

Argent St George, London and
Continental Railways and Exel
King's Cross Central
Transport Assessment

April 2004

Appendix 7

Argent St George

**King's Cross St
Pancras LUL
PEDROUTE Study**

King's Cross Central
Impact on London
Underground

ISSUE

Argent St George

King's Cross St Pancras LUL PEDROUTE Study

King's Cross Central Impact on London Underground

November 2003

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1. INTRODUCTION

1.1 Objectives

1.1.1 The main objective of this report is to assess the impact of King's Cross Central (KCC) development trips on the London Underground (LUL) Station, which has been modelled for the Base Case in 2007, when the Northern Ticket Hall and Western Ticket Hall works will be complete and operational.

1.2 Background

1.2.1 The objective of the modelling has been to test the impact on the LUL station of additional pedestrian flow demand due to the King's Cross Central developments north of the mainline station.

1.2.2 As a sensitivity case, allowance has been made for possible growth on mainline rail of 2.5% per annum between the existing (2002) and base (2007) cases.

1.2.3 The 2007 Phase 2 LUL model, which was included in the King's Cross St Pancras Phase 2 PEDROUTE Study, produced by Arup (February 2002), has been updated to reflect peak period mainline rail arrivals and departures. It also includes existing Thameslink interchanges (i.e. pre-Thameslink 2000), which have been loaded into LUL from Midland Road, via the Northern Ticket Hall and Western Ticket Hall. The existing Pentonville Road Thameslink Station is closed.

1.2.4 The King's Cross Central development trips, the derivation of which is described in Transport Assessment for KCC, have been added to the 2007 models to test the impact of these development trips on the LUL station during peak AM and PM conditions.

1.2.5 A summary of the model scenarios is included in Table 1 below.

Table 1: Summary of Model Scenarios

Scenario	Description
Test 1: 2007 AM and PM 2002 mainline rail demand	Phase 2 LUL model with 2007 LUL demand and mainline rail arrivals and departures (6 intercity and 9 suburban services, derived from the 2002 working timetable) based on 2002 demand, with existing Thameslink interchange flows at Midland Road..
Test 2: 2020 AM and PM 2002 mainline rail demand + King's Cross Central trips	As Test 1 with King's Cross development trips added, assuming 100% build-out of KCC development to test maximum demand on LUL infrastructure.
Test 3: 2007 AM and PM 2007 mainline rail demand	Phase 2 LUL model with 2007 LUL demand and mainline rail arrivals and departures (6 intercity and 9 suburban) based on 2002 demand expanded by 2.5% per annum to 2007, with existing Thameslink interchange flows at Midland Road. The growth factor has been determined by NR
Test 4: 2020 AM and PM 2007 mainline rail demand + King's Cross Central trips	As Test 3 with King's Cross development trips added, assuming 100% build-out of KCC development to test maximum demand on LUL infrastructure.

2. NETWORK DEVELOPMENT

2.1 Original Network

2.1.1 The original network was taken from the King's Cross St Pancras Phase 2 PEDROUTE Study, produced by Arup (February 2002). This Phase 2 LUL network extends to all LUL platforms, and includes the Tube Ticket Hall, the new Northern Ticket Hall and the new Western Ticket Hall. It also includes all street accesses to the station.

2.2 New Network

2.2.1 The Phase 2 network has been updated to include the following surface level links:

- From KCC to North West Stair;
- From KCC to Southern Stair;
- From KCC to Western Ticket Hall;
- From Suburban Shed to Southern Stair;
- From Main Train Shed to Southern Stair.

2.2.2 These connections have been added to facilitate route choice, particularly for King's Cross Central passengers, regarding which LUL access they use.

2.2.3 The existing Thameslink (i.e. pre-Thameslink 2000) flows have also been included, to and from Midland Road.

2.2.4 The new network block structure is shown in Figure 1, and Table 2 below describes the origin/destination locations that are included in the model:

Figure 1: Base LUL Network including Surface Level Connections

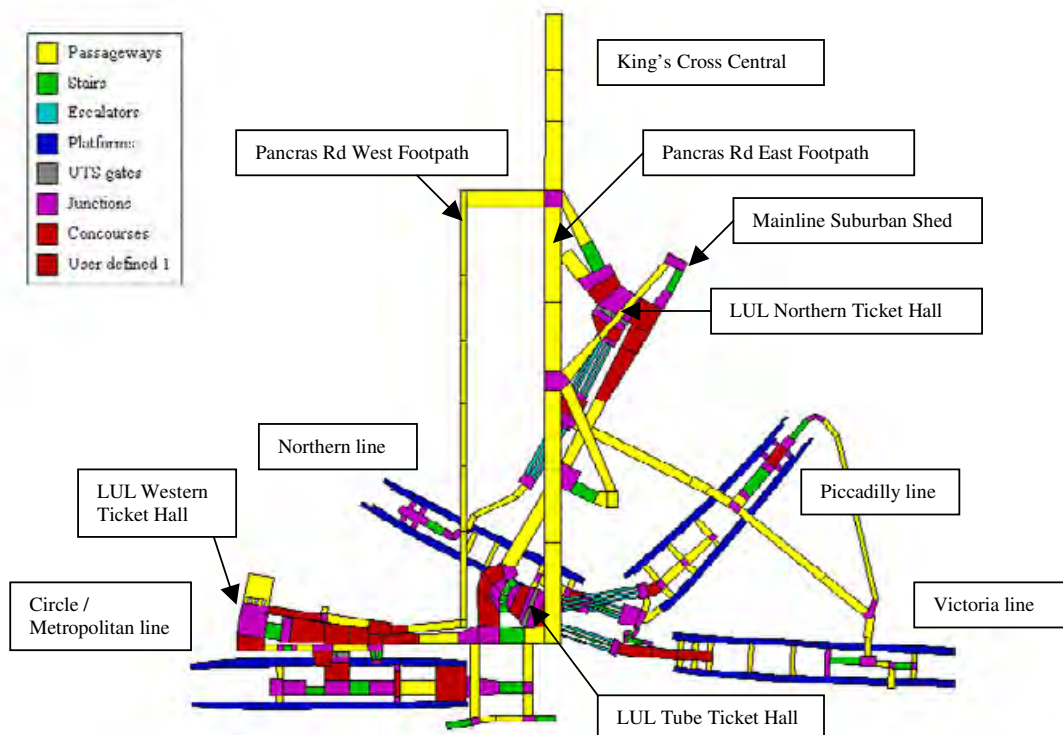


Table 2: Summary of Locations

Location	Description of location
1	Metropolitan / Circle / Hammersmith and City lines eastbound (Platform 2)
2	Metropolitan / Circle / Hammersmith and City lines westbound (Platform 1)
3	Northern line northbound (Platform 7)
4	Northern line southbound (platform 8)
5	Piccadilly line eastbound (Platform 5)
6	Piccadilly line westbound (platform 6)
7	Victoria line northbound (Platform 3)
8	Victoria line southbound (Platform 4)
10	Entrance / exit from King's Cross mainline station concourse
12	Entrance / exit from north side of Euston Road (adjacent to King's Cross)
13	Entrance / exit from south side of Euston Road
14	Entrance / exit from west side of Pancras Road into Western Ticket Hall
15	Entrance / exit from St Pancras domestic station into Western Ticket Hall
16	Entrance / exit from Thameslink into Western Ticket Hall
17	Entrance / exit from north side of Euston Road (adjacent to St Pancras)
18	Entrance / exit from King's Cross mainline suburban platforms
19	Entrance / exit from east side of Pancras Rd into Northern Ticket Hall
20	Entrance / exit from St Pancras international into Northern Ticket Hall
21	Entrance / exit from St Pancras international station into Western Ticket Hall
22	Entrance / exit from St Pancras domestic station into Northern Ticket Hall
23	Entrance / exit from Thameslink into Northern Ticket Hall
24	Entrance / exit from south side of Euston Road (near the bus stops)
25	Entrance / exit from King's Cross Central developments

3. PASSENGER DEMAND SCENARIOS

3.1 Original Demand Matrices

- 3.1.1** The original AM and PM peak period demand matrices were taken from the Phase 2 study. The original AM and PM matrices assume a 2007 base for LUL flows, with Thameslink 2000 flows.

3.2 Updated Demand Scenarios

All updated forecast demand scenarios included as part of this study are presented as Appendix A to this report.

Test 1: 2007 (2002 Rail Demand)

- 3.2.1** The Phase 2 AM and PM demand matrices were updated for the Test 1 model. They include the following:
- Movements to and from mainline rail to reflect existing peak period mainline rail timetable of 6 intercity / 9 suburban (in 2002);
 - Assumed 65% modal split between mainline rail and LUL.
- 3.2.2** The Thameslink 2000 passenger demand, which is included in the original Phase 2 matrix has been replaced by the existing Thameslink passenger demand (i.e. pre-Thameslink 2000) at Midland Road Station, entering the LUL Station via the Northern Ticket Hall and the Western Ticket Hall. The existing Thameslink passenger demand has been taken from the King's Cross St Pancras Phase 1 PEDROUTE Study, produced by Arup (January 2002).
- 3.2.3** This Test 1 2007 model has been tested for both the AM peak period (07.00-10.00 hours) and the PM peak period (16.00-19.00 hours).

Test 2: 2020 (2002 Rail Demand, no growth) with King's Cross Central

- 3.2.4** As Test 1 but with additional King's Cross Central development trips (see Section 3.3).

Test 3: 2007 (2007 Rail Demand)

- 3.2.5** The Test 1 AM and PM demand matrices were updated for the Test 3 model. They include the following:
- Movements to and from mainline rail to reflect existing peak period mainline rail timetable of 6 intercity / 9 suburban (in 2007);
 - Assumed 65% modal split between mainline rail and LUL.
- 3.2.6** Mainline rail demand has been factored from 2002 (as per Test 1) to 2007 using 2.5% per annum, applied generally to all trips to and from the mainline station throughout the AM and PM peak periods.
- 3.2.7** Mainline rail demand being fed into the LUL models therefore increases as described in Table 3.

Table 3: Mainline Rail Demand Tests 1 and 2, and 3 and 4

		Tests 1 and 2	Tests 3 and 4
Mainline Rail to LUL Two Way Flows	AM	13,837	15,526
	PM	16,077	18,197

3.2.8 Existing interchange movements to and from the new Thameslink station at Midland Road are included as per Tests 1 and 2.

Test 4: 2020 (2007 Rail Demand) With King's Cross Central

3.2.9 As Test 3 but with additional King's Cross Central development trips (see Section 3.3). This assumes background rail growth of 2.5% between 2002 and 2007. From 2007 to 2020 no background growth is expected, since KCC will be the main component of growth in the King's Cross area.

3.3 King's Cross Central

3.3.1 The AM and PM King's Cross Central development trips were added to the Test 1 and Test 3 demand matrices for both the AM and PM peak periods. The number of trips was derived from the peak hour trip generation flows in the Transport Assessment for KCC, and these are presented as Table 4 below. The hourly flows were expanded to peak period flows using established factors for the AM and PM peaks.

Table 4: King's Cross Central Development Trips

		Peak hour	Peak Hour to Peak Period Factor	Peak 3 hours
AM	KCC to LUL	2919	1/0.52	5613
	LUL to KCC	5490		10558
PM	KCC to LUL	5490	1/0.45	12200
	LUL to KCC	2919		6887

3.3.2 The Test 2 and Test 4 King's Cross Central models have been tested for both the AM peak period (07.00-10.00 hours) and the PM peak period (16.00-19.00 hours).

3.3.3 It is important to note that the King's Cross Central demand applied to the model represents 100% of demand generated by the whole KCC site, i.e. full build-out. This is likely to occur sometime after 2020, and has been applied to this modelling exercise in order to test maximum demand on LUL infrastructure.

3.4 Modelling Parameters

3.4.1 King's Cross Central and mainline rail trips are freely assigned within the model between LUL street entrances. This results in free route choice between:

- the North West stair;
- the South stair;

- the Euston Road (north side) stair; and,
- the Pancras Road stair (allowing access to the Western ticket Hall).

4. RESULTS

4.1 Test 1

Service Factors

- 4.1.1** Appendix B shows the peak 15 minute service factors for the Test 1 2007 AM and PM model scenarios.
- 4.1.2** The majority of the station and connecting passageways experience very little congestion (SF 0-2) during both the AM and PM peak 15 minute periods.
- 4.1.3** During the AM peak period, sections of all the underground platforms reach high levels of congestion (SF 3-4). The southbound Northern line platform experiences the worst levels of congestion, with SF 3-4 along the length of the platform between 08.45 and 09.00 hours.
- 4.1.4** The Northern Ticket Hall and the North West stair experience minimal congestion (SF 0-1).
- 4.1.5** During the PM peak period, the levels of congestion are less significant. Only small sections of some of the platforms (Victoria line southbound and Piccadilly line southbound) reach high levels of congestion (SF 3-4) during the peak 15 minute period.
- 4.1.6** The Northern Ticket Hall and the North West stair experience minimal congestion (SF 0-1).

Average Delay

- 4.1.7** The average passenger delay for the AM model period is 18 seconds. This represents approximately 9% of the total passenger movement time.
- 4.1.8** The average passenger delay for the PM model period is 22 seconds. This represents approximately 11% of the total passenger movement time.

4.2 Test 2

Service Factors

- 4.2.1** Appendix C shows the peak 15 minute service factors for the Test 2 AM and PM model scenarios.
- 4.2.2** The levels of congestion reflect the increase in demand as a result of including the King's Cross Central development trips.
- 4.2.3** The LUL entry gateline in the Northern Ticket Hall exhibits SF3-4 between 08.30-09.00 hours.
- 4.2.4** Platform congestion increases on the Northern Line southbound, Piccadilly Line southbound and Victoria Line southbound during the period 08.45 hours with SF3-4 evident.
- 4.2.5** The Northern Ticket Hall (with the exception of the LUL entry gateline as noted), Tube Ticket Hall and Western Ticket Hall are all free of congestion during the AM and PM peak periods.

- 4.2.6** Platform congestion during the PM peak period increases marginally compared with Test 1, with Service Factors 3-4 spreading on the Victoria Line northbound and Piccadilly Line southbound during the period 1800-1815 hours.

Average Delay

- 4.2.7** The average passenger delay for the AM model period is 25 seconds. This represents approximately 11% of the total passenger movement time.
- 4.2.8** The average passenger delay for the PM model period is 28 seconds. This represents approximately 12% of the total passenger movement time.

Northern Ticket Hall UTS Gate Flows

- 4.2.9** Given the sensitivity of this area, further analysis has been undertaken for the five minute passenger flows through the UTS gates in the Northern Ticket Hall are included in Table 5. The flows are provided for the time period between 08.15 and 09.15 hours.

Table 5: Test 2 Northern Ticket Hall Gateline Flows

Time Period	Test 2 AM					
	Entry into LUL	Gateline Capacity	Gateline Capacity	Exit from LUL	Gateline Capacity	Gateline Capacity
		5 Minute (25ppm per gate)	5 Minute (33 ppm per gate)		5 Minute (25ppm per gate)	5 Minute (33 ppm per gate)
0815-0820	846	1000	1320	471	1000	1320
0820-0825	993	1000	1320	792	1000	1320
0825-0830	947	1000	1320	525	1000	1320
0830-0835	869	1000	1320	594	1000	1320
0835-0840	1038	1000	1320	804	1000	1320
0840-0845	942	1000	1320	560	1000	1320
0845-0850	967	1000	1320	672	1000	1320
0850-0855	1004	1000	1320	673	1000	1320
0855-0900	970	1000	1320	516	1000	1320
0900-0905	981	1000	1320	731	1000	1320
0905-0910	862	1000	1320	532	1000	1320
0910-0915	953	1000	1320	674	1000	1320

- 4.2.10** The flows into LUL are over 1000 for most of the hour. Hence the high levels of congestion in this area. The flows out of LUL are lower – ranging from between approximately 500 to 900 over the hour.
- 4.2.11** It is clear that the two way entry and exit flows for the Northern Ticket Hall gateline never exceeds the two way total gateline capacity, based either on 25 or 33 passengers per minute per gate. There is therefore some flexibility in terms of the operation of this gateline in order to maximise capacity and reduce congestion.

4.3 Test 3

Service Factors

- 4.3.1 Appendix D shows the peak 15 minute service factors for the Test 3 2007 AM and PM model scenarios. Demand to and from rail has been uplifted to represent 2007, factored up from 2002 by 2.5% per annum.
- 4.3.2 The majority of the station and connecting passageways experience very little congestion (SF 0-2) during both the AM and PM peak 15 minute periods.
- 4.3.3 During the AM, sections of all the underground platforms reach high levels of congestion (SF 3-4). The southbound Northern line platform experiences the worst levels of congestion, with SF 3-4 along the length of the platform between 08.45 and 09.00 hours.
- 4.3.4 The southbound Piccadilly Line platform also experiences high Service Factors of SF3-4 for the period 0830-0845 hours and again between 0900 and 0915 hours.
- 4.3.5 The Northern Ticket Hall and the North West stair experience minimal congestion (SF 0-1).
- 4.3.6 During the PM, the levels of congestion are less significant. Only small sections of some of the platforms (Victoria line northbound and Piccadilly line southbound) reach high levels of congestion (SF 3-4) during the peak 15 minute period.
- 4.3.7 The Northern Ticket Hall and the North West stair experience minimal congestion (SF 0-1).

Average Delay

- 4.3.8 The average passenger delay for the AM model period is 18 seconds. This represents approximately 10% of the total passenger movement time.
- 4.3.9 The average passenger delay for the PM model period is 22 seconds. This represents approximately 11% of the total passenger movement time.
- 4.3.10 Average passengers delays are no worse than under Test 1 demand conditions.

4.4 Test 4

Service Factors

- 4.4.1 Appendix E shows the peak 15 minute service factors for the Test 2 AM and PM model scenarios. Demand to and from rail has been uplifted to represent 2007, factored up from 2002 by 2.5% per annum.
- 4.4.2 The levels of congestion reflect the increase in demand as a result of including the King's Cross Central development trips.
- 4.4.3 The LUL entry gateline in the Northern Ticket Hall exhibits SF3-4 between 0830-0915 hours.
- 4.4.4 The down escalators connecting the Northern Ticket Hall with the LUL platforms exhibit Service Factors 3-4 during the morning peak period.

- 4.4.5** Platform congestion increases on the Northern Line southbound, Piccadilly Line southbound and Victoria Line southbound during the period 0845-0900 hours with SF3-4 evident.
- 4.4.6** The Northern Ticket Hall (with the exception of the LUL entry gateline as noted), Tube Ticket Hall and Western Ticket Hall are all free of congestion during the AM and PM peak periods.
- 4.4.7** Platform congestion is also evident on the Metropolitan/Circle Line eastbound with SF3-4 between 0830-0845 hours, with limited areas of SF3-4 evident on eastbound and westbound platforms throughout the AM peak period.
- 4.4.8** Congestion on the Piccadilly Line southbound is also evident during the AM peak period with SF3-4 evident between 0830-0915 hours.
- 4.4.9** Platform congestion during the PM peak period affects the Piccadilly Line southbound, with Service Factors 3-4 evident.

Average Delay

- 4.4.10** The average passenger delay for the AM model period is 27 seconds. This represents approximately 12% of the total passenger movement time.
- 4.4.11** The average passenger delay for the PM model period is 28 seconds. This represents approximately 13% of the total passenger movement time.
- 4.4.12** Average passengers delays are no worse than under Test 3 demand conditions.

Northern Ticket Hall UTS Gate Flows

- 4.4.13** Given the sensitivity of this area, further analysis has been undertaken for the five minute passenger flows through the UTS gates in the Northern Ticket Hall are included in Table 6. The flows are provided for the time period between 08.15 and 09.15 hours when congestion at the Northern Ticket Hall gateline is most severe.

Table 6: Test 4 Northern Ticket Hall Gateline Flows

Time Period	Test 4 AM					
	Entry into LUL	Gateline Capacity 5 Minute (25ppm per gate)	Gateline Capacity 5 Minute (33 ppm per gate)	Exit from LUL	Gateline Capacity 5 Minute (25ppm per gate)	Gateline Capacity 5 Minute (33 ppm per gate)
0815-0820	868	1000	1320	501	1000	1320
0820-0825	944	1000	1320	769	1000	1320
0825-0830	1022	1000	1320	640	1000	1320
0830-0835	939	1000	1320	627	1000	1320
0835-0840	1018	1000	1320	657	1000	1320
0840-0845	1010	1000	1320	701	1000	1320
0845-0850	1033	1000	1320	665	1000	1320
0850-0855	983	1000	1320	647	1000	1320
0855-0900	1025	1000	1320	700	1000	1320
0900-0905	1037	1000	1320	639	1000	1320
0905-0910	971	1000	1320	601	1000	1320
0910-0915	1018	1000	1320	697	1000	1320

4.4.14 The flows into LUL are over 1000 for most of the hour. Hence the high levels of congestion in this area. The flows out of LUL are lower – ranging from between approximately 500 to 900 over the hour.

4.4.15 However, as with the Northern Gateline flows for Test 2, it is clear that the two way entry and exit flows for the Northern Ticket Hall gateline never exceeds the two way total gateline capacity, based either on 25 or 33 passengers per minue per gate. There is therefore some flexibility in terms of the operation of this gateline in order to maximise capacity and reduce congestion.

5. CONCLUSIONS

A number of key conclusions can be drawn from this assessment of passenger conditions in King's Cross LUL station during the AM and PM peak periods under the tested demand scenarios. These are summarised as follows:

- That congestion during the Base 2007 AM and PM peak periods, assuming either existing (2002) or growthed mainline rail demand, is limited to the LUL platforms;
- The inclusion of the King's Cross Central development trips into the LUL network results in additional congestion on the LUL platforms and localised congestion at the Northern Ticket Hall gateline, particularly during the AM peak period;
- The assessment of AM peak period five minute flows through the Northern Ticket Hall gateline for Tests 2 and 4 shows that in aggregate terms there is sufficient capacity given the layout of sixteen gates;
- That management of the Northern Ticket Hall gateline under periods of peak demand would alleviate any temporary localised congestion; and
- That platform congestion is expected to be alleviated in the future given the improvement in train frequencies as a result of the Public Private Partnership initiatives.

APPENDIX A

Demand Matrices

A1. TEST 1: 2007 AM (2002 RAIL DEMAND)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	TOTAL	
Mst/circle Eb	1	0	0	306	941	253	681	516	107	72	1360	618	55	447	100	56	34	56	0	228	0	0	0	518	5342	
Mst/circle Wb	2	0	0	19	71	212	357	255	197	60	1088	381	133	268	100	133	25	133	0	134	0	0	0	381	3047	
Northern Nil	3	120	600	0	0	204	220	109	140	229	1210	279	0	0	0	0	0	261	0	260	0	536	20	279	2610	
Northern St	4	830	731	0	0	202	1307	130	77	223	316	124	20	0	5	20	101	20	45	0	20	80	41	174	4413	
Pic. Eb	5	979	322	128	1362	0	0	116	98	103	980	104	126	0	62	126	50	126	513	0	1027	559	104	5170		
Pic. Wb	6	2406	1979	585	2017	0	0	99	264	100	28	66	21	0	18	21	60	21	16	0	89	180	66	8022		
Victoria NB	7	378	34	347	612	200	392	0	0	666	408	74	62	0	84	62	261	62	290	0	580	719	74	5026		
Victoria Sd	8	1639	1664	642	731	372	766	0	0	316	749	175	115	0	126	115	147	115	290	0	660	1150	175	9661		
KR DR	10	488	610	388	447	16	324	22	589	0	0	140	0	0	0	0	0	0	0	0	437	0	1213	0	140	5169
WHD/mt/mtax	12	527	562	100	526	55	70	50	472	0	0	0	0	421	0	0	0	0	0	0	245	0	0	0	0	3201
Euston Rd S	13	162	173	33	164	15	25	17	146	23	221	0	7	67	0	7	4	7	0	33	0	0	0	0	0	1104
Pancras Rd W	14	31	37	10	13	4	61	65	60	0	0	0	0	44	0	0	0	0	0	0	22	0	0	0	0	178
St Pancras domestic to WTH	15	1159	1091	0	0	0	0	0	0	0	459	48	32	0	0	32	0	0	0	0	0	0	0	0	48	2809
Thameslink 2000 to WTH	16	171	171	17	17	14	147	48	296	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	886
Euston Rd N	17	30	37	10	13	4	61	65	60	0	0	6	0	44	0	0	0	0	0	0	22	0	0	0	0	369
KX suburban N	18	721	612	306	660	23	967	32	870	0	0	72	0	0	0	0	0	0	0	0	306	0	611	0	72	5551
Pancras Rd N	19	59	37	10	13	4	61	66	66	0	0	6	0	0	0	0	0	0	0	0	22	0	11	0	0	369
CTRL international to NIH	20	0	0	16	151	32	637	26	1060	46	0	0	0	0	0	0	0	5	16	0	0	0	0	0	0	2018
CTRL international to WTH	21	579	515	4	38	8	159	6	272	0	229	24	16	0	16	0	0	0	0	0	0	0	0	0	24	1800
St Pancras domestic to NIH	22	0	0	40	129	0	1591	64	2721	92	0	0	0	0	0	0	10	32	0	0	0	0	0	0	0	2111
Thameslink 2000 to NIH	23	0	0	154	154	173	1418	419	2655	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4520
Euston Rd S bus stops	24	162	173	33	164	15	25	17	146	23	221	0	7	67	0	7	4	7	0	33	0	0	0	0	0	1104
TOTAL		10363	9696	3907	8212	1916	6942	2171	10520	2177	6674	3212	676	1426	601	676	960	676	2386	712	4769	3716	2212	84261		

A2. TEST 1: 2007 PM (2002 RAIL DEMAND)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	TOTAL
Met/Circle Eb	1	0	0	643	571	1122	590	1032	50	325	2156	219	100	1017	156	100	924	100	0	509	0	0	0	219	11063
Met/Circle Wb	2	0	0	623	103	1150	1353	1366	544	615	1700	172	0	561	156	0	616	0	0	400	0	0	0	172	10740
Norham Nb	3	96	675	0	1243	2675	590	582	717	2201	222	40	0	2	40	716	40	201	0	409	14	222	14	222	10876
Norham Sb	4	11	619	0	0	681	173	179	116	643	730	72	61	0	2	61	614	61	62	0	64	19	72	19	14537
Piccadilly	5	636	1449	1880	789	0	629	553	1406	437	44	255	0	188	255	1406	255	1130	0	2280	1880	44	2280	44	24537
Piccadilly	6	510	403	350	533	0	0	44	350	45	412	37	23	0	22	23	44	23	70	0	155	155	37	3322	
Victoria Nb	7	213	90	211	534	1259	136	0	0	765	1569	169	171	0	729	171	765	171	1166	0	2531	2064	169	171	12125
Victoria Sb	8	257	410	191	864	51	374	0	0	0	157	17	154	0	31	154	0	154	0	0	0	276	17	287	
KX RR	10	862	435	120	327	36	116	191	587	0	0	86	0	0	0	0	0	0	113	0	225	0	86	17	3779
W12Smith/taxi	12	631	617	130	549	7	306	243	335	0	0	94	0	212	0	0	0	0	0	165	0	0	94	147	
Euston Rd S	13	469	601	106	297	36	104	166	122	90	306	0	17	49	0	17	0	17	0	26	0	0	0	0	2490
Ramsgate Rd W	14	107	36	12	60	7	149	72	66	0	0	7	0	14	0	0	0	0	0	7	0	0	7	0	635
St Pancras domestic to WTH	16	247	113	0	0	0	0	0	0	1561	66	87	0	0	0	0	0	0	0	0	0	0	0	0	66
Thameslink 2000 to WTR	15	109	109	2	2	9	100	100	120	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	566
Euston Rd N	17	107	36	12	60	7	149	72	66	0	0	7	0	14	0	0	0	0	0	7	0	0	7	0	635
PX suburban N	10	204	267	74	201	21	72	117	309	0	0	13	0	0	0	0	0	0	13	0	26	0	13	0	1458
Ramsgate Rd N	15	107	36	12	60	7	149	72	66	0	0	7	0	14	0	0	0	0	0	7	0	14	0	7	635
CTRL International to NTH	20	0	0	46	150	40	573	171	290	317	0	0	0	0	0	0	102	41	0	0	0	0	0	0	1810
CTRL International to WTH	21	124	167	12	60	10	142	42	72	0	676	32	41	0	0	11	0	0	0	0	0	0	0	32	1426
St Pancras domestic to NTH	22	0	0	115	395	99	1433	438	726	632	0	0	0	0	0	0	384	152	0	0	0	0	0	0	4273
Thameslink 2000 to NTH	23	0	0	10	10	25	196	306	1156	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3173
Euston Rd S bus stops	24	459	581	175	257	36	184	166	172	98	376	0	17	49	0	17	60	17	0	25	0	0	0	0	2496
TOTAL		4856	5469	4232	6509	5749	10057	7556	6293	6162	11894	1366	1040	2916	783	1040	5677	1040	2799	1169	5478	4348	1356	91122	

A3. TEST 2: 2020 AM (2002 RAIL DEMAND WITH KING'S CROSS CENTRAL)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	TOTAL	
Malden to Ff	1	0	0	306	841	757	881	618	107	77	1980	616	55	447	100	55	54	55	0	275	0	24	0	618	648	7394	
Malden to Wb	2	0	0	19	71	212	357	255	197	60	1080	201	135	260	100	130	25	133	0	134	0	0	0	301	2207	6224	
Northern Nb	3	126	500	0	0	284	550	180	140	550	1235	279	82	0	6	50	261	82	238	0	535	58	270	1410	7038		
Northern Sb	4	839	791	0	0	302	1307	130	77	223	316	134	20	0	6	20	101	30	45	0	89	41	124	341	4757		
Pic. Fb	5	876	322	145	1363	0	0	116	86	103	360	104	126	0	62	126	60	126	513	0	1007	569	104	2162	8337		
Pic. Wb	6	2405	1070	595	2047	0	0	69	254	100	20	65	21	0	10	21	50	21	45	0	60	160	65	351	6704		
Victoria Nb	7	378	34	347	412	200	382	0	0	555	408	74	62	0	34	62	261	62	290	0	580	749	74	1066	8094		
Victoria Sb	8	1638	1664	842	731	572	756	0	0	318	749	175	115	0	128	115	147	115	290	0	590	1150	175	1977	11838		
Wt NP	9	400	610	200	447	16	122	22	270	0	0	140	0	0	0	0	0	0	0	0	167	0	1211	0	140	0	7129
WHSmith tovic	12	627	562	109	536	55	78	90	472	0	0	83	0	491	0	0	0	0	0	0	245	0	0	83	0	3291	
Euston Rd S	13	162	173	33	164	15	26	17	146	23	221	0	7	67	0	7	4	7	0	35	0	0	0	0	0	1104	
Pancras Rd W	14	21	27	10	12	4	61	12	10	0	0	0	0	44	0	0	0	0	0	0	72	0	0	0	0	379	
St Pancras domestic to WtH	15	1190	1031	0	0	0	0	0	0	0	492	46	32	0	0	32	0	0	0	0	0	0	0	48	0	2829	
Thameslink 2000 to WtH	16	121	121	12	12	14	157	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	898	
Euston Rd N	17	20	27	10	12	4	61	12	10	0	0	0	0	44	0	0	0	0	0	0	72	0	0	0	0	379	
St suburban N	18	721	912	306	680	20	567	32	170	0	0	72	0	0	0	0	0	0	0	0	306	0	611	0	72	0	5551
Pancras Rd N	19	34	27	10	12	4	61	12	10	0	0	6	0	0	0	0	0	0	0	0	22	0	44	0	6	0	328
CTRL international to NtH	20	0	0	16	151	32	637	26	1889	46	0	0	0	0	0	0	5	16	0	0	0	0	0	0	0	2018	
CTRL international to WtH	21	578	515	4	35	8	159	6	272	0	229	24	16	0	0	16	0	0	0	0	0	0	0	24	0	1890	
St Pancras domestic to NtH	22	0	0	40	379	80	1593	54	2721	12	0	0	0	0	0	10	22	0	0	0	0	0	0	0	0	5011	
Thameslink 2000 to NtH	23	0	0	154	154	123	1418	419	2655	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4920	
Euston Rd S bus stop	24	162	173	33	164	15	26	17	146	23	221	0	7	67	0	7	4	7	0	35	0	0	0	0	0	1104	
Kings Cross Central	25	637	714	122	591	77	1177	124	1212	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5675	
TOTAL		10970	10910	2190	8463	1992	11119	3425	11632	2177	8674	2212	676	1428	501	676	960	676	2886	712	4789	2718	2212	10568	100427		

A4. TEST 2: 2020 PM (2002 RAIL DEMAND WITH KING'S CROSS CENTRAL)

	1	2	3	4	5	6	7	8	9	10	12	13	14	15	16	17	18	19	20	21	22	23	24	25	TOTAL
Marion to Fb	1	0	0	623	571	1177	590	1697	58	875	2156	719	108	1017	156	105	324	108	0	509	0	0	719	795	11866
Mit/Circle Wb	2	0	0	623	100	1130	1353	1356	544	616	1700	172	0	961	156	0	516	0	0	490	0	0	172	590	10043
Northern Nb	3	95	875	0	0	1243	2675	590	582	717	2301	222	40	0	2	40	716	40	201	0	403	14	222	294	11172
Northern Sb	4	41	519	0	0	981	473	379	115	543	730	72	51	0	2	51	544	51	32	0	54	19	72	375	4713
Picc. Eb	5	600	940	1750	749	0	0	619	571	1400	477	44	227	0	100	225	1405	225	1100	0	2900	1030	44	1071	10410
Picc. Wb	6	518	483	380	533	0	0	44	350	45	412	37	20	0	22	25	44	23	78	0	155	195	37	169	3511
Victoria Nb	7	213	0	211	534	1229	135	0	0	765	1560	159	171	0	229	171	765	171	1165	0	2591	2054	159	1255	13219
Victoria Sb	8	267	410	191	664	51	704	0	0	0	157	17	154	0	31	154	0	154	0	0	0	276	31	1131	4016
WR DR	9	402	435	170	327	35	170	121	597	0	0	0	0	0	0	0	0	0	113	0	225	0	0	0	2729
WHSNth/Ws	12	631	617	130	549	7	303	343	326	0	0	94	0	212	0	0	0	0	0	106	0	0	94	0	3117
Easton Rd S	13	469	581	105	257	36	184	185	122	95	305	0	17	49	0	17	60	17	0	25	0	0	0	0	2498
Pancras Rd W	14	107	35	13	50	7	149	77	50	0	0	7	0	14	0	0	0	0	0	7	0	0	7	0	535
St Pancras domestic to WTH	15	247	313	0	0	0	0	0	0	0	1351	66	82	0	0	82	0	0	0	0	0	0	66	0	2207
Thameslink 2000 to WTH	16	109	109	2	2	2	100	105	129	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	565
Easton Rd N	17	107	35	13	50	7	149	77	50	0	0	7	0	14	0	0	0	0	0	7	0	0	7	0	535
PN suburban N	18	204	257	74	201	21	72	117	359	0	0	13	0	0	0	0	0	0	13	0	25	0	13	0	1459
Pancras Rd N	19	107	35	12	50	7	149	72	68	0	0	7	0	0	0	0	0	0	7	0	14	0	7	0	535
CTRL international to NTH	20	0	0	45	158	40	573	171	290	317	0	0	0	0	0	0	182	41	0	0	0	0	0	0	1818
CTRL international to WTH	21	124	127	12	40	10	147	43	77	0	676	30	41	0	0	41	0	0	0	0	0	0	30	0	1429
St Pancras domestic to NTH	22	0	0	115	395	99	1433	428	725	532	0	0	0	0	0	0	354	82	0	0	0	0	0	0	4273
Thameslink 2000 to NTH	23	0	0	111	111	79	189	949	1156	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3118
Easton Rd S bus stops	24	469	581	105	257	36	184	185	122	95	305	0	17	49	0	17	60	17	0	25	0	0	0	0	2498
King's Cross Central	25	2511	054	252	1220	171	3535	1757	1639	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12201
TOTAL		7467	7343	4725	6729	5920	13693	9312	7952	6162	11994	1254	1040	2316	769	1040	5677	1040	2739	1159	5478	4248	1255	5485	115609

A5. TEST 3: 2007 AM (2007 RAIL DEMAND)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	TOTAL	
Mt/Circle Eb	1	0	0	306	041	252	601	510	107	02	1360	510	55	447	100	55	30	55	0	223	0	0	0	0	510	6257
Mt/Circle Wb	2	0	0	19	71	212	327	355	197	91	1000	301	130	260	100	130	26	130	0	134	0	0	0	0	301	3926
Northern Nb	3	128	800	0	0	284	550	189	140	633	1255	279	82	0	6	82	205	82	288	0	538	58	270	5726	5726	
Northern Sb	4	529	731	0	0	302	1307	130	77	262	315	121	20	0	5	20	114	20	46	0	89	11	124	1468	1468	
Picc Eb	5	876	522	148	1362	0	0	116	38	117	380	104	126	0	62	126	57	126	513	0	1027	559	104	6190	6190	
Picc Wb	6	2405	1579	505	2047	0	0	69	254	114	20	65	21	0	10	21	57	21	45	0	09	100	65	6043	6043	
Victoria Nb	7	328	34	347	417	280	342	0	0	653	408	74	67	0	84	67	296	67	290	0	580	249	74	5125	5125	
Victoria Sb	8	1639	1864	842	731	372	785	0	0	380	749	175	115	0	128	115	167	115	290	0	580	1150	175	9822	9822	
KX RR	10	553	889	335	805	18	743	25	667	0	0	167	0	0	0	0	0	0	687	0	1372	0	167	5835	5835	
Wt/Smt/Toxic	12	527	562	109	536	55	70	50	472	0	0	10	0	491	0	0	0	0	0	0	246	0	0	0	63	3251
Euston Rd S	13	162	173	33	164	15	25	17	145	25	221	0	7	57	0	7	4	7	0	33	0	0	0	0	0	1107
Pancras Rd W	14	33	37	10	13	4	61	65	68	0	0	6	0	44	0	0	0	0	0	22	0	0	0	0	6	368
St Pancras domestic to WTH	15	1168	1031	0	0	0	0	0	0	0	458	48	32	0	0	32	0	0	0	0	0	0	0	48	2809	2809
Thameslink 2000 to WTH	16	171	171	17	17	14	197	45	296	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	600
Euston Int N	17	33	37	10	13	4	61	65	68	0	0	6	0	44	0	0	0	0	0	22	0	0	0	0	6	368
KX suburban N	18	790	1011	339	721	25	1072	35	964	0	0	79	0	0	0	0	0	0	338	0	677	0	79	6150	6150	
Pancras Rd N	19	33	37	10	13	4	61	65	68	0	0	6	0	0	0	0	0	0	22	0	44	0	0	0	6	368
CTRL international to NTH	20	0	0	16	151	32	637	25	1069	52	0	0	0	0	0	0	0	0	16	0	0	0	0	0	0	2024
CTRL international to WTH	21	579	515	1	38	8	189	5	272	0	229	21	16	0	0	16	0	0	0	0	0	0	0	21	1890	1890
St Pancras domestic to NTH	22	0	0	40	379	80	1899	64	2721	104	0	0	0	0	0	0	11	32	0	0	0	0	0	0	0	5024
Thameslink 2000 to NTH	23	0	0	154	154	120	1410	419	2255	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4529
Euston Rd S bus stops	24	182	173	33	164	15	25	17	145	25	221	0	7	57	0	7	4	7	0	33	0	0	0	0	0	1107
TOTAL		10475	9775	3057	8342	1930	10132	2177	10492	2463	5674	3239	576	1426	501	676	1075	676	2499	712	4884	2718	2289	2289	98445	

A6. TEST 3: 2007 PM (2007 RAIL DEMAND)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	TOTAL	
Mel/Circle Eb	1	0	0	643	571	1122	590	1632	50	1045	2156	219	100	1017	156	100	1045	100	0	509	0	0	0	219	11305	
Mel/Circle Wb	2	0	0	623	100	1150	1353	1366	544	697	1700	172	0	561	156	0	697	0	0	400	0	0	0	0	172	10479
Norham Nb	3	96	675	0	0	1243	2675	590	582	811	2201	222	40	0	2	40	810	40	201	0	409	14	222	14	222	11086
Norham Sb	4	11	619	0	0	681	473	379	116	614	730	72	51	0	2	51	616	51	52	0	64	19	72	19	72	1491
Picc Eb	5	636	949	1690	789	0	0	639	553	1993	47	44	255	0	188	255	1589	255	1130	0	2260	1890	44	1491	1491	
Picc Wb	6	510	403	350	533	0	0	44	360	51	412	37	23	0	22	23	50	23	70	0	155	155	37	37	3303	
Victoria Nb	7	273	90	211	534	1259	136	0	0	866	1569	169	171	0	729	171	866	171	1166	0	2531	2064	169	169	12524	
Victoria Sb	8	257	410	191	864	51	374	0	0	0	157	17	154	0	51	154	0	154	0	0	0	0	276	17	287	
KX RR	10	529	692	136	371	38	131	216	664	0	0	97	0	0	0	0	0	0	0	126	0	354	0	97	3185	
W12Smith/taxi	12	631	617	130	549	7	300	247	335	0	0	94	0	212	0	0	0	0	0	0	165	0	0	94	3417	
Euston Rd S	13	469	601	106	297	36	104	166	122	110	306	0	17	49	0	17	67	17	0	26	0	0	0	0	2519	
Ramsgate Rd W	14	107	36	12	50	7	149	77	66	0	0	7	0	14	0	0	0	0	0	0	7	0	0	7	535	
St Pancras domestic to WTH	16	247	113	0	0	0	0	0	0	0	1561	66	67	0	0	67	0	0	0	0	0	0	0	0	66	2707
Thameslink 2000 to WTrl	15	109	109	2	2	9	100	100	120	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	566
Euston Int N	17	107	36	12	50	7	149	77	66	0	0	7	0	14	0	0	0	0	0	0	7	0	0	7	535	
PX suburban N	18	321	302	03	227	24	61	133	407	0	0	16	0	0	0	0	0	0	0	15	0	30	0	15	1650	
Ramsgate Rd N	19	167	35	12	60	7	149	77	66	0	0	7	0	0	0	0	0	0	0	7	0	14	0	7	535	
CTRL International to NTH	20	0	0	46	150	40	573	171	290	368	0	0	0	0	0	0	205	41	0	0	0	0	0	0	1603	
CTRL International to WTH	21	124	167	12	60	10	142	43	72	0	676	33	41	0	0	41	0	0	0	0	0	0	0	33	1426	
St Pancras domestic to NTH	22	0	0	115	395	99	1433	438	726	716	0	0	0	0	0	0	472	92	0	0	0	0	0	0	4404	
Thameslink 2000 to NTH	23	0	0	10	10	25	196	306	1156	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3173	
Euston Rd S fare stops	24	459	581	105	257	36	184	166	172	110	306	0	17	49	0	17	67	17	0	25	0	0	0	0	2519	
TOTAL		4964	6681	4457	6576	5746	10062	7696	6417	6911	11894	1269	1040	2916	783	1040	6423	1040	2786	1169	5611	4348	1269	99236		

A7. TEST 4: 2020 AM (2007 RAIL DEMAND WITH KING'S CROSS CENTRAL)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	TOTAL
Malden to Ff	1	0	0	306	841	757	881	518	107	87	1980	616	55	447	100	56	38	45	0	275	0	24	0	618	648	7976
Malden to Wb	2	0	0	19	71	212	357	255	197	60	1080	201	135	260	100	130	20	133	0	134	0	0	0	301	2207	6245
Northern Nb	3	129	500	0	0	284	550	180	140	633	1235	279	82	0	6	50	235	82	289	0	535	59	279	1410	7126	
Northern Sb	4	839	791	0	0	302	1307	130	77	262	316	134	20	0	5	20	114	30	45	0	89	41	124	341	4800	
Pic. Fb	5	876	322	145	1363	0	0	116	86	117	360	104	126	0	62	126	67	126	513	0	1027	569	104	2162	8367	
Pic. Wb	6	2405	1070	595	2047	0	0	60	254	114	20	65	21	0	10	21	57	21	45	0	60	160	65	351	6404	
Victoria Nb	7	378	34	347	412	200	392	0	0	833	408	74	62	0	34	62	295	62	290	0	580	749	74	1066	6202	
Victoria Sb	8	1638	1664	842	731	372	755	0	0	360	749	175	115	0	128	115	167	115	290	0	590	1150	175	1977	11899	
Wt NP	9	251	620	205	515	16	743	25	672	0	0	167	0	0	0	0	0	0	667	0	1372	0	167	0	5708	
WHSmithtoxic	12	627	562	109	538	55	79	90	472	0	0	83	0	491	0	0	0	0	0	0	245	0	83	0	3291	
Euston Rd S	13	162	173	33	164	15	26	17	145	26	221	0	7	67	0	7	4	7	0	33	0	0	0	0	1107	
Pancras Rd W	14	21	37	10	13	4	61	65	60	0	0	0	0	44	0	0	0	0	0	0	72	0	0	0	0	379
St Pancras domestic to WtH	15	1190	1031	0	0	0	0	0	0	492	46	32	0	0	32	0	0	0	0	0	0	0	0	48	0	2829
Thameslink 2000 to WtH	16	171	171	17	17	14	157	46	246	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	898
Euston Rd N	17	21	37	10	13	4	61	65	60	0	0	0	0	44	0	0	0	0	0	0	72	0	0	0	0	379
St Pancras suburban N	18	790	1011	329	731	25	1072	32	964	0	0	79	0	0	0	0	0	0	0	339	0	677	0	79	0	6150
Pancras Rd N	19	34	27	10	13	4	61	65	60	0	0	5	0	0	0	0	0	0	22	0	44	0	5	0	0	328
CTRL international to NtH	20	0	0	16	151	32	637	26	1089	52	0	0	0	0	0	0	6	16	0	0	0	0	0	0	0	2024
CTRL international to WtH	21	579	515	4	35	8	159	8	272	0	229	24	16	0	0	16	0	0	0	0	0	0	0	24	0	1890
St Pancras domestic to NtH	22	0	0	40	379	80	1593	54	2721	104	0	0	0	0	0	0	11	32	0	0	0	0	0	0	0	5024
Thameslink 2000 to NtH	23	0	0	154	154	123	1418	419	2655	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4920
Euston Rd S bus stop	24	162	173	33	164	15	26	17	145	26	221	0	7	67	0	7	4	7	0	33	0	0	0	0	0	1107
Kings Cross Central	25	637	714	100	291	77	1177	124	1712	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5675
TOTAL		11112	10490	3250	8693	1997	11309	3431	11904	2463	8674	2239	676	1428	501	676	1075	676	2499	712	4994	2718	2239	10568	102116	

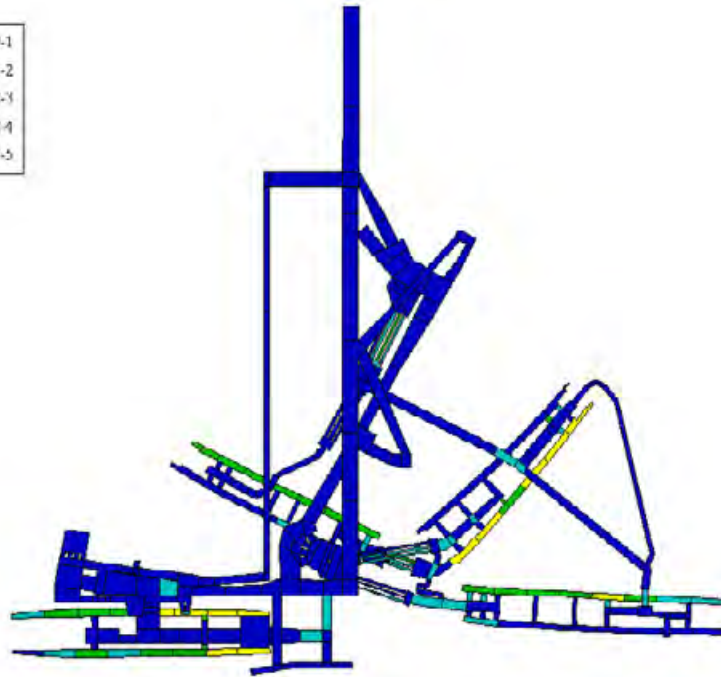
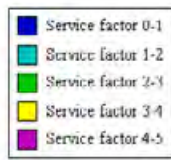
A8. TEST 4: 2020 PM (2007 RAIL DEMAND WITH KING'S CROSS CENTRAL)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	TOTAL
Maitland/Fb	1	0	0	643	571	1122	690	1832	58	1045	2156	219	108	1017	156	106	1045	108	0	409	0	0	0	219	793	12086
Mot/circle Wb	2	0	0	623	100	1150	1353	1366	544	597	1703	172	0	961	156	0	597	0	0	400	0	0	0	172	595	11004
Northern Nb	3	95	875	0	0	1243	2675	690	582	811	2201	222	40	0	2	40	810	40	201	0	403	14	222	294	294	11369
Northern Sb	4	41	519	0	0	581	473	379	115	514	730	72	51	0	2	51	616	51	32	0	84	19	72	375	4866	
Piccc/Fb	5	636	940	1690	749	0	0	619	551	1593	477	44	255	0	100	225	1509	255	1130	0	2200	1030	44	1073	16779	
Piccc/Wb	6	519	483	390	533	0	0	44	390	51	412	37	23	0	22	23	50	23	78	0	155	195	37	189	3552	
Victoria Nb	7	213	180	211	554	1229	135	0	0	886	1589	189	171	0	229	171	886	171	1165	0	2531	2854	189	1255	13589	
Victoria Sb	8	257	410	191	684	51	374	0	0	0	157	17	154	0	31	154	0	154	0	0	0	376	17	1131	4016	
K&L LK	10	523	452	130	371	35	131	210	634	0	0	0	0	0	0	0	0	0	120	0	254	0	37	0	3149	
WHSmid/basis	12	631	617	130	549	7	308	343	326	0	0	94	0	212	0	0	0	0	0	106	0	0	94	0	3417	
Euston Rd S	13	459	581	105	257	36	184	166	122	110	306	0	17	49	0	17	67	17	0	25	0	0	0	0	3519	
Pancras Rd W	14	107	25	13	50	7	149	77	80	0	0	7	0	14	0	0	0	0	0	7	0	0	0	7	0	575
St Pancras domestic to WTH	15	247	313	0	0	0	0	0	0	1351	88	82	0	0	82	0	0	0	0	0	0	0	82	0	2207	
Thameslink 2000 to WTH	16	109	109	2	2	9	100	108	126	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	566
Euston Rd N	17	107	35	13	50	7	149	77	80	0	0	7	0	14	0	0	0	0	0	7	0	0	0	7	0	535
K&L suburban N	19	321	302	83	227	24	0	133	407	0	0	15	0	0	0	0	0	0	15	0	30	0	15	0	1052	
Pancras Rd N	19	107	25	13	50	7	149	77	80	0	0	7	0	0	0	0	0	0	7	0	14	0	7	0	535	
CTRL international to NTH	20	0	0	46	168	40	573	171	290	369	0	0	0	0	0	206	41	0	0	0	0	0	0	0	0	1883
CTRL international to WTH	21	124	157	13	40	10	143	43	77	0	678	33	41	0	0	41	0	0	0	0	0	0	0	0	0	1425
St Pancras domestic to NTH	22	0	0	115	395	99	1433	428	725	715	0	0	0	0	0	412	82	0	0	0	0	0	0	0	0	4101
Thameslink 2000 to NTH	23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Euston Rd S bus stops	24	459	581	105	257	36	184	166	122	110	306	0	17	49	0	17	67	17	0	25	0	0	0	0	0	3519
King's Cross Central	25	2511	454	250	1224	171	3636	1757	1039	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12207
TOTAL		7565	7435	4750	6798	5927	13718	9353	8075	6971	11994	1268	1040	2316	783	1040	6425	1040	2756	1159	5511	4248	1288	6486	117908	

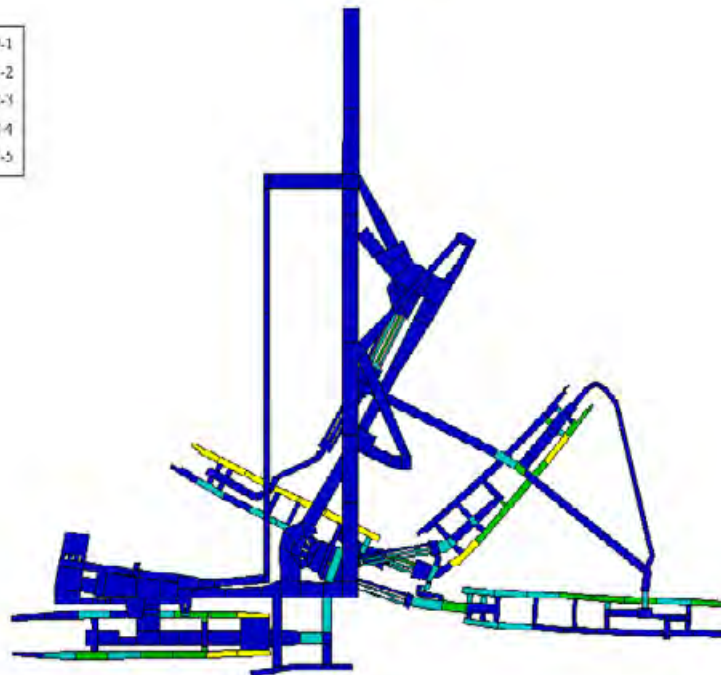
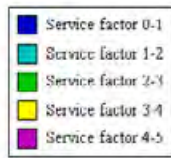
APPENDIX B

**Test 1 Service Factor
Plots**

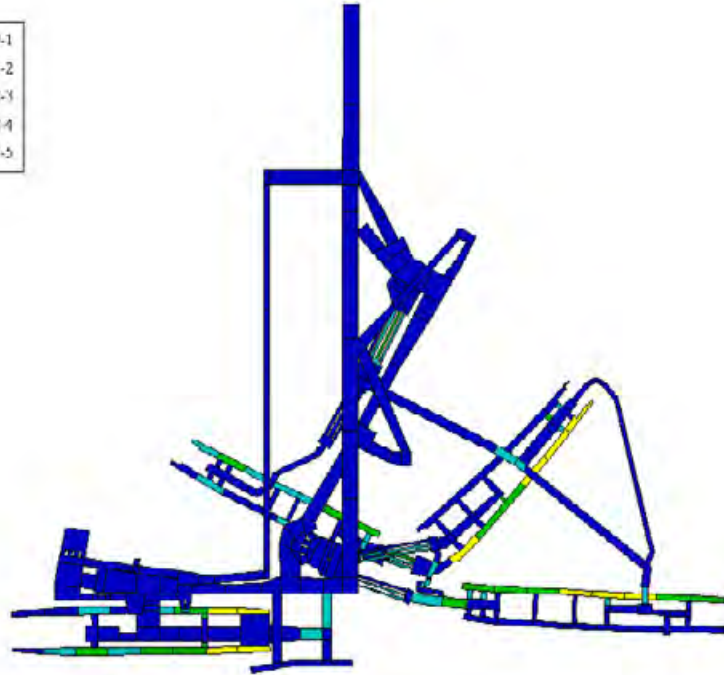
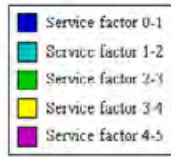
Test 1AM: 08.30-08.45



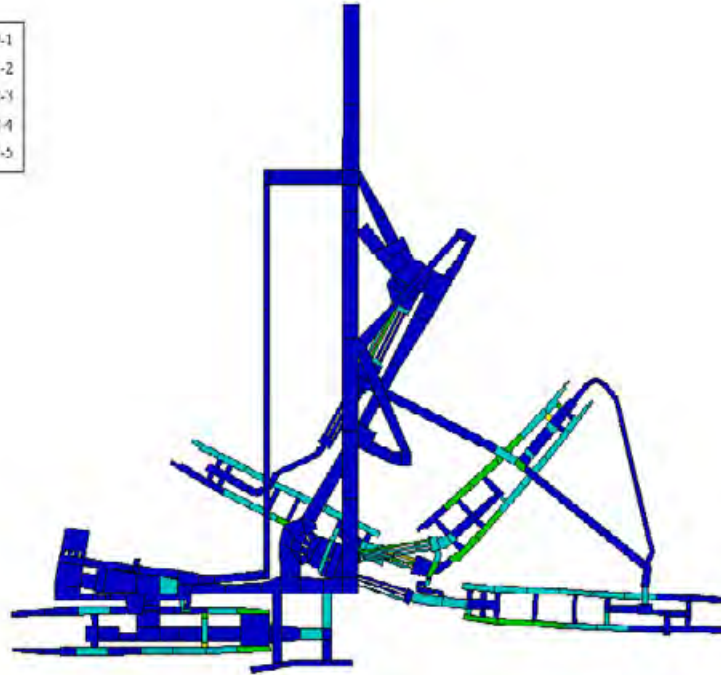
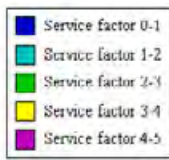
Test 1AM: 08.45-09.00



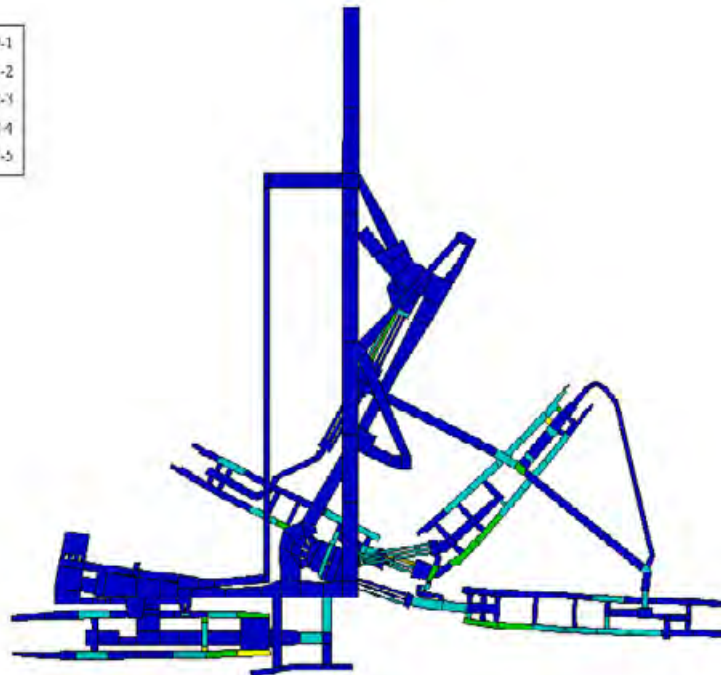
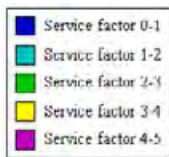
Test 1AM 09.00-09.15



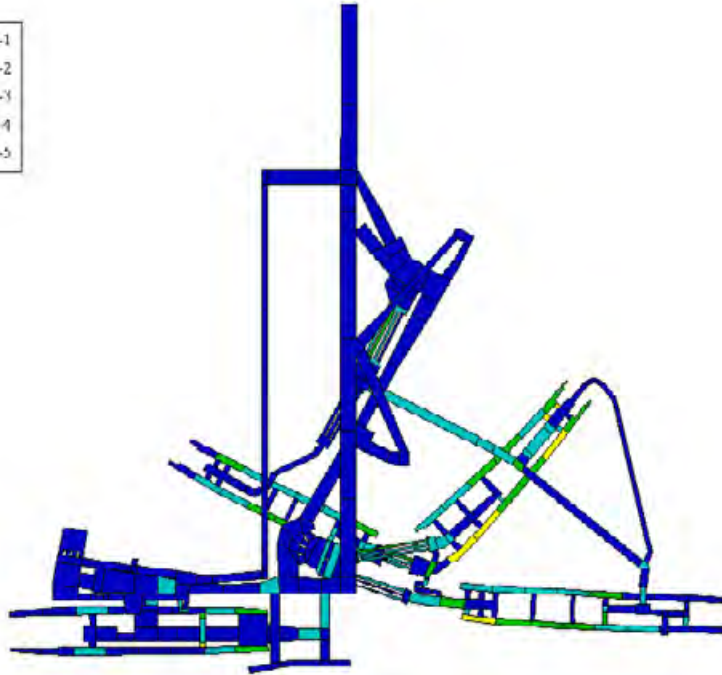
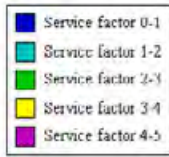
Test 1PM: 17.30-17.45



Test 1PM: 17.45-18.00



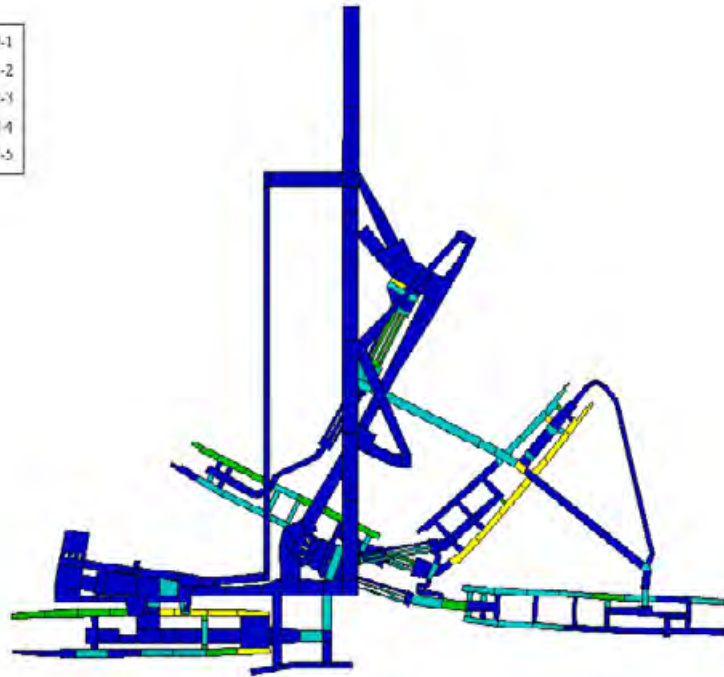
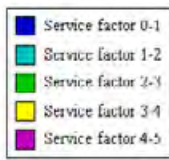
Test 1PM: 18.00-18.15



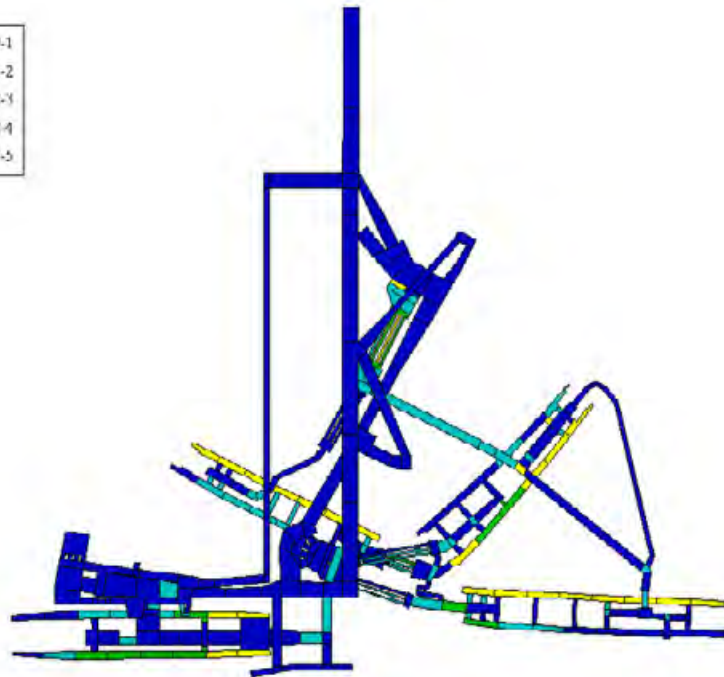
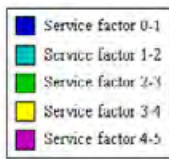
APPENDIX C

**Test 2 Service Factor
Plots**

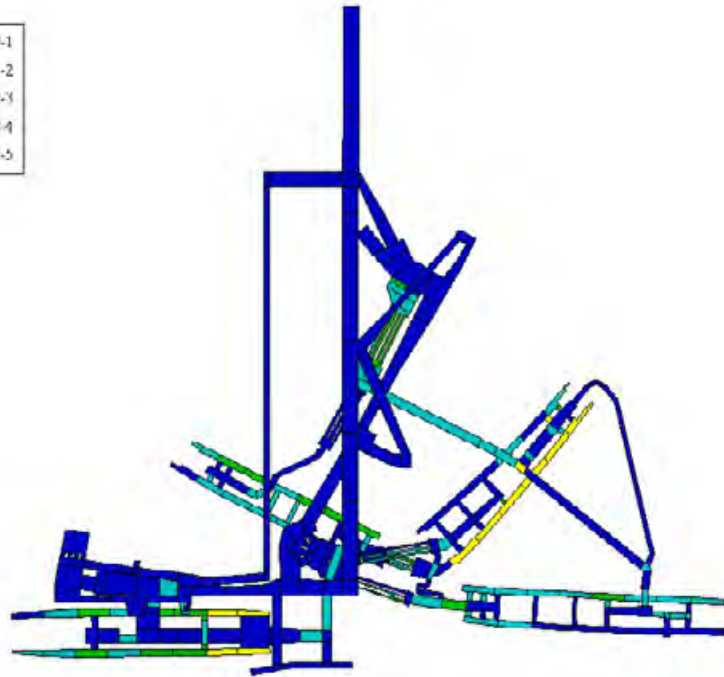
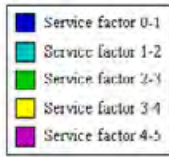
Test 2AM: 08.30-08.45



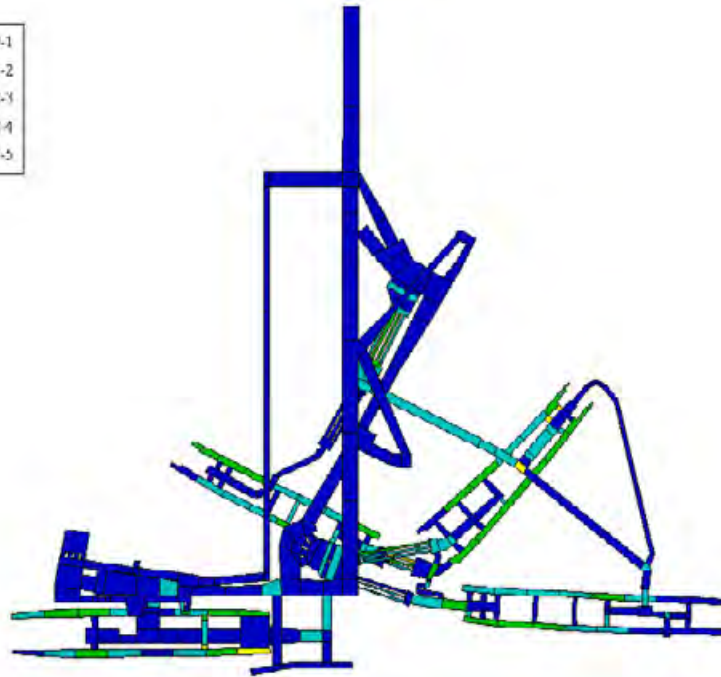
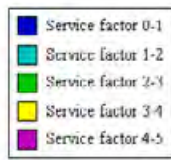
Test 2AM: 08.45-09.00



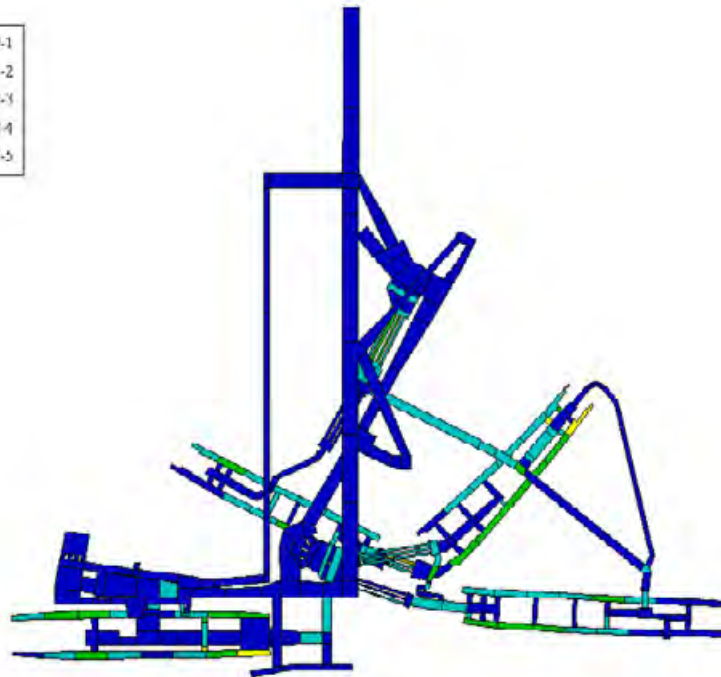
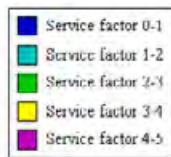
Test 2AM: 09.00-09.15



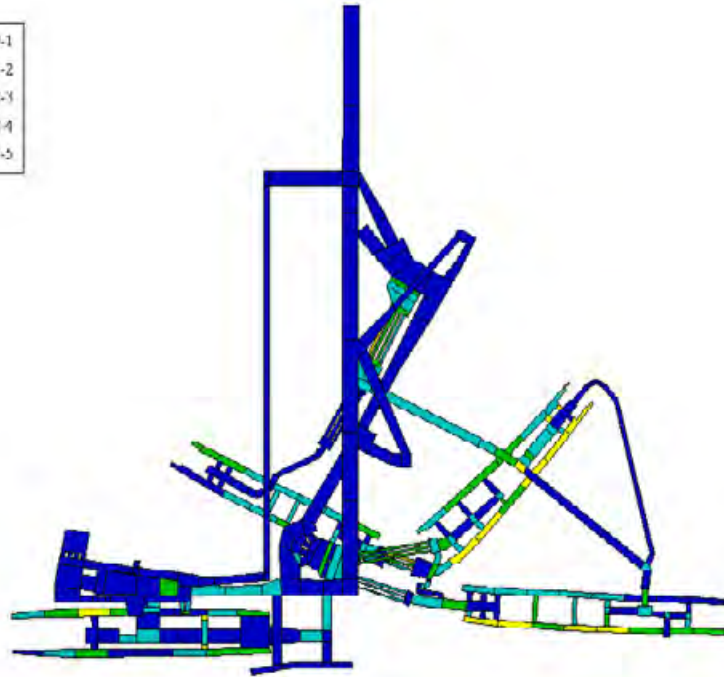
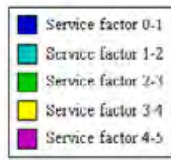
Test 2PM: 17.30-17.45



Test 2PM: 17.45-18.00



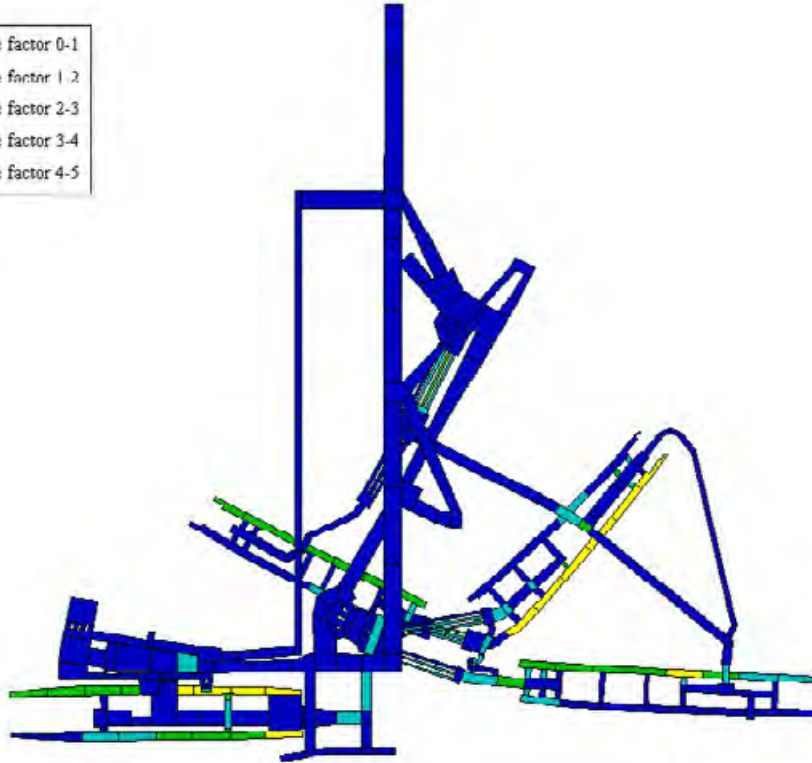
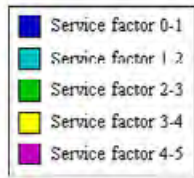
Test 2PM: 18.00-18.15



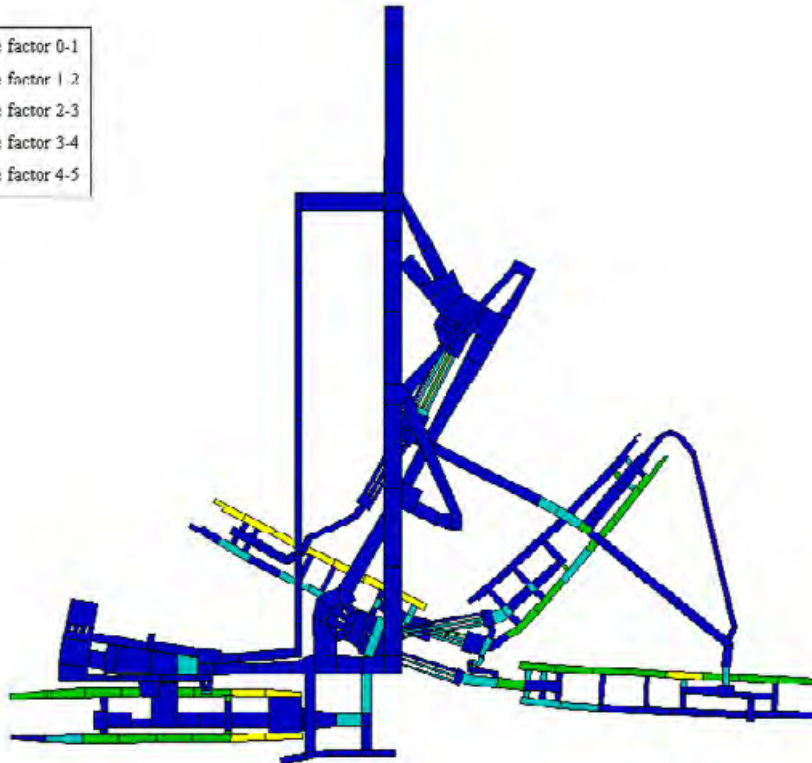
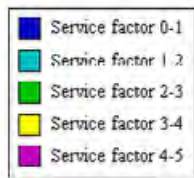
APPENDIX D

**Test 3 Service Factor
Plots**

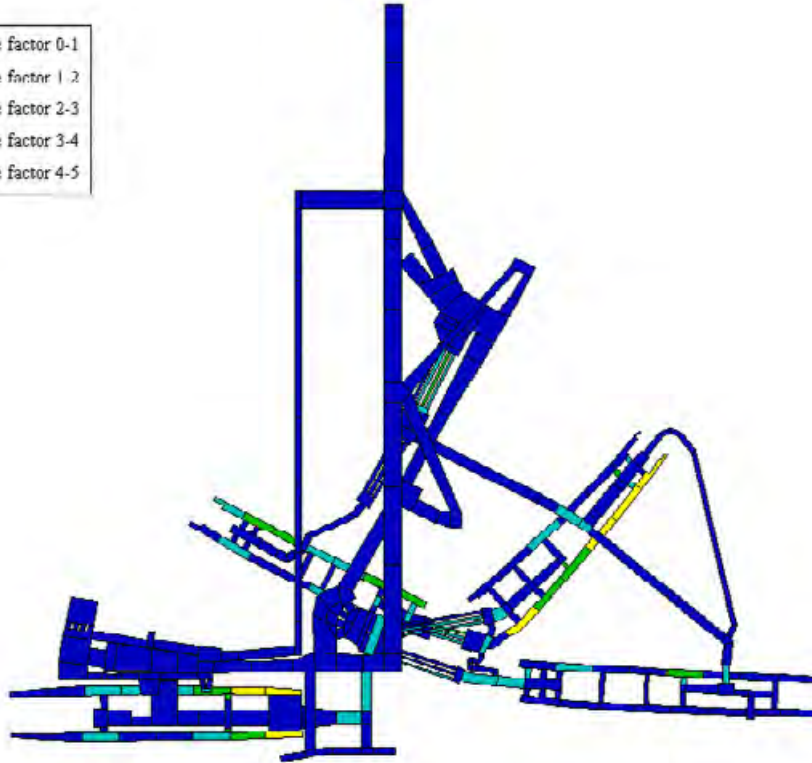
Test 3AM: 08.30-08.45



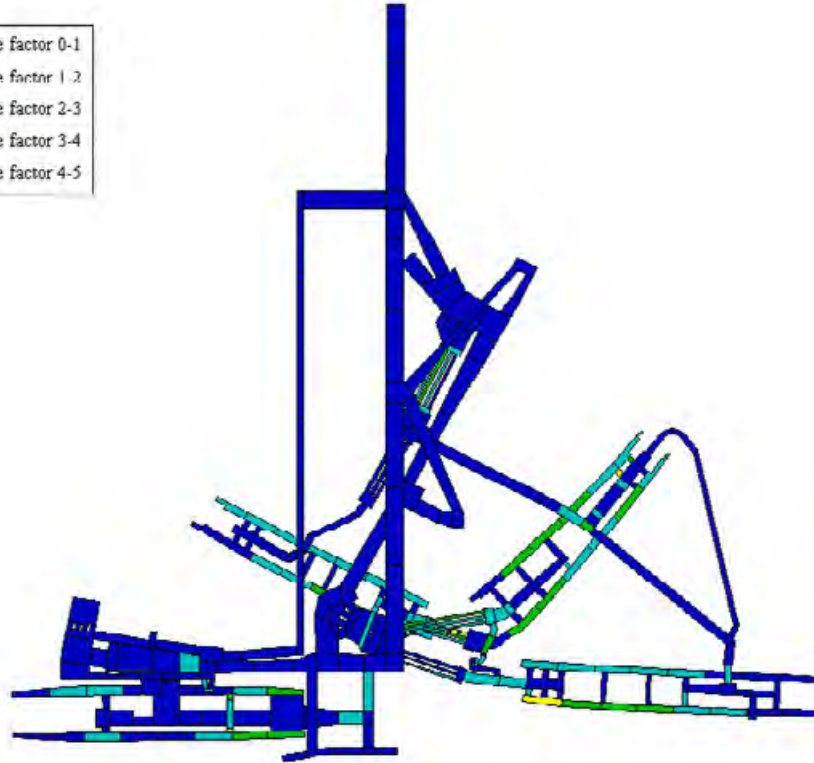
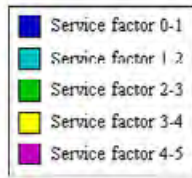
Test 3AM: 08.45-09.00



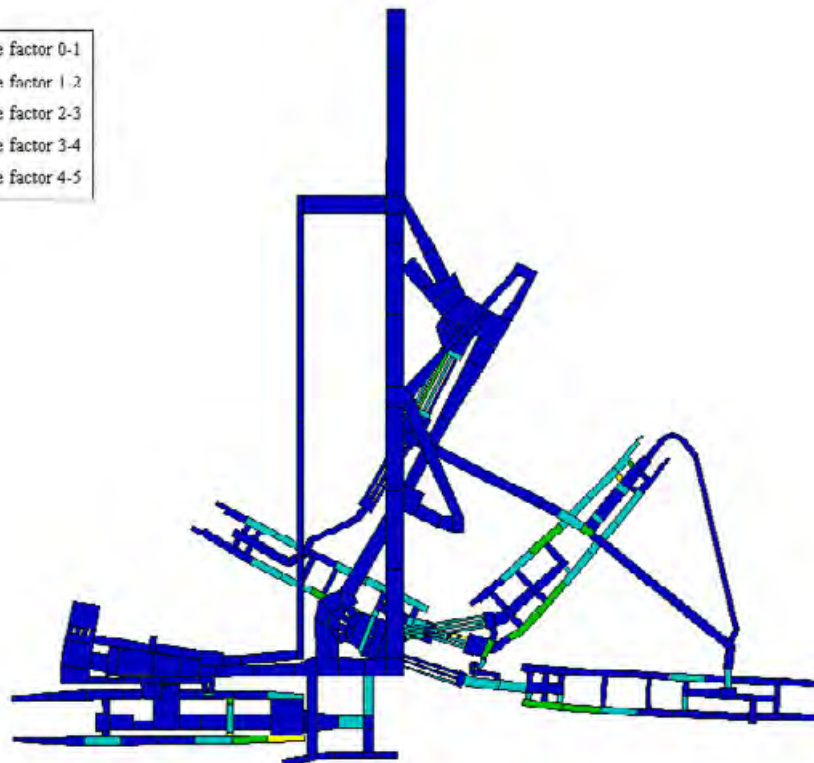
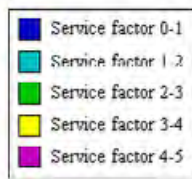
Test 3AM 09.00-09.15



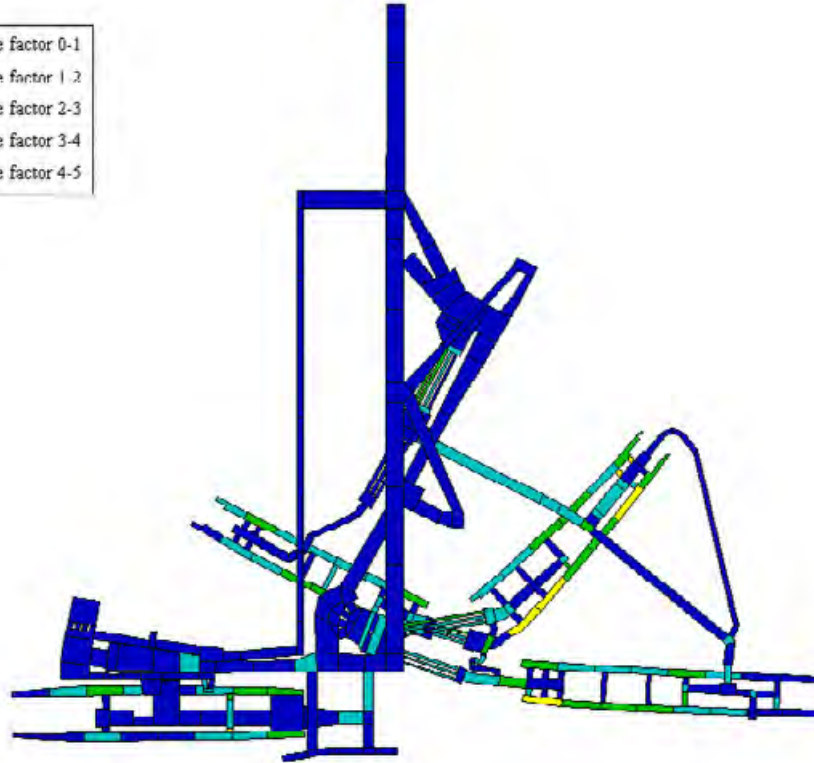
Test 3PM: 17.30-17.45



Test 3PM: 17.45-18.00



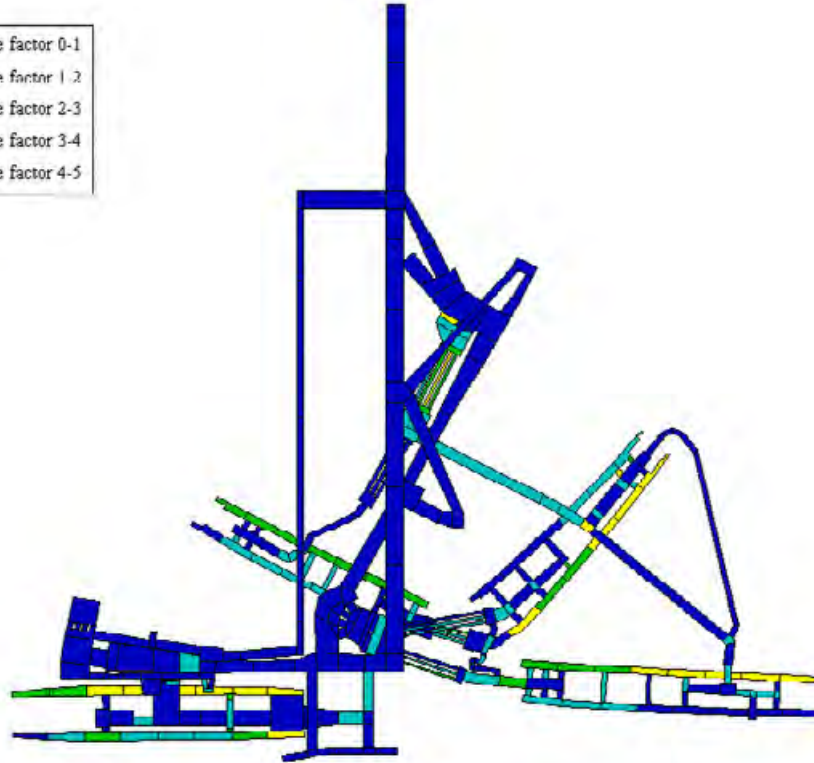
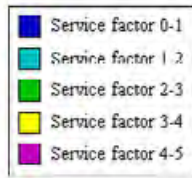
Test 3PM: 18.00-18.15



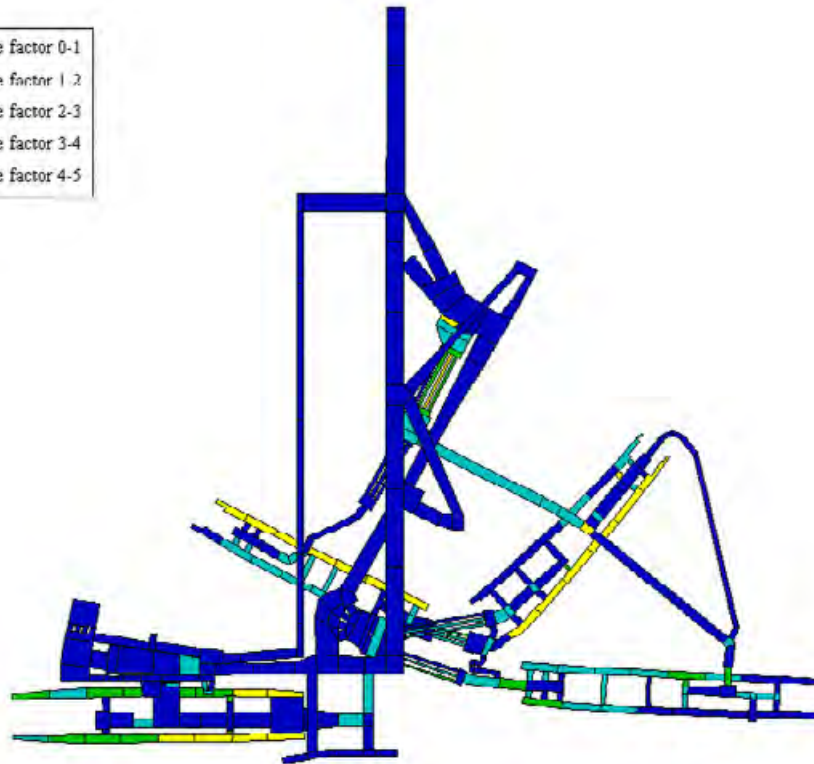
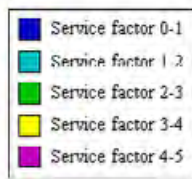
APPENDIX E

**Test 4 Service Factor
Plots**

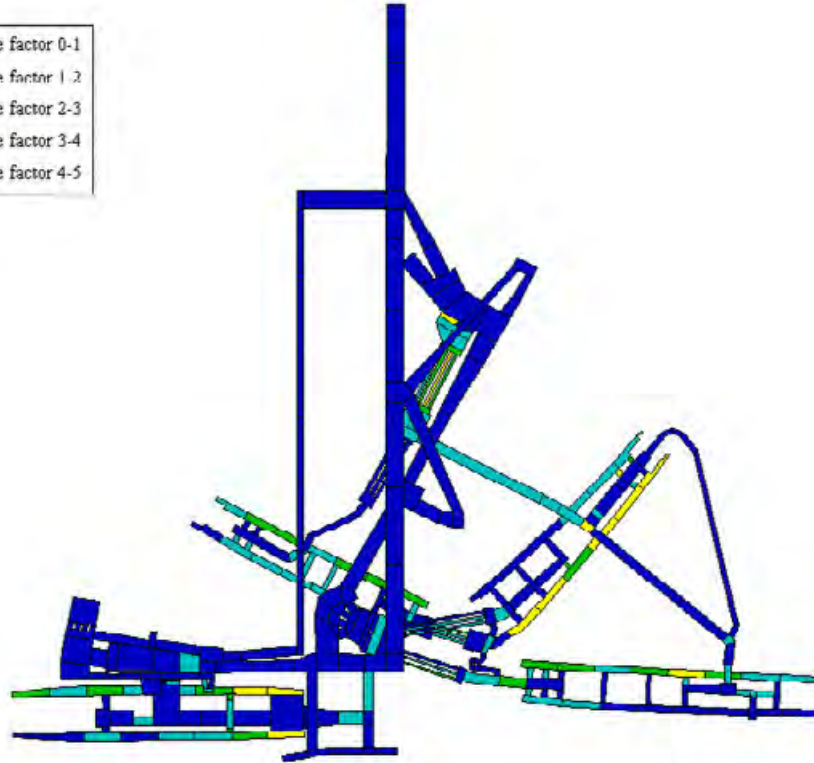
Test 4AM: 08.30-08.45



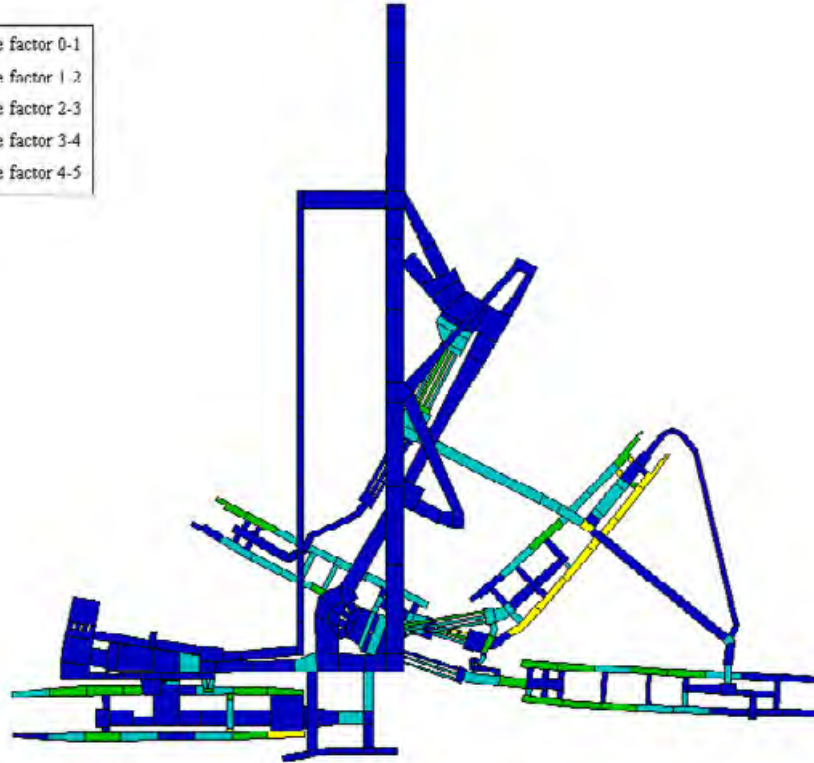
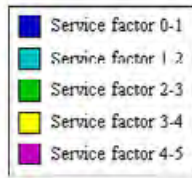
Test 4AM: 08.45-09.00



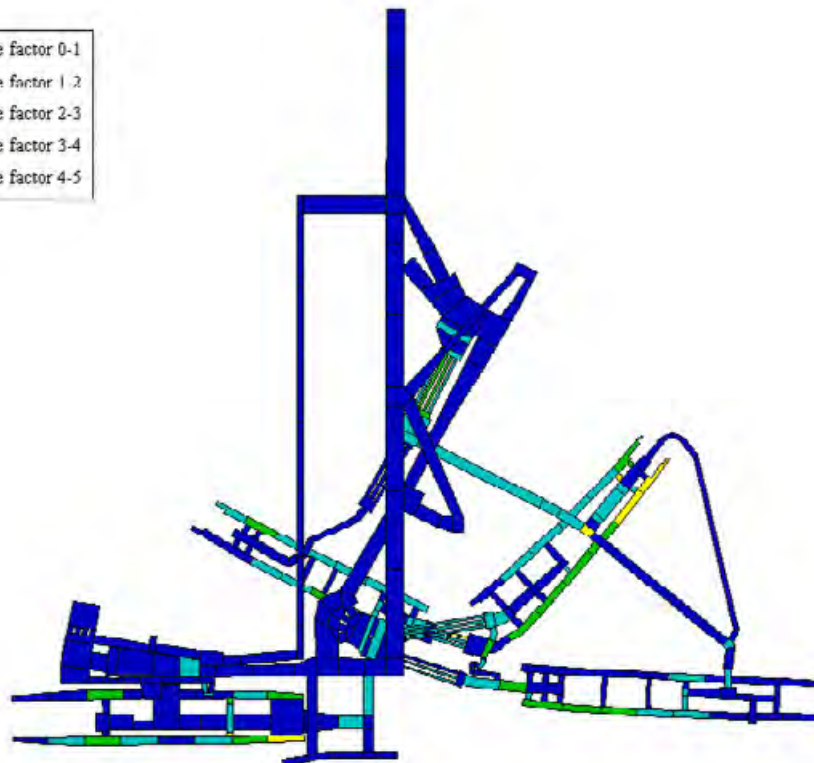
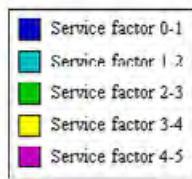
Test 4AM: 09.00-09.15



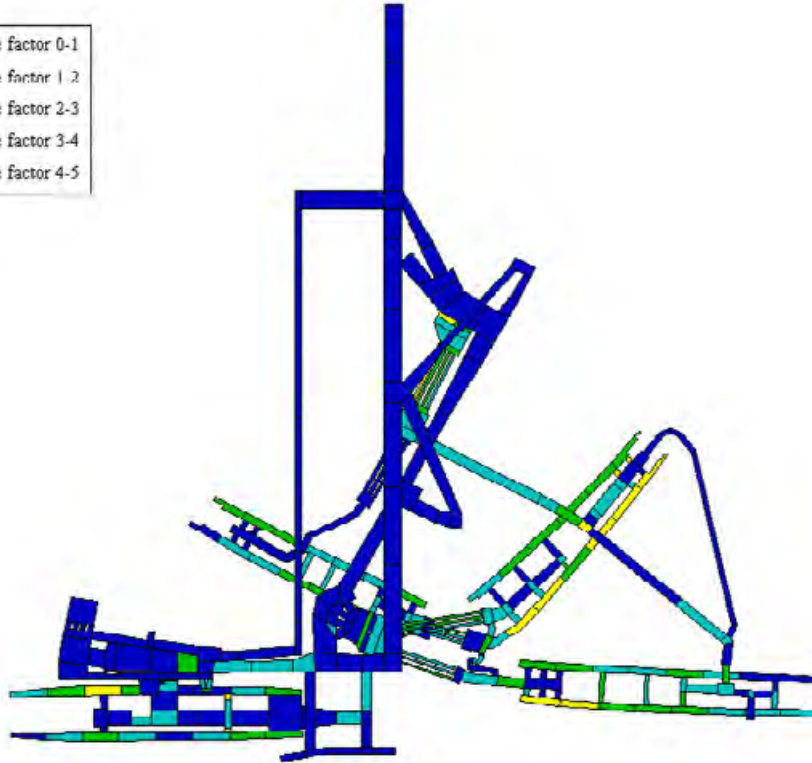
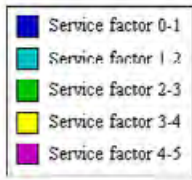
Test 4PM: 17.30-17.45



Test 4PM: 17.45-18.00



Test 4PM: 18.00-18.15



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09 DEC 2003



Ext/Direct 020 7843 0641
Our ref LULSSL-S704-LET-01055
Your ref
Date 5th December 2003

London Underground Limited
CTRL - King's Cross Re-development Project
3rd Floor, Derbyshire House
St. Chad's Street
London
WC1H 8AD

Chris Smith
Argent St George
5 Albany Courtyard,
Piccadilly,
London W1J 0HF

Dear Chris,

CTRL - KINGS CROSS STATION REDEVELOPMENT PROJECT
KING'S CROSS CENTRAL DEVELOPMENT- IMPACT ON LUL.

We acknowledge receipt of the report analysing pedestrian flows to and from the proposed development of King's Cross Central and the London Underground station.

Thank you for allowing London Underground to discuss the analysis with your team. In the light of this, we can confirm that the scheme you are developing, whilst having an impact on elements of the station such that for periods service factors go above LUL planning standards, this can be managed with appropriate mitigation. This coupled with delivery of the line upgrades as part of the contractual obligations on the Infracos under the PPP Contracts means the London Underground station should be able to cope with the forecast numbers associated with the development.

Yours sincerely,

Mike Crabtree
Project Sponsor