

London Borough of Barnet Traffic & Development Design Team

AERODROME ROAD PEDESTRIAN FACILITY AND BUS STOP INTRODUCTION FEASIBILITY REPORT

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1. Introduction

Project Background

- 1.1 The Traffic and Development Team were asked to carry out an impact review for the introduction of pedestrian crossing facilities along Aerodrome Road, and to ascertain the most appropriate facility to serve pedestrians and ensure traffic flow through the route would not be detrimentally affected. Appendix A shows the current layout.
- 1.2 This study was requested due to the increase in traffic flow and pedestrian movements along Aerodrome Road, a direct result of the new residential developments in the area. The difficulties which are faced by pedestrians crossing Aerodrome Road have been highlighted by local elected members and there is a signed petition from concerned local residents.
- 1.3 In a previous pedestrian route study undertaken in 2010 the recommendations were to introduce two uncontrolled pedestrian refuge islands as part of an overall package of pedestrian improvement measures. The location of the two proposed pedestrian refuge islands are on Aerodrome Road east of its junction with Peel Drive and west of its junction with Heritage Avenue.
- 1.4 In light of the concerns and the petition put forward by residents, this report further investigates whether considerations should be given to provide a controlled pedestrian crossing facility by Heritage Avenue such as a zebra or pelican crossing instead of the previously proposed pedestrian refuge island.
- 1.5 These reports also investigate the feasibility of introducing an additional westbound bus stop by Heritage Avenue.
- 1.6 Fig 1.1 below highlights the sites' locations.

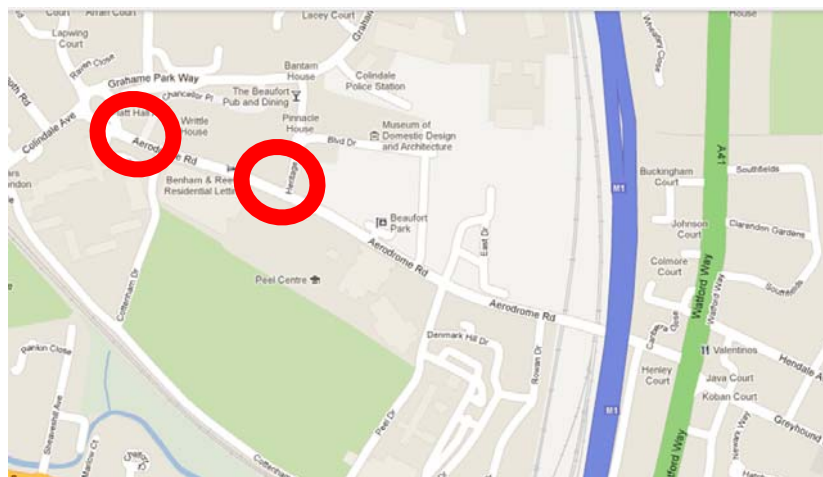


Fig 1.1 Location plan of Aerodrome Road, Hendon, Barnet

2. Existing Site Characteristics

Context and Current Layout

- 2.1 A plan showing the existing layout of Aerodrome Road from its junctions with Heritage Avenue and Colindale Avenue is included in Appendix A.
- 2.2 Aerodrome Road is a busy local distributor road between the east and west of the Colindale area, as well as a main supply road to and from the A41.
- 2.3 The Colindale Area Regeneration has plans to introduce 10,000 residential units within the area. Beaufort Park and Graham Park Developments are the two main developments in the area. These units have steadily been occupied resulting in an increased footfall along Aerodrome Road on route to the local amenities, transport links, schools and so forth.
- 2.4 The steady increase of population across the Colindale area has also resulted in the increase of vehicular traffic along Aerodrome Road.
- 2.5 The introduction of 'no waiting at any time' restrictions along Aerodrome Road has provided a wider carriageway space for passing traffic, where previously vehicles would have been parked. This has resulted in increased vehicular speeds with the 85 percentile speed being 35mph in both directions.
- 2.6 Aerodrome Road is a two way road which consists of a single lane in either direction. The carriageway width varies between 7.5 – 10m, with an average 2m wide footway on either side. However, along the southern footway, outside the police training grounds, the footway is 8m in width.
- 2.7 On the western side of Aerodrome Road on approach to the Colindale Roundabout, there are a number of trees and strips of grass verge, creating a pleasant environment.

Traffic and Pedestrian Flows

- 2.8 Traffic and pedestrian flows have been obtained using the results of a classified manual count for the junction of Aerodrome Road and Heritage Avenue.
- 2.9 The above survey was carried out in May 2010, for the duration of a day to capture any variations outside of the peak periods.
- 2.10 The results highlighted that the peak traffic flows were between 8 - 9am and 5 - 6pm.
- 2.11 Pedestrian flows showed the peak demand to be in the morning peak 8 - 9am and during the lunch time period 12:30pm – 1:30pm and then followed by the evening peak of 5 - 6pm.
- 2.12 The survey results are represented in table 2.1 below:

	8.00am-9.00am	12.30pm – 1.30pm	5.00pm - 6.00pm	Total
Aerodrome Road Eastbound	407	390	404	1201
Aerodrome Road Westbound	416	375	769	1560
Pedestrian Flow Combined 2 way	22	45	12	79

Table 2.1: May 2010 vehicle and Pedestrian Flows

- 2.13 Table 2.1 above indicates that traffic flows along Aerodrome Road are relatively equal in both directions within the three different peak periods, with the exception for the evening westbound flow which is substantially high in comparison.

- 2.14 The existing traffic flows and pedestrian movements have increased since 2010 due to the steady increase of the population across the Colindale Area. In order to replicate today's flows and taking a cautious approach for the forthcoming calculations, the figures have been increased by a factor of 20% for traffic and by 100% for pedestrians.
- 2.15 These grossed up figures will be the ones used in the modelling and assessment's criteria of each crossing facility.
- 2.16 The results are represented in table 2.2 below:

	8.00am-9.00am	12.30pm – 1.30pm	5.00pm - 6.00pm	Total
Aerodrome Road Eastbound	489	468	485	1442
Aerodrome Road Westbound	499	450	923	1872
Pedestrian Flow Combined 2 way	44	90	24	158

Table 2.2: Estimated 2012 vehicle and Pedestrian Flows

3. Pedestrian Crossing Options

- 3.1 As mentioned in the project background a previous pedestrian route study undertaken in 2010 recommended that two uncontrolled pedestrian refuge islands be provided on Aerodrome Road as part of an overall package of pedestrian improvement measures. These two pedestrian refuge islands would be located on Aerodrome Road east of junction with Peel Drive and west of junction with Heritage Avenue.
- 3.2 The location on Aerodrome Road just west of its junction with Heritage Avenue has been the focal point for which the various pedestrian crossing options below have been assessed.
- 3.3 In order to determine the most appropriate pedestrian crossing facility the following four options were considered and evaluated:
- Do Nothing
 - Uncontrolled Pedestrian Crossing with a Refuge Island
 - Zebra Crossing with a Refuge Island
 - Pelican Crossing
- 3.4 The advantages and disadvantages for each of the options are detailed below.

Do Nothing

3.5 Option Summary

- Advantages
 - This option would avoid expenditure on any new pedestrian crossing facility. The cost savings from this could then be redirected to an alternative location.
- Disadvantages
 - This approach would not address the increased traffic flows and speeds in the area which are making it difficult for pedestrians to cross the road.
 - The increased pedestrian movement in the area further highlights the requirement for some type of pedestrian crossing facility.
 - Vulnerable pedestrians are not catered for.

Uncontrolled Pedestrian Refuge Island: Cost £5000 - £7000

3.6 Option Summary

- Advantages
 - The presence of a pedestrian refuge island would reduce the available carriageway width and thus assist in reducing vehicle speeds.
 - The provision of a pedestrian refuge island would enable pedestrians to cross one side of the road at a time. This would provide more opportunities or gaps in traffic for pedestrians to cross safely.
 - Table 2.2 above highlights the peak demand in the PM westbound direction would be 923 vehicles. On an even displacement, this means a vehicle every 4 seconds which could cause some difficulty for pedestrians wanting to safely cross Aerodrome Road. However, given that most of the vehicular movements would be in platoons, the gaps available for pedestrians would be greater which would allow safe passage to the pedestrian refuge island. The other traffic flows are significantly less so would have sufficient gaps for pedestrians to negotiate through.
 - During the construction phase, additional ducts could be installed in the carriageway should there be a future requirement to upgrade this facility to a zebra crossing.
 - This option would cost the least to implement and maintain.
- Disadvantages
 - This is an uncontrolled pedestrian crossing and therefore does not provide pedestrians right of way.
 - The crossing provides a limited assistance to vulnerable pedestrians such as those who are visually impaired.

Zebra Crossing with a Refuge Island: Cost £25000

3.7 Calculations were undertaken to ascertain the capacity of the zebra crossing to meet increasing pedestrian and traffic demands. The formula below was used to assess the capacity.

- First derived by J. D. Griffiths (Transportation Science, Vol 15, No. 3, August 1981).

2.2.2 Crossing capacity: An equation for the vehicular capacity of a zebra crossing has been derived by Griffiths³:

$$\text{Crossing capacity (veh/s)} \quad C = \frac{\mu}{\mu\beta + (e^{\mu\alpha} - 1)(1 - e^{-\mu\beta})} \quad \dots \dots \dots (3)$$

where μ = pedestrian flow (number per second)
 α = time for pedestrian to cross (seconds)
 β = mean time headway of vehicles passing over the crossing (seconds) in the absence of pedestrians (ie the reciprocal of the vehicular saturation flow in vehicles per second).

3.8 The highest recorded PM peak demand was 923 vehicles in the westbound direction. Using this as the vehicular demand, the formula indicates that the pedestrian demand could be increased by as much as 750 pedestrians per hour (both directions combined) before it would severely impact traffic flows and lead to queuing.

3.9 The results of the zebra crossing assessment are represented in table 3.1 below. The degree of saturation indicates whether the demand can be met by the anticipated capacity. A figure less than 80% is seen as healthy and above this figure, traffic flows are severely affected.

	Pedestrian Demand	Vehicle Demand	Vehicular Crossing Capacity	Degree of Saturation
Estimated Maximum Pedestrians and Vehicle Demand	750	923	1184	78%

Table 3.1: Zebra Crossing Assessment Results

3.10 Option Summary

- Advantages
 - The presence of a pedestrian refuge island would reduce the available carriageway width thus assist in reducing vehicular speeds. Lowering 85 percentile speed in both directions which currently stands at 35mph would make the site suitable for this type of measure.
 - The refuge island would enable pedestrians to cross Aerodrome Road in stages thus only impacting the flow of traffic in a single direction at a time.

- Pedestrian would be able to establish right of way as soon as they approach the crossing thus reducing the time it would take for them to cross the road.
- Less maintenance required than for of a pelican crossing.
- Disadvantages
 - A zebra crossing would start having a detrimental impact on traffic when the volume of pedestrians crossing at the location exceeds 750 per hour. (Note that this figure is however unlikely to be reached at this location)
 - Zebra crossings do not provide much assistance for visually impaired people and can also be difficult to negotiate for the younger pedestrians and those with mental difficulties.

Pelican Crossing: Cost £35000 - £40000

3.11 To assess the impact of a pelican crossing a signal modelling exercise was undertaken using the forecasted 2012 AM and PM traffic flows.

3.12 Model Integrity

The following assumptions were made whilst modelling the junction:

- The traffic counts received were not classified. Having already increased the 2010 flows by 20%, a 1.1 ratio was used to convert the vehicle count into PCUs (Passenger Car Units).
- The model was based on the worst case scenario, with the pedestrian stage being called every cycle.
- The resulting cycle time was therefore found to be 41 seconds for both AM & PM periods.
- Vehicular Saturation flow was set at 1800 PCU/hr.

3.13 Timings for the Crossing

Sequence Pedestrian / Traffic	Timings (seconds)	Period
Red man / Green	20	1
Red man / Amber	3	2
Red man / Red	2	3
Green man / Red	7	4
Flashing Green man / Red	0	5
Flashing Green man / Flashing Amber	8	6
Red man / Flashing Amber	1	7

Table 3.2: Pedestrian Crossing Timings

3.14 Signal Stage Sequence

Phases A and B represents the traffic phases in both an east and west direction along Aerodrome Road and phase C represents the pedestrian crossing phase. Refer to figure 3.1 below.

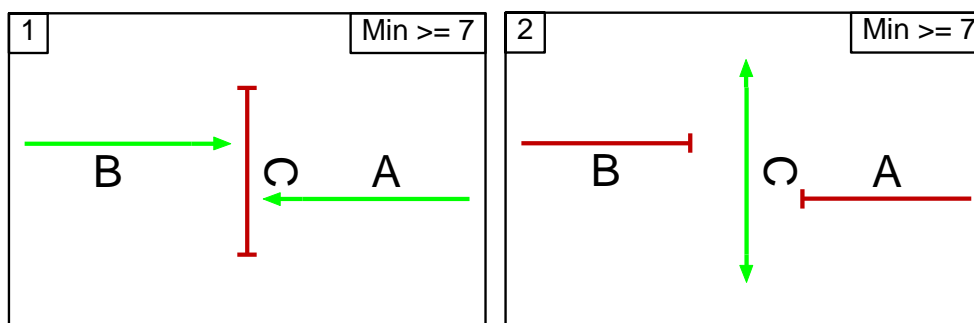


Figure 3.1 Signal Stage sequence

3.15 Results - AM period

Link Num	Link Description	Full Phase	Num Greens	Total Green (s)	Demand Flow (pcu)	Ave Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Total Delay (pcuHr)	Av. Delay Per Veh (s/pcu)	Mean Max Queue (pcu)	
1/1	Aerodrome Road Westbound Ahead	A	1	20	494	1800	922	53.6	1.5	10.9	4.3	
2/1	Aerodrome Road - Eastbound Ahead	B	1	20	585	1800	922	63.5	2.0	12.5	5.6	
PRC for Signalled Links (%):				41.8	Total Delay for Signalled Links (pcuHr):				3.54			
PRC Over All Links (%):				41.8	Total Delay Over All Links(pcuHr):				3.54	Cycle Time (s):		
				41								

Table 3.3 AM Period Model Results

3.16 Results - PM period

Link Num	Link Description	Full Phase	Num Greens	Total Green (s)	Demand Flow (pcu)	Ave Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Total Delay (pcuHr)	Av. Delay Per Veh (s/pcu)	Mean Max Queue (pcu)	
1/1	Aerodrome Road Westbound Ahead	A	1	20	923	1800	922	100.1	18.0	70.3	26.0	
2/1	Aerodrome Road - Eastbound Ahead	B	1	20	485	1800	922	52.6	1.5	10.8	4.2	
PRC for Signalled Links (%):				-11.2	Total Delay for Signalled Links (pcuHr):				19.49			
PRC Over All Links (%):				-11.2	Total Delay Over All Links(pcuHr):				19.49	Cycle Time (s):		
				41								

Table 3.4 PM Period Model Results

3.17 The results show that the AM period would operate well within capacity as the practical reserve capacity is 41.8%. However, the PM period indicates that the pedestrian crossing would have a negative practical reserve capacity of -11.2% resulting in average queues of 26 PCU.

3.18 Although the above modelling scenario depicts the worst case situation from a traffic point of view (calling the pedestrian green man at every cycle), it shows the potential impact a pelican crossing could have at times of high demand. .

3.19 Option Summary

- Advantages
 - This form of controlled crossing would cater for the most vulnerable and visually impaired pedestrians.
 - It would provide a clear advance warning and instruction for traffic to slow and stop before allowing pedestrians to cross.
 - This option would be an appropriate measure for high traffic and or pedestrians flows as well as high traffic speeds.
- Disadvantages
 - This option would be the most expensive option to implement and maintain.
 - It would result in a greater delay to pedestrians and traffic in comparison to a zebra crossing.
 - It could lead to heavy congestion along Aerodrome Road if the pedestrian phase is called at every cycle which is a fair possibility in future years during peak times.
 - The on-going maintenance cost of £1500 per year would have to be funded.

4. Bus Stop Introduction Review

- 4.1 The feasibility of introducing an additional bus stop in the westbound direction was investigated as part of this review.
- 4.2 Suitable locations along the southern side of Aerodrome Road close to Heritage Avenue were considered to be in close proximity to the bus patronage catchment area.
- 4.3 Having consulted with the Police and London Buses a preferred location was identified opposite the entrance to Chancellor's Place. Although the Police did not wish to have the bus stop outside their training centre they felt that the location was acceptable.
- 4.4 The preferred location would be 200m west from Heritage Avenue, which would be an improvement on the current situation, whereby the bus patrons have to travel 400m to the stop east of Peel Drive from Heritage Avenue.
- 4.5 The proposed position of the bus stop would place the proposed pedestrian crossing by Heritage Avenue in the pedestrian desire line for most patrons accessing it to and from the Beaufort Park development. Details and location of the bus stop is shown in Appendix B.
- 4.6 The bus stop introduction would require kerb realignment works and some of the verge area to be converted into a hardstand area. The works would possibly require the removal of two trees. Due to the footway level differences there could be a requirement to divert statutory undertaker's plant and reconstruct approximately 30m of the existing private boundary wall. The detailed estimate for these works will require further investigation works at the detailed design stage to determine exact costs of providing a new bus stop.

5. Conclusion & Recommendation

- 5.1 Apart from the do nothing option any of the three pedestrian crossing options would offer an improvement on the existing situation for pedestrians.
- 5.2 Although the pelican and the zebra crossing options would both work well with the current flows, the zebra crossing would be more resilient to an increase in pedestrian volumes and would also minimise delays for the vast majority of pedestrian and all traffic movements.
- 5.3 To address the speeding issue along Aerodrome Road it would be beneficial to include a pedestrian refuge island in the proposal. Although zebra crossings are often provided with pedestrian refuge islands it is not the case for pelican crossings which are preferred without.
- 5.4 A pelican crossing would suit all users including the visually impaired but would be less resilient to increase in demand, would introduce more delays to pedestrian and traffic, and be more expensive to implement and maintain than a zebra crossing.
- 5.5 Based on the above, and in the absence of any known special requirement from disabled user group in the area it is recommended is that a zebra crossing with a central pedestrian refuge island be introduced on Aerodrome Road west of Heritage Avenue.
- 5.6 This report also recommends introducing a westbound bus stop opposite Chancellors Place.
- 5.7 The proposed zebra crossing would be in the pedestrian desire line from the bus stop to Heritage Avenue.

Appendix A: Existing Layout Drawing

Appendix B: Proposed Layout Drawing



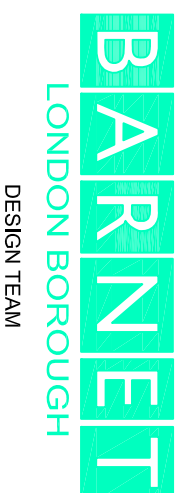
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Revision and Date	Description	Initial

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Interim Director of Environment, Planning & Regeneration

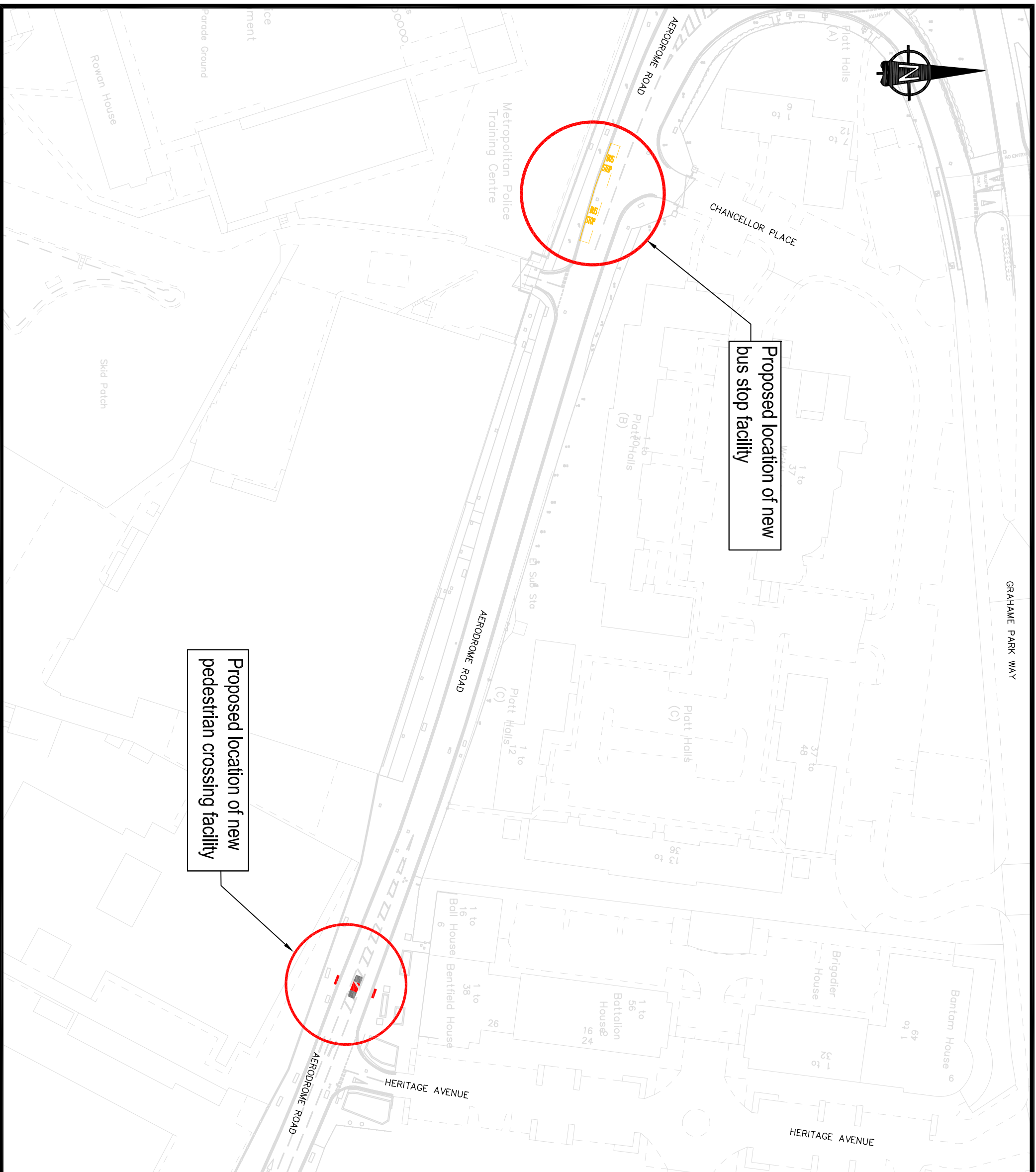
North London Business Park
Oakleigh Road South
New Southgate N11 1NP
Tel. 020 8359 2000



SCHEME:
Aerodrome Road Pedestrian
And Bus Stop Facility Study

TITLE:
APPENDIX A
Existing Layout

Scales:	N.T.S @ A3	Date:	SEP 12
Initiated:	NR	Drawn:	MJ
DRAWING NO.:	60668_P_003		
Checked:	AA	Acad Ref.:	-



Proposed location of new bus stop facility

Proposed location of new pedestrian crossing facility

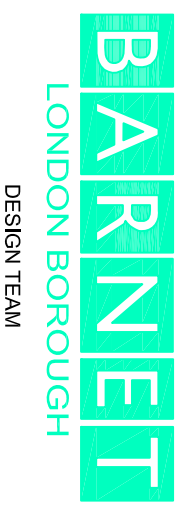
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Revision and Date	Description	Initial

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SCHEME:
Aerodrome Road Pedestrian And Bus Stop Facility Study

TITLE:
APPENDIX B
Proposed Measures

Scale:	N.T.S @ A3	Date:	SEP 12
Initiated:	NR	Drawn:	MJ
Checked:		Checked:	AA
DRAWING NO.:	60668_P_004		
Acad Ref.			