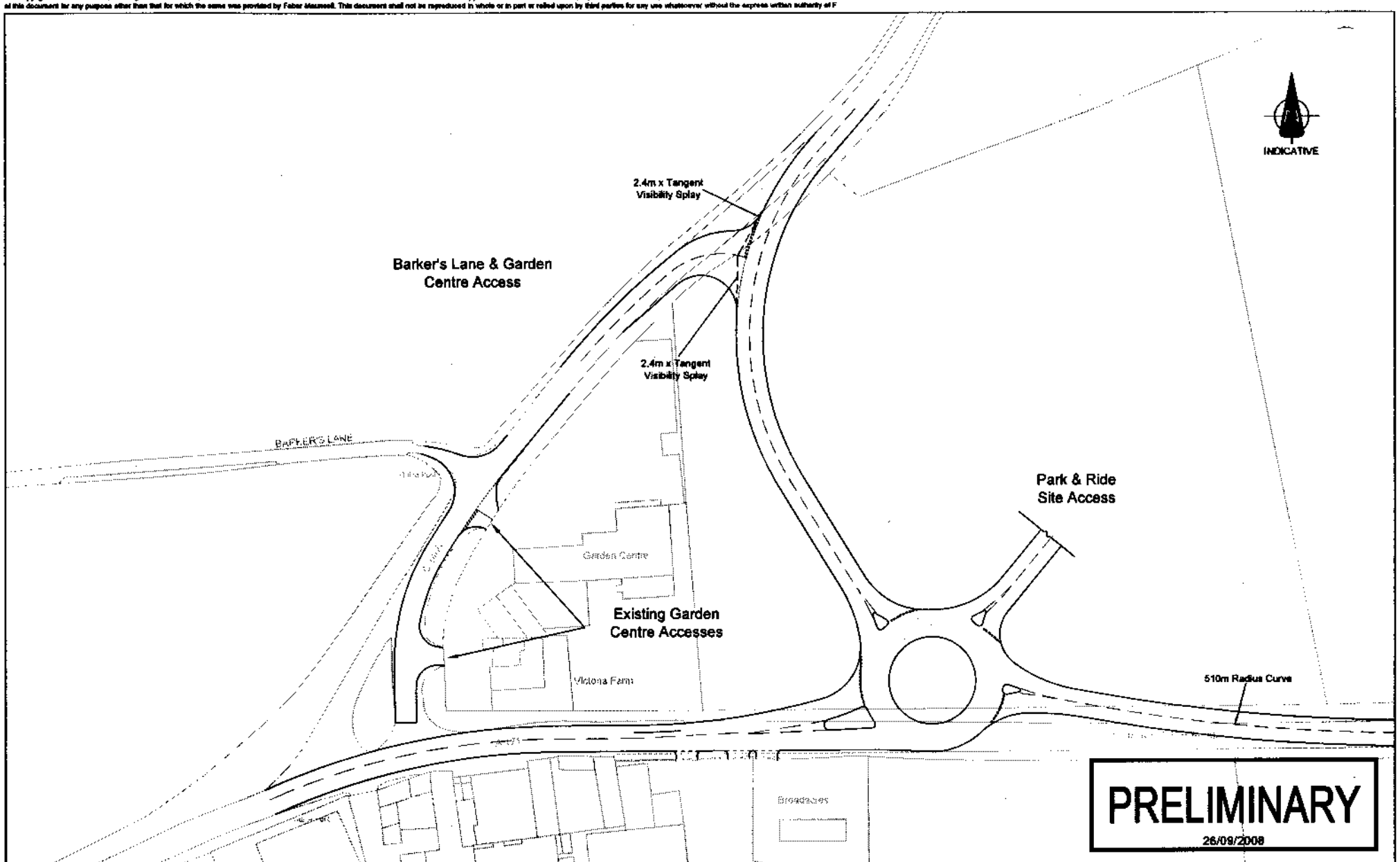

Client: North Yorks Moors National Parks	Project: Whitby Park And Ride Scheme	Title: Revised Layout Option 3	FABER MAUNSELL | AECOM St. Christopher House, George Cayley Drive, Clifton Moor, YORK, YO30 4XE T [redacted] Fax [redacted]	Design: MIT	CAD: MIT	cm
				Checked: CS	Date: 26 Sept 2008	
				Approved: CS	Scale: 1:1000 @ A3	
				Drawing No. 60041470-P-003	Rev: A	
						A3

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Appendix B

Assessment of Roundabout Options

ARCADY Output Files

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ASSESSMENT OF ROUNDABOUT CAPACITY AND DELAY

Analysis Program: Release 3.0 (JUNE 2005)

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

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Run with file:-
"f:\PROJECTS\Whitby P&R (NYMNPA)\Additional Work\ARCADY\Saturday Peak NYCC Proposed Scheme.vai"
(drive-on-tha-left) at 15:52:21 on Wednesday, 24 September 2008

.FILE PROPERTIES
****

RUN TITLE: Whitby Park & Ride NYCC Proposed Scheme Saturday Peak
LOCATION: Whitby A171 / B1460
DATE: 24/09/2008
CLIENT:
ENUMERATOR: macklinka [UKYRK1PC16402]
JOB NUMBER:
STATUS: Preliminary
DESCRIPTION:

.INPUT DATA
****
ARM A - B1460
ARM B - A171 East
ARM C - A171 West
ARM D - Park & Ride

.GEOMETRIC DATA

ARM	V (M)	E (M)	L (M)	R (M)	D (M)	PHI (DEG)	SLOPE	INTERCEPT (PCU/MIN)
ARM A	3.70	4.80	4.90	10.40	44.00	28.0	0.534	21.080
ARM B	3.70	4.70	3.50	20.00	44.00	37.0	0.535	20.805
ARM C	3.80	7.70	21.40	30.00	44.00	37.0	0.665	31.377
ARM D	3.60	5.20	4.00	20.00	44.00	33.0	0.547	21.498

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

.TRAFFIC DEMAND DATA

(Only sets included in the current run are shown)

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

.TIME PERIOD BEGINS 15.45 AND ENDS 17.15
.LENGTH OF TIME PERIOD - 90 MINUTES.
LENGTH OF TIME SEGMENT - 15 MINUTES.

.DEMAND FLOW PROFILES ARE SYNTHESISED FROM TURNING COUNT DATA

DEMAND SET TITLE: Saturday Peak

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	1.79	2.68	1.79
ARM B	15.00	45.00	75.00	12.68	19.01	12.68
ARM C	15.00	45.00	75.00	11.00	16.50	11.00
ARM D	15.00	45.00	75.00	1.69	2.53	1.69

DEMAND SET TITLE: Saturday Peak

TURNING PROPORTIONS
TURNING COUNTS (VEH/HR)
(PERCENTAGE OF H.V.S)

TIME	FROM/TO	ARM A	ARM B	ARM C	ARM D
15.45 - 17.15	ARM A	0.000	0.154	0.846	0.000
		0.0	22.0	121.0	0.0
		(0.0)	(0.0)	(0.0)	(0.0)
	ARM B	0.030	0.000	0.959	0.012
		30.0	0.0	972.0	12.0
		(0.0)	(0.0)	(0.0)	(0.0)
	ARM C	0.245	0.755	0.000	0.000
		216.0	664.0	0.0	0.0
		(0.0)	(0.0)	(0.0)	(0.0)
	ARM D	0.215	0.000	0.785	0.000
		29.0	0.0	106.0	0.0
		(0.0)	(0.0)	(0.0)	(0.0)

QUEUE AND DELAY INFORMATION FOR EACH 15 MIN TIME SEGMENT

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)
15.45-16.00									
ARM A	1.79	15.96	0.112		0.0	0.1	1.8		0.07
ARM B	12.68	19.29	0.657		0.0	1.9	26.0		0.15
ARM C	11.00	31.03	0.354		0.0	0.5	8.0		0.05
ARM D	1.69	15.29	0.110		0.0	0.1	1.8		0.07

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)
16.00-16.15									
ARM A	2.13	14.95	0.143		0.1	0.2	2.4		0.08
ARM B	15.14	18.99	0.797		1.9	3.6	49.4		0.24
ARM C	13.14	30.96	0.424		0.5	0.7	10.8		0.06
ARM D	2.02	14.07	0.143		0.1	0.2	2.4		0.08

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)
16.15-16.30									
ARM A	2.61	13.57	0.193		0.2	0.2	3.5		0.09
ARM B	18.54	18.59	0.997		3.6	16.3	169.4		0.76
ARM C	16.09	30.89	0.521		0.7	1.1	15.8		0.07
ARM D	2.47	12.42	0.199		0.2	0.2	3.6		0.10

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)
16.30-16.45									
ARM A	2.61	13.56	0.193		0.2	0.2	3.6		0.09
ARM B	18.54	18.58	0.997		16.3	22.7	295.3		1.23
ARM C	16.09	30.88	0.521		1.1	1.1	16.2		0.07
ARM D	2.47	12.40	0.199		0.2	0.2	3.7		0.10

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	2.13	14.93	0.143		0.2	0.2	2.6		0.08
ARM B	15.14	18.99	0.797		22.7	4.3	123.6		0.51
ARM C	13.14	30.93	0.425		1.1	0.7	11.4		0.06
ARM D	2.02	14.03	0.144		0.2	0.2	2.6		0.08

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	1.79	15.93	0.112		0.2	0.1	1.9		0.07
ARM B	12.68	19.28	0.657		4.3	2.0	31.9		0.16
ARM C	11.00	31.02	0.355		0.7	0.6	8.4		0.05
ARM D	1.69	15.26	0.111		0.2	0.1	1.9		0.07

.QUEUE AT ARM A

TIME SEGMENT ENDING	NO. OF VEHICLES IN QUEUE	
16.00	0.1	
16.15	0.2	
16.30	0.2	
16.45	0.2	
17.00	0.2	
17.15	0.1	

.QUEUE AT ARM B

TIME SEGMENT ENDING	NO. OF VEHICLES IN QUEUE	
16.00	1.9	**
16.15	3.6	****
16.30	16.3	**********
16.45	22.7	**********
17.00	4.3	****
17.15	2.0	**

.QUEUE AT ARM C

TIME SEGMENT ENDING	NO. OF VEHICLES IN QUEUE	
16.00	0.5	*
16.15	0.7	*
16.30	1.1	*
16.45	1.1	*
17.00	0.7	*
17.15	0.6	*

.QUEUE AT ARM D

TIME SEGMENT ENDING	NO. OF VEHICLES IN QUEUE
16.00	0.1
16.15	0.2
16.30	0.2
16.45	0.2
17.00	0.2
17.15	0.1

QUEUEING DELAY INFORMATION OVER WHOLE PERIOD

ARM	TOTAL DEMAND		* QUEUEING * DELAY *		* INCLUSIVE QUEUEING * DELAY *	
	(VEH)	(VEH/H)	(MIN)	(MIN/VEH)	(MIN)	(MIN/VEH)
A	196.1	130.7	15.8	0.08	15.8	0.08
B	1390.4	926.9	695.5	0.50	695.6	0.50
C	1206.7	804.4	70.6	0.06	70.6	0.06
D	185.1	123.4	16.1	0.09	16.1	0.09
ALL	2978.3	1985.5	797.9	0.27	798.1	0.27

* 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

ARCADY 6

ASSESSMENT OF ROUNDABOUT CAPACITY AND DELAY

Analysis Program: Release 3.0 (JUNE 2005)

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

TRL Limited
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Email: softwarebureau@trl.co.uk
Web: www.trlsoftware.co.uk

Run with file:-
"f:\PROJECTS\Whitby P&R (NYMNPA)\Additional Work\ARCADY\Saturday Peak PM Proposed Scheme (Clockwise).vai"
(drive-on-the-left) at 09:37:58 on Thursday, 25 September 2008

.FILE PROPERTIES
****

RUN TITLE: Whitby Park & Ride PM Proposed Scheme Saturday Peak (clockwise)
LOCATION: Whitby A171 / B1460
DATE: 24/09/2008
CLIENT:
ENUMERATOR: macklinka [UKYRK1PC16402]
JOB NUMBER:
STATUS: Preliminary
DESCRIPTION:

.INPUT DATA
****
ARM A - B1460
ARM B - Park & Ride
ARM C - A171 East
ARM D - A171 West

.GEOMETRIC DATA

ARM	V (M)	E (M)	L (M)	R (M)	D (M)	PHI (DEG)	SLOPE	INTERCEPT (PCU/MIN)
ARM A	3.70	5.20	2.00	20.00	40.00	29.0	0.555	20.986
ARM B	3.70	5.10	2.00	10.00	40.00	13.0	0.558	21.078
ARM C	3.70	5.00	4.50	20.00	40.00	25.0	0.577	22.480
ARM D	4.00	7.80	12.50	15.00	40.00	57.0	0.588	26.636

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

.TRAFFIC DEMAND DATA

(Only sets included in the current run are shown)

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

.TIME PERIOD BEGINS 15.45 AND ENDS 17.15
.LENGTH OF TIME PERIOD - 90 MINUTES.
LENGTH OF TIME SEGMENT - 15 MINUTES.

.DEMAND FLOW PROFILES ARE SYNTHESISED FROM TURNING COUNT DATA

DEMAND SET TITLE: Saturday Peak (clockwise)

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	1.79	2.68	1.79
ARM B	15.00	45.00	75.00	1.69	2.53	1.69
ARM C	15.00	45.00	75.00	12.68	19.01	12.68
ARM D	15.00	45.00	75.00	11.00	16.50	11.00

DEMAND SET TITLE: Saturday Peak (clockwise)

TIME	FROM/TO	TURNING PROPORTIONS / TURNING COUNTS (VEH/HR) (PERCENTAGE OF H.V.S) ARM A	ARM B	ARM C	ARM D
15.45 - 17.15	ARM A	0.000	0.000	0.154	0.846
		0.0	0.0	22.0	121.0
		(0.0)	(0.0)	(0.0)	(0.0)
	ARM B	0.215	0.000	0.000	0.785
		29.0	0.0	0.0	106.0
		(0.0)	(0.0)	(0.0)	(0.0)
	ARM C	0.030	0.012	0.000	0.959
		30.0	12.0	0.0	972.0
		(0.0)	(0.0)	(0.0)	(0.0)
	ARM D	0.245	0.000	0.755	0.000
		216.0	0.0	664.0	0.0
		(0.0)	(0.0)	(0.0)	(0.0)

QUEUE AND DELAY INFORMATION FOR EACH 15 MIN TIME SEGMENT

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)
15.45-16.00									
ARM A	1.79	16.32	0.110		0.0	0.1	1.8		0.07
ARM B	1.69	15.47	0.109		0.0	0.1	1.8		0.07
ARM C	12.68	20.64	0.614		0.0	1.6	22.0		0.12
ARM D	11.00	26.12	0.421		0.0	0.7	10.5		0.07
16.00-16.15									
ARM A	2.13	15.39	0.139		0.1	0.2	2.4		0.08
ARM B	2.02	14.37	0.140		0.1	0.2	2.4		0.08
ARM C	15.14	20.28	0.746		1.6	2.8	39.1		0.19
ARM D	13.14	26.01	0.505		0.7	1.0	14.8		0.08
16.15-16.30									
ARM A	2.61	14.15	0.185		0.2	0.2	3.3		0.09
ARM B	2.47	12.86	0.192		0.2	0.2	3.5		0.10
ARM C	18.54	19.78	0.937		2.8	9.6	112.3		0.49
ARM D	16.09	25.88	0.622		1.0	1.6	23.3		0.10
16.30-16.45									
ARM A	2.61	14.13	0.185		0.2	0.2	3.4		0.09
ARM B	2.47	12.85	0.192		0.2	0.2	3.5		0.10
ARM C	18.54	19.78	0.937		9.6	11.3	158.5		0.65
ARM D	16.09	25.87	0.622		1.6	1.6	24.3		0.10
16.45-17.00									
ARM A	2.13	15.37	0.139		0.2	0.2	2.5		0.08
ARM B	2.02	14.34	0.141		0.2	0.2	2.5		0.08
ARM C	15.14	20.27	0.747		11.3	3.1	58.8		0.24
ARM D	13.14	26.00	0.505		1.6	1.0	16.0		0.08

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	1.79	16.29	0.110		0.2	0.1	1.9		0.07
ARM B	1.69	15.44	0.109		0.2	0.1	1.9		0.07
ARM C	12.68	20.63	0.614		3.1	1.6	25.7		0.13
ARM D	11.00	26.11	0.421		1.0	0.7	11.3		0.07

.QUEUE AT ARM A

TIME SEGMENT ENDING	NO. OF VEHICLES IN QUEUE	
16.00	0.1	
16.15	0.2	
16.30	0.2	
16.45	0.2	
17.00	0.2	
17.15	0.1	

.QUEUE AT ARM B

TIME SEGMENT ENDING	NO. OF VEHICLES IN QUEUE	
16.00	0.1	
16.15	0.2	
16.30	0.2	
16.45	0.2	
17.00	0.2	
17.15	0.1	

.QUEUE AT ARM C

TIME SEGMENT ENDING	NO. OF VEHICLES IN QUEUE	
16.00	1.6	**
16.15	2.8	***
16.30	9.6	**********
16.45	11.3	**********
17.00	3.1	***
17.15	1.6	**

.QUEUE AT ARM D

TIME SEGMENT ENDING	NO. OF VEHICLES IN QUEUE	
16.00	0.7	*
16.15	1.0	*
16.30	1.6	**
16.45	1.6	**
17.00	1.0	*
17.15	0.7	*

QUEUEING DELAY INFORMATION OVER WHOLE PERIOD

ARM	TOTAL DEMAND		* QUEUEING * DELAY *		* INCLUSIVE QUEUEING * DELAY *	
	(VEH)	(VEH/H)	(MIN)	(MIN/VEH)	(MIN)	(MIN/VEH)
A	196.1	130.7	15.2	0.08	15.2	0.08
B	185.1	123.4	15.6	0.08	15.6	0.08
C	1390.4	926.9	416.4	0.30	416.5	0.30
D	1206.7	804.4	100.1	0.08	100.1	0.08
ALL	2978.3	1985.5	547.3	0.18	547.4	0.18

* 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

A R C A D Y 6

ASSESSMENT OF ROUNDABOUT CAPACITY AND DELAY

Analysis Program: Release 3.0 (JUNE 2005)

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

TRL Limited
Crowthorne House
Nine Mile Ride
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Email: softwarebureau@trl.co.uk
Web: www.trlsoftware.co.uk

Run with file:-
"f:\PROJECTS\Whitby P&R (NYMNPA)\Additional Work\ARCADY\Saturday Peak FM Proposed Scheme (Clockwise) Rev 01.vai"
(drive-on-the-left) at 16:52:45 on Thursday, 25 September 2008

.FILE PROPERTIES
****

RUN TITLE: Whitby Park & Ride FM Proposed Scheme Saturday Peak (clockwise) Rev 01
LOCATION: Whitby A171 / B1460
DATE: 24/09/2008
CLIENT:
ENUMERATOR: macklinka [UKYRK1PC16402]
JOB NUMBER:
STATUS: Preliminary
DESCRIPTION:

.INPUT DATA
****
ARM A - B1460
ARM B - Park & Ride
ARM C - A171 East
ARM D - A171 West

.GEOMETRIC DATA

ARM	V (M)	E (M)	L (M)	R (M)	D (M)	PHI (DEG)	SLOPE	INTERCEPT (PCU/MIN)
ARM A	3.70	5.20	4.10	20.00	40.00	30.0	0.568	22.175
ARM B	3.70	5.20	3.20	10.00	40.00	42.0	0.512	19.749
ARM C	3.70	6.00	9.00	20.00	40.00	22.0	0.620	25.771
ARM D	3.70	7.70	15.00	15.00	40.00	29.0	0.648	29.205

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

.TRAFFIC DEMAND DATA

(Only sets included in the current run are shown)

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

.TIME PERIOD BEGINS 15.45 AND ENDS 17.15
.LENGTH OF TIME PERIOD - 90 MINUTES.
LENGTH OF TIME SEGMENT - 15 MINUTES.

.DEMAND FLOW PROFILES ARE SYNTHESISED FROM TURNING COUNT DATA

DEMAND SET TITLE: Saturday Peak (clockwise)

ARM	NUMBER OF MINUTES FROM START WHEN FLOW STARTS TO RISE	TOP OF PEAK IS REACHED	FLOW STOPS FALLING	RATE OF FLOW (VEH/MIN) BEFORE PEAK	AT TOP OF PEAK	AFTER PEAK
ARM A	15.00	45.00	75.00	1.79	2.68	1.79
ARM B	15.00	45.00	75.00	1.69	2.53	1.69
ARM C	15.00	45.00	75.00	12.68	19.01	12.68
ARM D	15.00	45.00	75.00	11.00	16.50	11.00

DEMAND SET TITLE: Saturday Peak (clockwise)

TURNING PROPORTIONS
TURNING COUNTS (VEH/HR)
(PERCENTAGE OF H.V.S)

TIME	FROM/TO	ARM A	ARM B	ARM C	ARM D
15.45 - 17.15	ARM A	0.000	0.000	0.154	0.846
		0.0	0.0	22.0	121.0
		(0.0)	(0.0)	(0.0)	(0.0)
	ARM B	0.215	0.000	0.000	0.785
		29.0	0.0	0.0	106.0
		(0.0)	(0.0)	(0.0)	(0.0)
	ARM C	0.030	0.012	0.000	0.959
		30.0	12.0	0.0	972.0
		(0.0)	(0.0)	(0.0)	(0.0)
	ARM D	0.245	0.000	0.755	0.000
		216.0	0.0	664.0	0.0
		(0.0)	(0.0)	(0.0)	(0.0)

QUEUE AND DELAY INFORMATION FOR EACH 15 MIN TIME SEGMENT

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)
15.45-16.00									
ARM A	1.79	17.39	0.103		0.0	0.1	1.7		0.06
ARM B	1.69	14.61	0.116		0.0	0.1	1.9		0.08
ARM C	12.68	23.80	0.533		0.0	1.1	16.2		0.09
ARM D	11.00	28.63	0.384		0.0	0.6	9.1		0.06

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)
16.00-16.15									
ARM A	2.13	16.45	0.130		0.1	0.1	2.2		0.07
ARM B	2.02	13.59	0.148		0.1	0.2	2.5		0.09
ARM C	15.14	23.41	0.647		1.1	1.8	25.7		0.12
ARM D	13.14	28.52	0.461		0.6	0.8	12.4		0.06

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)
16.15-16.30									
ARM A	2.61	15.17	0.172		0.1	0.2	3.0		0.08
ARM B	2.47	12.21	0.202		0.2	0.3	3.7		0.10
ARM C	18.54	22.88	0.810		1.8	4.0	53.7		0.22
ARM D	16.09	28.37	0.567		0.8	1.3	18.8		0.08

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)
16.30-16.45									
ARM A	2.61	15.15	0.173		0.2	0.2	3.1		0.08
ARM B	2.47	12.20	0.202		0.3	0.3	3.8		0.10
ARM C	18.54	22.87	0.810		4.0	4.1	60.9		0.23
ARM D	16.09	28.36	0.567		1.3	1.3	19.5		0.08

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	2.13	16.43	0.130		0.2	0.2	2.3		0.07
ARM B	2.02	13.57	0.148		0.3	0.2	2.7		0.09
ARM C	15.14	23.40	0.647		4.1	1.9	29.9		0.13
ARM D	13.14	28.51	0.461		1.3	0.9	13.2		0.07

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	1.79	17.37	0.103		0.2	0.1	1.8		0.06
ARM B	1.69	14.58	0.116		0.2	0.1	2.0		0.08
ARM C	12.68	23.79	0.533		1.9	1.2	18.0		0.09
ARM D	11.00	28.63	0.384		0.9	0.6	9.6		0.06

.QUEUE AT ARM A

TIME SEGMENT ENDING	NO. OF VEHICLES IN QUEUE	
16.00	0.1	
16.15	0.1	
16.30	0.2	
16.45	0.2	
17.00	0.2	
17.15	0.1	

.QUEUE AT ARM B

TIME SEGMENT ENDING	NO. OF VEHICLES IN QUEUE	
16.00	0.1	
16.15	0.2	
16.30	0.3	
16.45	0.3	
17.00	0.2	
17.15	0.1	

.QUEUE AT ARM C

TIME SEGMENT ENDING	NO. OF VEHICLES IN QUEUE	
16.00	1.1	*
16.15	1.8	**
16.30	4.0	****
16.45	4.1	****
17.00	1.9	**
17.15	1.2	*

.QUEUE AT ARM D

TIME SEGMENT ENDING	NO. OF VEHICLES IN QUEUE	
16.00	0.6	*
16.15	0.8	*
16.30	1.3	*
16.45	1.3	*
17.00	0.9	*
17.15	0.6	*

QUEUEING DELAY INFORMATION OVER WHOLE PERIOD

ARM	TOTAL DEMAND		* QUEUEING * DELAY *		* INCLUSIVE QUEUEING * DELAY *	
	(VEH)	(VEH/H)	(MIN)	(MIN/VEH)	(MIN)	(MIN/VEH)
A	196.1	130.7	14.1	0.07	14.1	0.07
B	185.1	123.4	16.6	0.09	16.6	0.09
C	1390.4	926.9	204.4	0.15	204.4	0.15
D	1206.7	804.4	82.7	0.07	82.7	0.07
ALL	2978.3	1985.5	317.7	0.11	317.7	0.11

* 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

ARCADY 6

ASSESSMENT OF ROUNDABOUT CAPACITY AND DELAY

Analysis Program: Release 3.0 (JUNE 2005)

For sales and distribution information,
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Web: www.trlsoftware.co.uk

Run with file:-
"f:\PROJECTS\Whitby P&R (NYMNPA)\Additional Work\ARCADY\
Saturday Peak FM Proposed Scheme (Counter Clockwise) Rev 01.vai"
(drive-on-the-left) at 16:54:46 on Thursday, 25 September 2008

.FILE PROPERTIES
****

RUN TITLE: Whitby Park & Ride FM Proposed Scheme Saturday Peak (counter clockwise) Rev 01
LOCATION: Whitby A171 / B1460
DATE: 24/09/2008
CLIENT:
ENUMERATOR: macklinka [UKYRK1PC16402]
JOB NUMBER:
STATUS: Preliminary
DESCRIPTION:

.INPUT DATA
****
ARM A - B1460
ARM B - Park & Ride
ARM C - A171 East
ARM D - A171 West

.GEOMETRIC DATA

ARM	V (M)	E (M)	L (M)	R (M)	D (M)	PHI (DEG)	SLOPE	INTERCEPT (PCU/MIN)
ARM A	3.70	5.20	4.10	20.00	40.00	30.0	0.568	22.175
ARM B	3.70	5.20	3.20	10.00	40.00	42.0	0.512	19.749
ARM C	3.70	6.00	9.00	20.00	40.00	22.0	0.620	25.771
ARM D	3.70	7.70	15.00	15.00	40.00	29.0	0.648	29.205

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

.TRAFFIC DEMAND DATA

(Only sets included in the current run are shown)

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

.TIME PERIOD BEGINS 15.45 AND ENDS 17.15
.LENGTH OF TIME PERIOD - 90 MINUTES.
LENGTH OF TIME SEGMENT - 15 MINUTES.

.DEMAND FLOW PROFILES ARE SYNTHESISED FROM TURNING COUNT DATA

DEMAND SET TITLE: Saturday Peak (counter clockwise)

ARM	NUMBER OF MINUTES FROM START WHEN FLOW STARTS TO RISE	TOP OF PEAK IS REACHED	FLOW STOPS FALLING	RATE OF FLOW (VEH/MIN) BEFORE PEAK	AT TOP OF PEAK	AFTER PEAK
ARM A	15.00	45.00	75.00	1.94	2.91	1.94
ARM B	15.00	45.00	75.00	1.69	2.53	1.69
ARM C	15.00	45.00	75.00	12.52	18.79	12.52
ARM D	15.00	45.00	75.00	11.00	16.50	11.00

DEMAND SET TITLE: Saturday Peak (counter clockwise)

TURNING PROPORTIONS
TURNING COUNTS (VEH/HR)
(PERCENTAGE OF H.V.S)

TIME	FROM/TO	ARM A	ARM B	ARM C	ARM D
15.45 - 17.15	ARM A	0.000	0.077	0.142	0.781
		0.0	12.0	22.0	121.0
		(0.0)	(0.0)	(0.0)	(0.0)
	ARM B	0.000	0.000	0.215	0.785
		0.0	0.0	29.0	106.0
		(0.0)	(0.0)	(0.0)	(0.0)
	ARM C	0.030	0.000	0.000	0.970
		30.0	0.0	0.0	972.0
		(0.0)	(0.0)	(0.0)	(0.0)
	ARM D	0.245	0.000	0.755	0.000
		216.0	0.0	664.0	0.0
		(0.0)	(0.0)	(0.0)	(0.0)

QUEUE AND DELAY INFORMATION FOR EACH 15 MIN TIME SEGMENT

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)
15.45-16.00									
ARM A	1.94	17.48	0.111		0.0	0.1	1.8		0.06
ARM B	1.69	14.61	0.116		0.0	0.1	1.9		0.08
ARM C	12.52	24.02	0.521		0.0	1.1	15.5		0.09
ARM D	11.00	28.96	0.380		0.0	0.6	8.9		0.06
16.00-16.15									
ARM A	2.31	16.55	0.140		0.1	0.2	2.4		0.07
ARM B	2.02	13.59	0.148		0.1	0.2	2.5		0.09
ARM C	14.96	23.67	0.632		1.1	1.7	24.2		0.11
ARM D	13.14	28.92	0.454		0.6	0.8	12.1		0.06
16.15-16.30									
ARM A	2.83	15.29	0.185		0.2	0.2	3.3		0.08
ARM B	2.47	12.21	0.202		0.2	0.3	3.7		0.10
ARM C	18.32	23.20	0.789		1.7	3.5	48.4		0.19
ARM D	16.09	28.85	0.558		0.8	1.2	18.2		0.08
16.30-16.45									
ARM A	2.83	15.28	0.185		0.2	0.2	3.4		0.08
ARM B	2.47	12.20	0.202		0.3	0.3	3.8		0.10
ARM C	18.32	23.20	0.790		3.5	3.6	54.0		0.20
ARM D	16.09	28.85	0.558		1.2	1.3	18.8		0.08
16.45-17.00									
ARM A	2.31	16.53	0.140		0.2	0.2	2.5		0.07
ARM B	2.02	13.57	0.148		0.3	0.2	2.7		0.09
ARM C	14.96	23.67	0.632		3.6	1.8	27.8		0.12
ARM D	13.14	28.91	0.454		1.3	0.8	12.9		0.06

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	1.94	17.45	0.111		0.2	0.1	1.9		0.06
ARM B	1.69	14.58	0.116		0.2	0.1	2.0		0.08
ARM C	12.52	24.01	0.522		1.8	1.1	17.1		0.09
ARM D	11.00	28.96	0.380		0.8	0.6	9.4		0.06

.QUEUE AT ARM A

TIME SEGMENT ENDING	NO. OF VEHICLES IN QUEUE
16.00	0.1
16.15	0.2
16.30	0.2
16.45	0.2
17.00	0.2
17.15	0.1

.QUEUE AT ARM B

TIME SEGMENT ENDING	NO. OF VEHICLES IN QUEUE
16.00	0.1
16.15	0.2
16.30	0.3
16.45	0.3
17.00	0.2
17.15	0.1

.QUEUE AT ARM C

TIME SEGMENT ENDING	NO. OF VEHICLES IN QUEUE	
16.00	1.1	*
16.15	1.7	**
16.30	3.5	****
16.45	3.6	****
17.00	1.8	**
17.15	1.1	*

.QUEUE AT ARM D

TIME SEGMENT ENDING	NO. OF VEHICLES IN QUEUE	
16.00	0.6	*
16.15	0.8	*
16.30	1.2	*
16.45	1.3	*
17.00	0.8	*
17.15	0.6	*

QUEUEING DELAY INFORMATION OVER WHOLE PERIOD

ARM	TOTAL DEMAND (VEH)	TOTAL DEMAND (VEH/H)	* QUEUEING * DELAY * (MIN)	* QUEUEING * DELAY * (MIN/VEH)	* INCLUSIVE QUEUEING * DELAY * (MIN)	* INCLUSIVE QUEUEING * DELAY * (MIN/VEH)
A	212.5	141.7	15.3	0.07	15.3	0.07
B	185.1	123.4	16.6	0.09	16.6	0.09
C	1374.0	916.0	186.9	0.14	187.0	0.14
D	1206.7	804.4	80.3	0.07	80.3	0.07
ALL	2978.3	1985.5	299.1	0.10	299.2	0.10

* 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