

Appendix A:
Scheme design report



innovation
through
experience
enriches

Harrow Engineering Services

Petts Hill/Alexandra Avenue



Design Report R1

November 2004

Pell Frischmann

CONSULTING ENGINEERS

Millars Three, Southmill Road, Bishop's Stortford, Herts, CM23 3DH



CONTENTS

SECTION 1	INTRODUCTION
	Background
	The Brief
	Information Base
	Acknowledgements
SECTION 2	THE SITE
	Location and Description
	Background and Objectives
	Traffic Movements
	Road User Behaviour
	Accidents
SECTION 3	IMPROVEMENT PROPOSALS
	Early Studies
	Business Case
	Current Proposals
SECTION 4	DESIGN APPROACH
	Highway Layout
	Traffic Signals
	Bus Services
	Cycle Provision
	Pedestrians
	Heavy Goods Vehicles
	Road Safety
	Service Road
	Access to Dabbs Hill
	Property Access
	Lighting
	Signs and Markings
	Drainage
	Utilities
	Tunnel Structures
SECTION 5	CONSULTATION
	Initial Consultation
	Public Response

Background

- 1.1 On the boundary between the London Borough of Harrow and Ealing, Petts Hill has long been the site of long traffic queues and heavy congestion in peak periods with consequent delays to the local bus routes.
- 1.2 Improvement proposals for Petts Hill were first put forward in the Whole Route Improvement Plan (WRIP) for the Route 140 as part of the initial phase of the London Bus Initiative (LBI 1).
- 1.3 Following a number of feasibility studies it was determined to proceed with a scheme to provide three traffic lanes beneath the bridge and two tunnels through the embankments on each side to carry shared footpath-cycleways.

The Brief

- 1.4 On this basis Harrow Engineering Services on behalf of Harrow Council commissioned Pell Frischmann Consulting Engineers to develop detailed designs for the scheme, and to procure its construction.

Information Base

- 1.5 Much of the information utilised and referred to as part of the detailed design was provided by Harrow Engineering Services from the previous studies carried out in developing the scheme to this stage. A number of site visits were made for familiarisation with the existing topography, land uses and street layout and numerous photographs were taken. New traffic data was obtained via a manual classified turning count during both morning and evening peak periods. Information from Network Rail was used to develop the proposals for the footpath-cycleway tunnels.

Acknowledgements

- 1.6 The Consultants are pleased to acknowledge the valuable assistance and continuing support received from Harrow Engineering Services (Dave Masters, Vic Jenkins and Hanif Islam), the London Borough of Ealing (Peter Tonkin), Transport for London (Stuart Foster and Daniel Newcombe) and Network Rail (Bob Aldridge) as well as others from time to time.

Location and Description

- 2.1 Petts Hill is a section of the A312 principal road which links Harrow with the A40, Western Avenue. Beneath the railway bridge it also forms part of the collinear A4090 between Sudbury and North Harrow. The characteristic features of this section of road change from wide single two lane carriageway on the higher ground near the roundabout with Whitton Avenue to two narrower lanes beneath the bridge.

Immediately north of the bridge the road sweeps to the right into a long straight section of Northolt Road. At this point is a signal controlled junction with the A4090 Alexandra Avenue and there is also a separate one-way slip road along which Petts Hill traffic can reach Alexandra Avenue.

- 2.3 There is a pelican crossing to the south of the bridge and which often has queues extending back beyond the bridge in peak periods and impedes the proper operation of the signal junction causing yet more congestion.

The curving approach to the bridge means that southbound buses and large commercial vehicles overrun beyond the centre line in negotiating the bridge thus introducing potential delay, congestion and safety problems.

Background and Objectives

Following the Route 140 WRIP as part of LBI 1 Harrow Engineering Services carried out a study of the feasibility of a range of options for improving traffic conditions in the vicinity of Petts Hill. In particular this study examined ways to provide bus priority through the area to complete the missing sections of route where bus priority measures had not been introduced or facilities upgraded.

- 2.6 Two options emerged, namely, (i) a new replacement rail bridge over a widened Petts Hill carriageway allowing four traffic lanes as well as footpaths/cycleways, and (ii) widening the carriageway beneath the existing bridge to three lanes and the relocation of the footpaths into shared footway-cycleway tunnels through the embankment on each side.
- 2.7 In both options the extra carriageway width would be used to provide further bus priority.
- 2.8 The two options involved very different costs - Option 1 costing some £6-7 million became the ultimate scheme with the ideal improvements but at a high and currently unaffordable cost; Option 2 costing some £4.32 million became the interim solution offering the opportunity to progress to the ultimate scheme in time but with significant immediate benefits at a currently affordable cost.

2.9 The objectives of the scheme are:

To provide improved bus priority at the junction of Northolt Road and Alexandra Avenue by the completion of bus lane measures either side of the bridge and removal of the pinch point at Petts Hill bridge, thus increasing reliability and reducing journey time on Route 140 and other bus routes using Petts Hill.

To improve routes for pedestrians and cyclists beneath the railway at Petts Hill, particularly segregating vehicular traffic from pedestrians and cyclists. The cycle lanes will link to the existing London Cycle Network. The new route will also benefit from improved lighting and visibility.

To enhance the operation of the traffic signalled junction between Northolt Road and Alexandra Avenue, including improved provision for pedestrians.

To enhance the urban environment in the area of the Petts Hill bridge

To reduce general traffic congestion as far as possible subject to the objectives above.

Traffic Movements

2.10 Peak period traffic flows through the junction and beneath Petts Hill bridge are heavy but constrained by the congestion in the area. There are also significant flows throughout the rest of the working day. The turning movements observed in the morning and evening peak periods in July 2004 are summarised in Table 2.1 and Figure 2.1.

	Petts Hill	Alexandra Avenue	Northolt Road
Petts Hill	0	470	556
Alexandra Avenue	592	0	48
Northolt Road	694	41	0

Table 2.1A AM Peak Traffic Flows

NORTHOLT ROAD
41 694

ALEXANDRA AVENUE 48 592

470 556
PETTS HILL

PEAK

NORTHOLT ROAD
158 712

ALEXANDRA AVENUE 101 517

687 599
PETTS HILL

PEAK

FIGURE 2.1

	Petts Hill	Alexandra Avenue	Northolt Road
Petts Hill	0	687	599
Alexandra Avenue	517	0	101
Northolt Road	712	158	0

Table 2.1B PM Peak Traffic Flows

- 2.11 In the morning peak there is only a modest right turning movement from Northolt Road but virtually all the Alexandra Avenue traffic turns right into Petts Hill. Some 45% of the northbound traffic on Petts Hill follows the slip road to the left onto Alexandra Avenue. In the evening peak the pattern is broadly reversed.
- 2.12 There are some twelve scheduled buses per hour running in each direction between Northolt Road and Petts Hill throughout the day.

Road User Behaviour

- 2.13 Road user behaviour is generally reasonable at this location except for traffic approaching along Alexandra Avenue in the morning peak hour. Because of the frequent delays at the pelican crossing south of the bridge this traffic frequently turns right from both right and left hand lanes of Alexandra Avenue and in funnelling into the single lane on Petts Hill typically extends back to block the forward movement of Petts Hill traffic onto Northolt Road.

Accidents

- 2.14 There have been a total of some 21 personal injury accidents on Petts Hill between the signal junction and the Whitton Avenue roundabout. Analysis, however, shows no unusual features except that 67% of the 9 accidents south of the bridge occurred during the hours of darkness compared with only 17% of those (12) north of the bridge. Otherwise there is the prospect of several accidents being prevented by the proposed scheme.

Early Studies

- 3.1 Following the initial study outlined above, Donaldson Associates and McNicholas were commissioned to carry out an engineering feasibility to identify the preferred method of construction of the two tunnels. Reporting in October 2001 this study examined design options, cost estimates and implementation programme paying particular attention to the requirements of Network Rail.
 - 3.2 After considering six alternative construction methods the preferred option was the segmental jacked box.
 - 3.3 In November 2001 H E S prepared a further feasibility study (Stage 2) considering the surveys undertaken, landtake and ownership, further Network Rail discussions and the planning and legal issues. A subsequent update of this study, in March 2003, reviewed both the new bridge and the twin tunnel option and confirm the latter as the preferred solution.
 - 3.4 However amidst concern that this option might not be able to accommodate a future intermediate mode service a new option was evolved with a staged approach involving construction of the two tunnels as Stage 1 followed by their use as the abutments for a new bridge as Stage 2.

This new option with a staged construction was adopted as the preferred approach on which detailed design was to proceed.

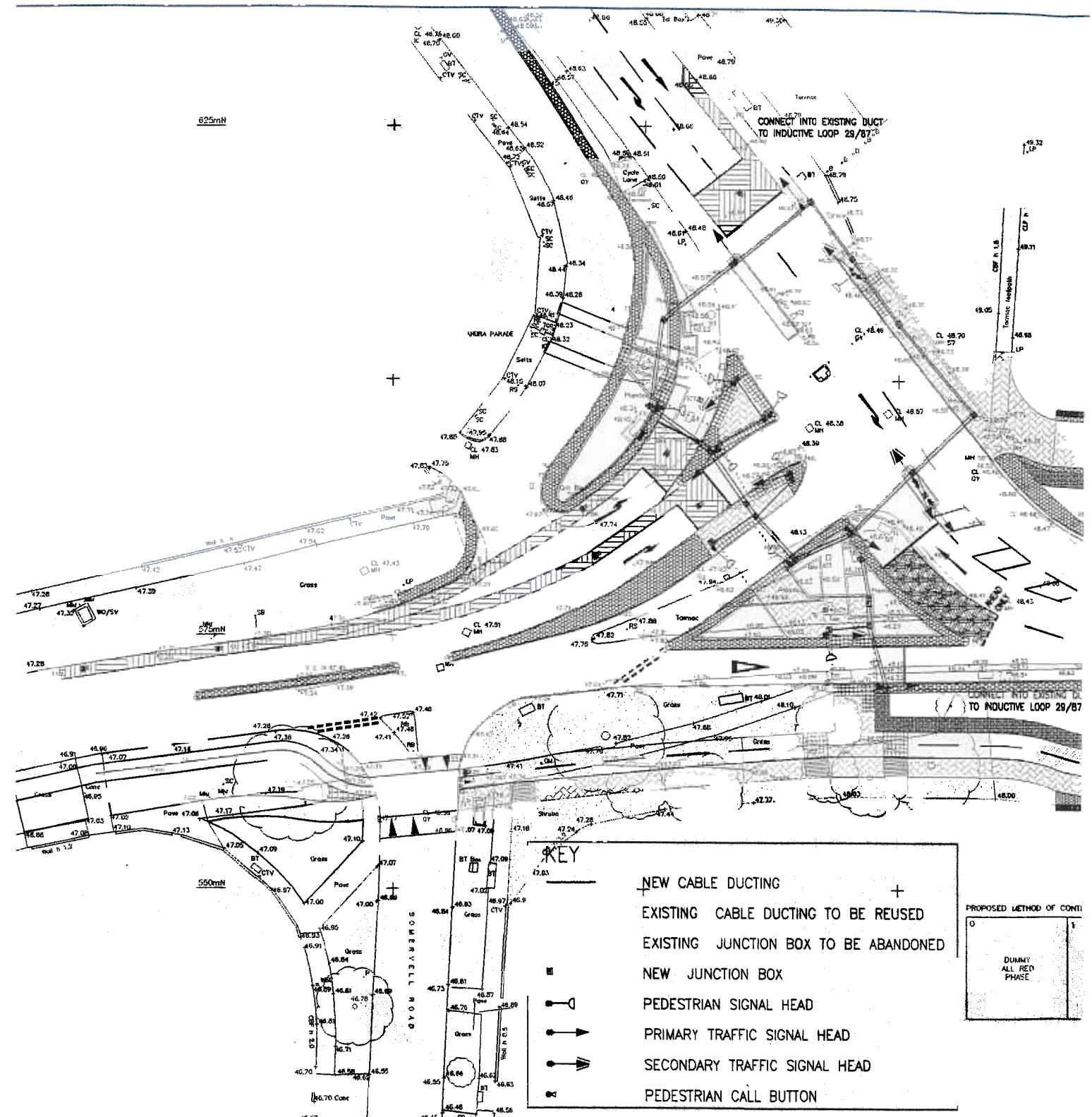
Business Case

The business case for the scheme has been reported separately, dated April 2004, and shows total discounted benefits of £9.9 million compared with costs of £3.3 million. The benefits to public transport (journey time savings and increased patronage) amount to some £1.8 million whilst some £8.0 million accrue to other traffic through time savings.

Although estimated costs emerging through the design development stage are expected to rise beyond the above figure the rise would be relatively modest and benefits would remain significantly greater than costs.

Current Proposals

The current proposals are shown on Figure 3.1



10

- 1) DO NOT SCALE THIS DRAWING. ANY DISCREPANCIES SHALL BE NOTIFIED TO THE ENGINEER IMMEDIATELY.
 - 2) ALL DIMENSIONS ARE IN MILLIMETRES - (mm)
ALL LEVELS ARE IN METRES - (m)
UNLESS NOTED OTHERWISE
 - 3) THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL PELL FRISCHMANN PROJECT DRAWINGS, DETAILS AND SPECIFICATIONS.

PROPOSED METHOD OF CONTI	
0	1

DUMMY
ALL RED
PHASE

MATCH

52.72 CL 52.70
MH MH O

52.48

52.31 MH
52.20

51.96

52.30
52.26
CL 51.1851.99
51.86

51.62

51.50
51.53

51.21 51.31

51.77
51.7651.50 Pow
51.70

51.10 51.37

51.37 51.38

51.61

51.74 50.11

51.60 50.14
50.11

51.14 G1

51.12

51.70

50.77

50.55

50.45

50.35

50.25

50.15

50.05

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

50.00

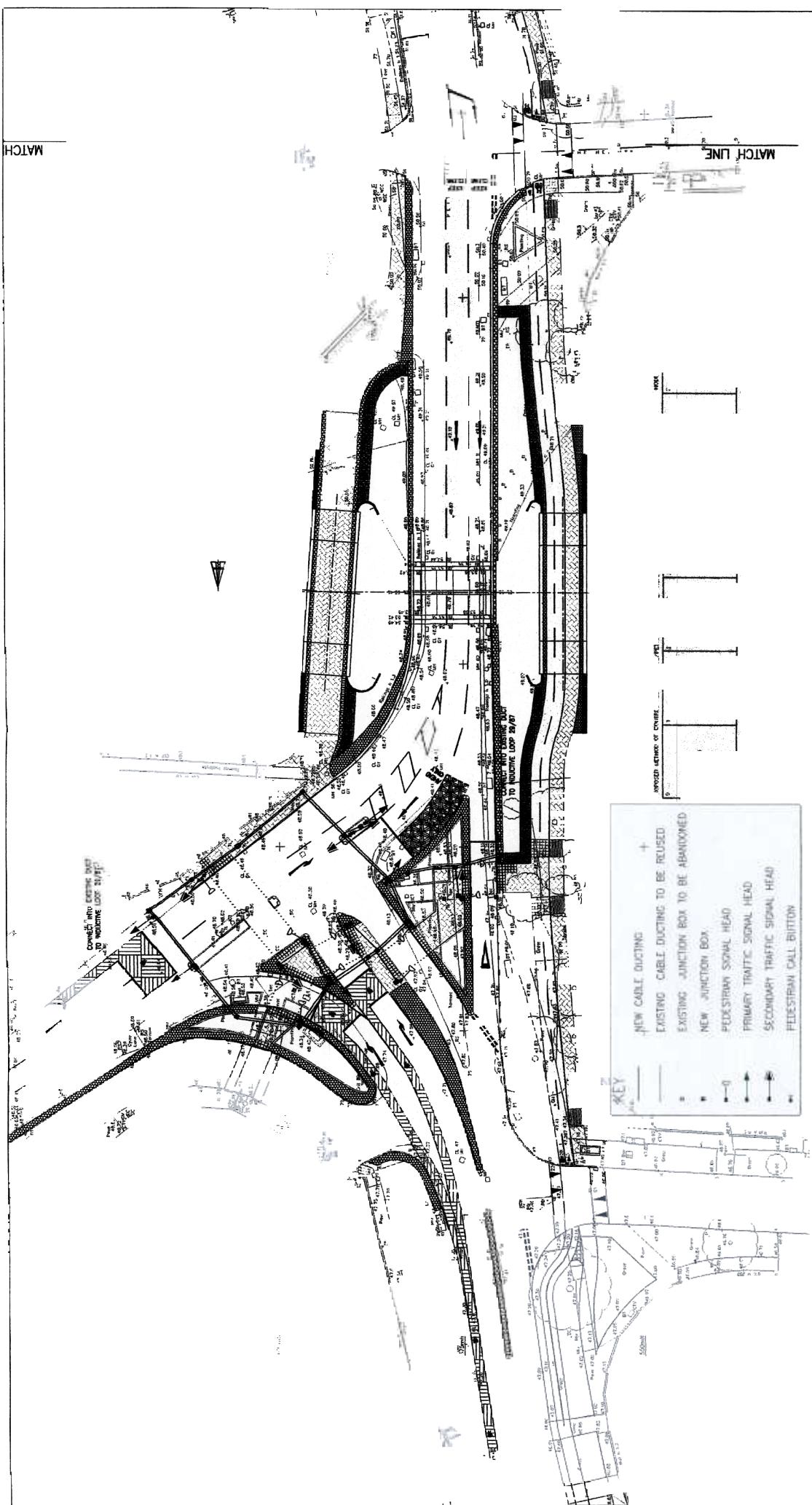
50.00

50.00

50.00

50.00

50.00



F-UN
INFORMATION

JUNCTION DESIGN		Petts Hill, Northolt Rd, STH HARROW	
		Drawing No.	Date
Rev.	Revisions Description	Rev.	Date
		P5	05.03.08
		P6	05.03.08
		P7	05.03.08
		P8	05.03.08
		P9	05.03.08
		P10	05.03.08
		P11	05.03.08
		P12	05.03.08
		P13	05.03.08
		P14	05.03.08
		P15	05.03.08
		P16	05.03.08
		P17	05.03.08
		P18	05.03.08
		P19	05.03.08
		P20	05.03.08
		P21	05.03.08
		P22	05.03.08
		P23	05.03.08
		P24	05.03.08
		P25	05.03.08
		P26	05.03.08
		P27	05.03.08
		P28	05.03.08
		P29	05.03.08
		P30	05.03.08
		P31	05.03.08
		P32	05.03.08
		P33	05.03.08
		P34	05.03.08
		P35	05.03.08
		P36	05.03.08
		P37	05.03.08
		P38	05.03.08
		P39	05.03.08
		P40	05.03.08
		P41	05.03.08
		P42	05.03.08
		P43	05.03.08
		P44	05.03.08
		P45	05.03.08
		P46	05.03.08
		P47	05.03.08
		P48	05.03.08
		P49	05.03.08
		P50	05.03.08
		P51	05.03.08
		P52	05.03.08
		P53	05.03.08
		P54	05.03.08
		P55	05.03.08
		P56	05.03.08
		P57	05.03.08
		P58	05.03.08
		P59	05.03.08
		P60	05.03.08
		P61	05.03.08
		P62	05.03.08
		P63	05.03.08
		P64	05.03.08
		P65	05.03.08
		P66	05.03.08
		P67	05.03.08
		P68	05.03.08
		P69	05.03.08
		P70	05.03.08
		P71	05.03.08
		P72	05.03.08
		P73	05.03.08
		P74	05.03.08
		P75	05.03.08
		P76	05.03.08
		P77	05.03.08
		P78	05.03.08
		P79	05.03.08
		P80	05.03.08
		P81	05.03.08
		P82	05.03.08
		P83	05.03.08
		P84	05.03.08
		P85	05.03.08
		P86	05.03.08
		P87	05.03.08
		P88	05.03.08
		P89	05.03.08
		P90	05.03.08
		P91	05.03.08
		P92	05.03.08
		P93	05.03.08
		P94	05.03.08
		P95	05.03.08
		P96	05.03.08
		P97	05.03.08
		P98	05.03.08
		P99	05.03.08
		P100	05.03.08
		P101	05.03.08
		P102	05.03.08
		P103	05.03.08
		P104	05.03.08
		P105	05.03.08
		P106	05.03.08
		P107	05.03.08
		P108	05.03.08
		P109	05.03.08
		P110	05.03.08
		P111	05.03.08
		P112	05.03.08
		P113	05.03.08
		P114	05.03.08
		P115	05.03.08
		P116	05.03.08
		P117	05.03.08
		P118	05.03.08
		P119	05.03.08
		P120	05.03.08
		P121	05.03.08
		P122	05.03.08
		P123	05.03.08
		P124	05.03.08
		P125	05.03.08
		P126	05.03.08
		P127	05.03.08
		P128	05.03.08
		P129	05.03.08
		P130	05.03.08
		P131	05.03.08
		P132	05.03.08
		P133	05.03.08
		P134	05.03.08
		P135	05.03.08
		P136	05.03.08
		P137	05.03.08
		P138	05.03.08
		P139	05.03.08
		P140	05.03.08
		P141	05.03.08
		P142	05.03.08
		P143	05.03.08
		P144	05.03.08
		P145	05.03.08
		P146	05.03.08
		P147	05.03.08
		P148	05.03.08
		P149	05.03.08
		P150	05.03.08
		P151	05.03.08
		P152	05.03.08
		P153	05.03.08
		P154	05.03.08
		P155	05.03.08
		P156	05.03.08
		P157	05.03.08
		P158	05.03.08
		P159	05.03.08
		P160	05.03.08
		P161	05.03.08
		P162	05.03.08
		P163	05.03.08
		P164	05.03.08
		P165	05.03.08
		P166	05.03.08
		P167	05.03.08
		P168	05.03.08
		P169	05.03.08
		P170	05.03.08
		P171	05.03.08
		P172	05.03.08
		P173	05.03.08
		P174	05.03.08
		P175	05.03.08
		P176	05.03.08
		P177	05.03.08
		P178	05.03.08
		P179	05.03.08
		P180	05.03.08
		P181	05.03.08
		P182	05.03.08
		P183	05.03.08
		P184	05.03.08
		P185	05.03.08
		P186	05.03.08
		P187	05.03.08
		P188	05.03.08
		P189	05.03.08
		P190	05.03.08
		P191	05.03.08
		P192	05.03.08
		P193	05.03.08
		P194	05.03.08
		P195	05.03.08
		P196	05.03.08
		P197	05.03.08
		P198	05.03.08
		P199	05.03.08
		P200	05.03.08
		P201	05.03.08
		P202	05.03.08
		P203	05.03.08
		P204	05.03.08
		P205	05.03.08
		P206	05.03.08
		P207	05.03.08
		P208	05.03.08
		P209	05.03.08
		P210	05.03.08
		P211	05.03.08
		P212	05.03.08
		P213	05.03.08
		P214	05.03.08
		P215	05.03.08
		P216	05.03.08
		P217	05.03.08
		P218	05.03.08
		P219	05.03.08
		P220	05.03.08
		P221	05.03.08
		P222	05.03.08
		P223	05.03.08
		P224	05.03.08
		P225	05.03.08
		P226	05.03.08
		P227	05.03.08
		P228	05.03.08
		P229	05.03.08
		P230	05.03.08
		P231	05.03.08
		P232	05.03.08
		P233	05.03.08
		P234	05.03.08
		P235	05.03.08
		P236	05.03.08
		P237	05.03.08
		P238	05.03.08
		P239	05.03.08
		P240	05.03.08
		P241	05.03.08
		P242	05.03.08
		P243	05.03.08
		P244	05.03.08
		P245	05.03.08
		P246	05.03.08
		P247	05.03.08
		P248	05.03.08
		P249	05.03.08
		P250	05.03.08
		P251	05.03.08
		P252	05.03.08
		P253	05.03.08
		P254	05.03.08
		P255	05.03.08
		P256	05.03.08
		P257	05.03.08
		P258	05.03.08
		P259	05.03.08
		P260	05.03.08
		P261	05.03.08
		P262	05.03.08
		P263	05.03.08
		P264	05.03.08
		P265	05.03.08
		P266	05.03.08
		P267	05.03.08
		P268	05.03.08
		P269	05.03.08
		P270	05.03.08
		P271	05.03.08
		P272	05.03.08
		P273	05.03.08
		P274	05.03.08
		P275	05.03.08
		P276	05.03.08
		P277	05.03.08
		P278	05.03.08
		P279	05.03.08
		P280	05.03.08
		P281	05.03.08
		P282	05.03.08
		P283	05.03.08
		P284	05.03.08
		P285	05.03.08
		P286	05.03.08
		P287	05.03.08
		P288	05.03.08
		P289	05.03.08
		P290	05.03.08
		P291	05.03.08
		P292	05.03.08
		P293	05.03.08
		P294	05.03.08
		P295	05.03.08
		P296	05.03.08
		P297	05.03.08
		P298	05.03.08
		P299	05.03.08
		P300	05.03.08
		P301	05.03.08
		P302	05.03.08
		P303	05.03.08
		P304	05.03.08
		P305	05.03.08
		P306	05.03.08
		P307	05.03.08
		P308	05.03.08
		P309	05.03.08
		P310	05.03.08
		P311	05.03.08
		P312	05.03.08
		P313	05.03.08
		P314	05.03.08
		P315	05.03.08
		P316	05.03.08
		P317	05.03.08
		P318	05.03.08
		P319	05.03.08
		P320	05.03.08
		P321	05.03.08
		P322	05.03.08
		P323	05.03.08
		P324	05.03.08

Highway Layout

- 4.1 In broad terms the existing highway boundaries will remain but the scheme proposes a redistribution of the existing allocation of space together with the creation of additional space beyond the highway boundary.
- 4.2 Beneath the bridge the existing two lane carriageway and the footpath on each side will be amalgamated into a new three lane carriageway. This wider carriageway will be marked into three running lanes - the single southbound lane will be 4.5m wide and the two northbound lanes will each be 3.0m wide.
- 4.3 These 'lost' footpaths will be replaced by either footpath or shared footpath - cycleway tunnels through the railway embankment on each side of the bridge. These tunnels are expected to be owned by Network Rail but effectively operated and maintained by the local authorities as highway.
- 4.4 North of the bridge the wider carriageway will replace part of the large island at the signal junction. The two lane approach to the stopline will narrow back to a single lane beyond the junction but the merging width required to allow this will be more than a single lane and will involve a northbound relocation of the kerb and a consequent reduction in width of the service road in that area. This consequence will be exacerbated by the need to provide a minimum 1.2m width cycle lane on the southbound Northolt Road approach to the junction.
- 4.5 In Alexandra Avenue the central island has been extended from the signal junction beyond the mouth of the service road as far as Somervell Road and the left and right turn movements have been separated by a physical island.
- 4.6 To the south of the bridge the access to the JAF Vans land as well as Dabbs Hill have both been closed off in order to reduce the dangers of excessive uncontrolled access points and, in the case of the former, to remove a visibility problem.

Traffic Signals

- 4.7 The existing signals operate on a two phase system in which the opposing Northolt Road - Petts Hill traffic flows run simultaneously followed by the Alexandra Avenue flows.
- 4.8 These signals are believed to be linked to the pelican crossing to the south of the bridge. There is also a pelican crossing a similar distance to the north of the junction along Northolt Avenue but this is not thought to be linked to the junction installation.
- 4.9 There is a pelican crossing on the slip road from Petts Hill to Alexandra Avenue but there are no other signal controlled pedestrian facilities at present - crossing movements being on a 'walk with traffic' basis.

- 4.10 The proposed scheme will generally retain the existing phasing but will also introduce revised timings to assist pedestrian movement across each approach. The proposals provide signalised facilities for crossing each approach.
- 4.11 The new signal installation at the junction will be coordinated with the neighbouring pelican crossings to minimise delays.

Bus Services

- 4.12 The proposals include two short stretches of bus lane - between the southern pelican crossing and Danemead and on the northbound approach to the Northolt Road stopline. There are no changes to bus stops or other bus facilities.

Cycle Provision

- 4.13 Cycle facilities are provided extensively in the proposals and meet the requirements of both LBE and LBH Cycle Officers as well as the TfL Cycling Centre of Excellence.
- 4.14 The western tunnel through the embankment comprises a shared footpath-cycleway of 4.5m in width plus two 0.5m strips of deterrent paving. The shared footpath-cycleway includes a 2.5m two way cycleway, a delineator strip some 150 mm wide, and 20mm higher than the footway and cycleway level, and a footpath of some 1.85m. Both surfaces will be at the same level as indicated by TfL.
- 4.15 This facility will run northwards as far as Somervell Road on an alignment which offers as straight a view as possible through the tunnel as requested by the police to promote personal security. The alignment will run within the existing trees at a minimum distance of 2.0m from the boundary fence of the maisonettes numbers 1-6 Somervell Road. The alignment would match up with the existing raised crossing of Somervell Road.
- 4.16 South of the bridge/tunnel the alignment would again run as direct and straight as possible matching up with the pelican crossing and continuing as far as Danemead. The crossings of Dabbs Hill and The Heights would be raised to the levels of the shared facilities on each side.
- 4.17 Contrary to the request of the LBE Cycling Officer the crossings of side roads have left priority to traffic because both the Design Team and the Client felt strongly that to do otherwise would introduce danger from traffic stopping or slowing whilst turning from the main roads and would not pass a safety audit.

The eastern tunnel would be the same width but would be designated for pedestrians only rather than shared use because both the Design Team and the LBE Cycling Officer doubted its effectiveness in drawing cyclists off the main carriageway. Thus, southbound cyclists would remain on the highway - the kerbside lane having the greater width of 4.5m to allow buses to safely overtake cyclists.

- 4.19 On both Northolt Road and Alexandra Avenue approaches to the junction there will be Advanced Cycle Stoplines together with the mandatory approach lane which in both cases will be the minimum 1.2m width and relatively short in length. There will not be a similar facility on the Petts Hill approach because cyclists from that route are expected to use the shared cycleway-footway provided.
- 4.20 Cycle crossing facilities will be combined with those for pedestrians as a toucan on Northolt Road and well as the slip road between Petts Hill and Alexandra Avenue, although owing to a lack of space this is not practical for the remainder of Alexandra Avenue.

Pedestrians

- 4.21 Pedestrians will be given new facilities to cross each of the approaches to the junction under their own phase of the signals. Elsewhere they will be provided with extensive footpaths of good width and relatively straight alignment. To the south of the junction the new footways will be well clear of the highway and in places will also be separated from the highway by new cycleway.
- 4.22 Since the base of the tunnels will be relatively low and the level of the road rises with increasing distance south of the bridge there will be a relatively steep gradient on the footpaths especially on the eastern side of the road. To the north of the bridge however the tunnel level is close to that of the footpath and no gradient issues occur.

Heavy Goods Vehicles

The height available to vehicles beneath the bridge is signposted as 4.5m but there have been a small but regular number of incidents of vehicles hitting the abutments or overheight vehicles becoming stuck - bridge strikes.

The carriageway beneath the bridge will be reconstructed and its level will fall by up to 50 mm and thus headroom increased and strikes reduced.

Road Safety

The accident records held by the two highway authorities show some 21 personal injury accidents occurred at the site within the last three years. This number is not unduly high for such sites and the location has not figured on either authority's list of most hazardous sites.

Service Road

- 4.26 The service road alongside Northolt Road will be narrower at the curve near the access from Alexandra Avenue because of the need to widen both Northolt Road and Alexandra Avenue to the north of the signals. This will necessitate removal of the parking opportunities at the offside kerb of the service road in order to maintain the single lane for through movement.
- 4.27 The existing gap in the offside kerb allowing cycle access from Northolt Road will be closed.
- 4.28 The radius at the entry to the service road from Alexandra Avenue will be eased and a longer footpath provided. The central island on Alexandra Avenue will be extended as far as Somervell Road to prevent entry by right turning traffic which is seen as a dangerous movement.

Access to Dabbs Hill

- 4.29 Dabbs Hill, with its ornamental gates betraying its former role as access to Northolt Road Park, now has bollards across the entrance to prevent access and has long been used as a meeting point for vehicles on a range of illicit activities. Thus the London Borough of Ealing encouraged the closure of the approach and the roadside kerbs, as well as the cycleway-footpath, have therefore been continued across the former mouth of the junction.

Property Access

- 4.30 Access to existing property has been maintained throughout the design. The single exception to this is that the dropped kerb allowing access to the JAF Vans site to the south and east of the bridge has been raised to a normal kerb. This is because egress at that location does not provide adequate visibility and the present use being made of the site does not have planning permission. Access will also be difficult in any case once the scheme is complete because of the difference in level between the site and the footpath across which access would have to be taken.

Lighting

- 4.31 The lighting of the improved junction will be in accordance with Harrow Council's normal practice and will maintain and enhance the existing illumination on the street as well as introducing high quality lighting within the two tunnels for maximum personal security. The lighting has been designed and columns located so as to provide optimum illumination for both highway and cycleway-footpath.

Signs and Markings

The traffic signs and carriageway markings would follow standard practice and there are not expected to be any departures from regulations.

Drainage

The design of the drainage system for the improved scheme has made maximum use of the existing facilities and will be agreed with Thames Water.

Utilities

- 4.34 Discussions have been held with each of the utility companies and costed proposals agreed for the relocation of their equipment from the proposed carriageway and cycleway-footpath to more accessible locations. The period for their removal has been agreed as 22 weeks and would include successive closures of southbound and northbound lanes.

Tunnel Structures

The two tunnel structures, referred to as passageways, are 5.5m wide and 2.7m deep internally with an extra 1.0 metre depth chamber to carry services. The tops of the structures are located at a depth of 3.0m beneath the top of the rail as required by Network Rail.

The western tunnel (passageway) will carry a two way cycleway of 2.5m width and a footpath of 1.85m with a separator strip of 150 mm together with 0.5m wide strips of deterrent paving on each side. The eastern tunnel will be to the same dimensions but will not have a cycleway and will there be footpath only.



CONSULTATION

Initial Consultation

- 5.1 The initial consultation with the public about the scheme comprised the distribution of some 11,000 leaflets providing information on the problems at Petts Hill and details of the proposed improvements including coloured photomontages of the scheme.
- 5.2 Leaflets were distributed by hand to local residents and businesses and were also included in local press deliveries. Further leaflets together with plans and reports were made available in both Ealing and Harrow Civic Centres and in local libraries.

Public Response

- 5.3 The leaflets incorporated a tear-off/reply paid questionnaire as well as offering telephone enquiry services from both Councils. Whilst the number of telephone enquiries is not known there were over 400 questionnaires received representing a return of 4% on those distributed.
- 5.4 Almost threequarters of the responses received (73%) were in favour of the proposals. The main issues of objectors referred to the dissatisfaction with bus lanes, personal security and right turning facilities at the signals.