steer davies gleave

Tottenham Area Action Plan - Transport Modelling and Analysis

Final Report
January 2015

London Borough of Haringey

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1 Introduction

1.1 The Tottenham area's population has grown strongly in recent years (as demonstrated in the 2011 census) and this process is due to continue over the next 20 years with significant new housing developments and centres of employment planned across Tottenham. The Tottenham Area Action Plan (AAP) has identified the key locations where these developments will be focused.

1.2 The principal objective of this study has been to provide a high-level evidence base to understand the impacts of the proposed developments and associated transport interventions across Haringey, mainly with the aid of Transport for London's (TfL) existing strategic highway and public transport models. The impacts assessed consider the developments planned in neighbouring boroughs of Waltham Forest and Enfield as part of wider growth forecasts contained within TfL's future year models. In order to meet the time constraints, our approach is focused on understanding the high-level impacts of the Tottenham AAP on the local highway and public transport networks.

1.3 Significant planning work[1][2] has gone into identifying the best sites for the new developments and the transport infrastructure to accommodate future growth. This study translates these inputs into the models to assess the impact of these developments on the transport network.

1.4 The Tottenham AAP has identified the key locations where the proposed developments will be focused. Transport modelling is required to make an assessment of the impact of these developments on local roads and the public transport network.

1.5 There are many transport challenges in the Tottenham area, which will need to be addressed as part of planning the growth in housing and jobs in the area. In terms of the highway network, the A10 is an important north south arterial route in the area, but is constrained along Tottenham High Road which is an important local shopping area. To the southern end of the A10 (in Haringey), the junction with St Ann's Road has been identified as a potentially problematic pinch point on the road network in future years.

[1] Haringey's Site Allocations DPD, Reg 18 Consultation Document, January 2014 (Haringey Council)
[2] Tottenham Area Action Plans, Scoping Report, January 2014 (Haringey Council)

1.6 East – West routes within Tottenham, such as Phillip Lane/ West Green Lane and White Hart Lane to the north are fairly narrow winding roads which already suffer congestion at various pinch points and cannot accommodate a significant increase in traffic.

1.7 Tottenham Hale is a confluence of important highway routing in the area, with the A10/A1010 taking traffic towards the north circular and towards central London along Seven Sisters Road or Stamford Hill. To the East the natural barrier of the River Lea means that the A503 is an important route to and from Walthamstow (Blackhorse Rd area) and the A1055 brings traffic to the retail parks (such as IKEA) along this road as well as being an alternative route towards the A406 (north circular).

1.8 There are ambitious plans to regenerate the Tottenham Hale area which have already been defined. Until recently the road system was organised as a gyratory system comprising of Tottenham High Road (with southbound contra-flow bus lane), Monument Way and Broad Lane. This has recently been converted into 2-way operation in order to improve local accessibility. The new system is currently in operation but work is still ongoing to finalise the road layout. In addition, a major housing development to the East of Tottenham Hale Station (Hale Village) is currently being developed (with some parts already completed and opened). The long term plan is make Tottenham Hale a distinctive town centre. A significant part of this study will be to understand the impacts of these plans for Tottenham Hale on the transport system.

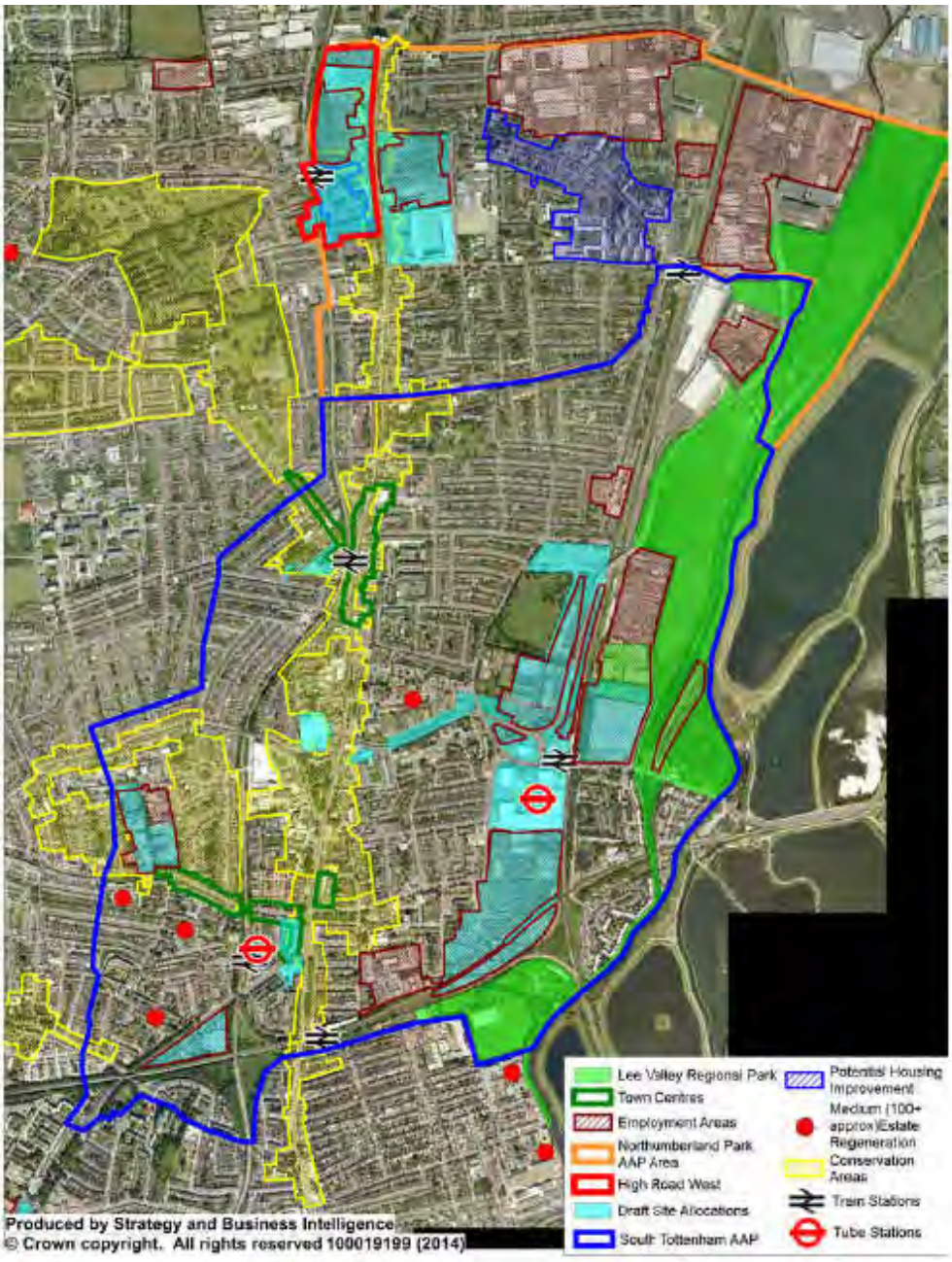
1.9 The area to the South of the AAP areas has excellent public transport connections. Tottenham Hale is a National Rail and London Underground Victoria Line station with Stansted Express services. There is good bus provision with high frequency routes along Tottenham High Road and many other East – West services. Nearby Seven Sisters also has National Rail and London Underground Victoria Line stations.

1.10 The main issues of concern in terms of future public transport provision are:

- The impact on station capacity, particularly at Tottenham Hale where the station is already an important interchange for passengers travelling to Stansted Airport and changing to access the Victoria Line. The access to the tube station is also limited. The ongoing project to upgrade the station aims to mitigate this – this project includes a new access entrance and increased capacity on the station concourse.
- The impact of increased highway flows on bus services, particular increases in delay and unreliability.
- The potential to improve transport connections to the north of Tottenham where the National Rail service is limited to two trains per hour in the peak periods (though proposals are in place to increase this to four trains per hour).

1.11 Figure 1.1 shows the extent of the Tottenham and Northumberland Park AAP areas.

Figure 1.1: Indicative extent of the two Tottenham Area Action Plans



1.12 The following tasks were undertaken:

1. **Review of previous studies** – similar studies have previously been undertaken to understand some of the development opportunities in the Tottenham area and the likely transport interventions required. This task reviewed this previous work in order to maximise value for money within the short project timescale.
2. **Transport modelling and analysis** – application and analysis of TfL's highway (NoLHAM) and public transport (Railplan) models to understand where the constraints in the transport networks are forecast to occur.
3. **Summary of transport constraints and issues** – draw together the findings from Task 2 and present a story that illustrates the degree to which the constraints identified in Task 2 are attributable to the AAP development proposals.

4. **Identification of mitigation measures –** identification of two packages of potential solutions to the constraints identified in Task 3, and perform analysis (similar to that undertaken in Task 2) to demonstrate that these packages will at least partly alleviate the constraints that are attributable to the AAP developments.

2 Previous Studies

Introduction

2.1 Tottenham is one of London's key growth areas, with significant potential for regeneration over the next 20 years. The London Borough of Haringey's 'A Plan for Tottenham' document outlines a vision for up to 10,000 new homes and more than 5,000 jobs in the area by 2025. To formalise this vision for regeneration, the London Borough of Haringey is currently preparing two key planning documents, comprising the Site Allocations DPD and the Tottenham Area Action Plan (AAP).

2.2 The Site Allocation DPD (2014) identifies the location, scale and timeframes of strategic sites in Haringey which will provide the main development opportunities over the next 20 years. The document will help the Council to deliver its housing growth targets. The Tottenham AAP will provide the detailed statutory planning guidance for development in the eastern part of the borough. The AAP will also provide a comprehensive spatial strategy for the area and become a key component of Haringey's Local Plan portfolio.

2.3 There are however many transport challenges in the Tottenham area which will need to be addressed in order to achieve the scale of proposed development outlined in the documents above. As noted in the project brief provided by LB Haringey, a series of transport studies have been previously undertaken in the area, detailing those transport challenges and how they might be overcome in the future.

2.4 The purpose of this section is to provide a summary of previous work undertaken, to help further our understanding of baseline issues, future constraints and identify potential mitigation measures. This understanding will optimise our own modelling and analytical work taking into account the latest growth and development assumptions for the area.

North London Sub-Regional Transport Plan

Background

2.5 Published in 2010, the North London Sub Regional Transport Plan (NLSRTP) identified key challenges for North London, with headline figures of 16% population growth and 20% employment growth between 2006 and 2031; with much of the growth concentrated in three

opportunity areas, including the Upper Lea Valley (ULV). According to the London Plan (2011), the Upper Lea Valley Opportunity Area (OA) alone is forecast to accommodate 9,000 new homes and 15,000 new jobs by 2031. In addition, the draft Further Alterations to the London Plan (FALP, published in 2014) envisages a greater number of homes (around 20,000). Given the large size of the ULV OA, housing and employment growth is forecast to be concentrated in a number of areas, including Tottenham Hale, Central Leeside, Blackhorse Lane and the A10/A1010 Tottenham High Road.

Current Issues and Future Constraints

Highway

2.6 The NLSRTP identified road congestion hotspots within the Tottenham area at Tottenham Hale Gyratory, the A1010 Tottenham High Road at Lordship Lane junction, St Ann's Road junction and Bruce Grove junction, and at the borough boundary with LB Enfield. The most serious congestion is experienced on radial routes between town centres and towards transport interchanges; primarily along the A1010 and the A1055.

2.7 Congestion on the A406 North Circular Road to the north, the presence of the West Anglia Main Line (WAML) corridor, and the extensive reservoirs to the east of Tottenham serve to restrict east-west movements within the area. East-west crossings do exist however they can be subject to considerable delay; the level crossings of the Lea Valley line can be closed to road traffic for significant periods, creating congestion and hampering the reliable operation of bus services in the area.

2.8 East-west highway routes in the Tottenham area, such as West Green Lane, Lordship Lane and White Hart Lane are narrow, winding roads already experiencing regular congestion at pinch points and will not be able to accommodate a significant increase in local traffic levels.

Public Transport

2.9 According to the NLSRTP this predicted population and employment growth in north London is likely to increase demand on peak hour public transport by up to 40% by 2025, particularly on radial routes into central London.

2.10 National Rail services are highlighted as a key transport issue in the NLSTRP. The WAML routes (the Lea Valley line via Tottenham Hale and the Southbury loop via Seven Sisters) are already highly crowded (particularly north of Tottenham Hale) and urgently require significant additional capacity. Despite committed investments, challenges remain with the quality, frequency and performance of existing services. .

2.11 Specifically, the existing two track main line constrains both frequency and capacity, while interchange facilities are inadequate at some stations, particularly Seven Sisters and Tottenham Hale. In addition, some stations have a relatively poor level of stopping services. This is a result of the already mentioned constrained line capacity and priority being given to longer distance services. In addition, rail access to Stratford, with its expanding economy and Olympic legacy, is seen as weak. The Gospel Oak to Barking London Overground line, stopping at South Tottenham in the OA, suffers from overcrowding in peak periods, mainly due to the success of investment in Overground services and Oyster ticketing.

2.12 Tottenham Hale is a key interchange station where many commuters switch between WAML services, local bus routes and the Victoria line. Station congestion occurs at Tottenham Hale, and whilst Victoria line services are not crowded within the area, severe line crowding is

experienced further south at Finsbury Park; another key interchange offering connections to the Piccadilly Line and Great Northern line National Rail services.

2.13 The NLSTRP expects growth in the demand for rail and underground services in the area to be especially strong given the development plans for the ULV OA. More capacity at stations and on trains is required to avoid worsening crowding levels, which would become particularly bad in 2031 under a 'do-nothing' scenario.

Potential Mitigation Measures

2.14 Road interventions are already taking place in the Tottenham area; the most recent measure being the removal of the Tottenham Hale gyratory and its conversion to a two-way system. Further highway enhancements and/or changes to the local road network should be considered, particularly in response to anticipated increases in local demand.

2.15 Beyond 2020, additional National Rail capacity could be achieved by four-tracking the West Anglia Main Line, which would reduce crowding and allow for more local stopping services in the Tottenham area, as well as permitting more regular services in order to access opportunities in Stratford. TfL are lobbying for a minimum service of four trains per hour to all stations throughout the day and into the night.

2.16 The provision of suitable bus infrastructure to respond to new rail infrastructure and Tube upgrades would help facilitate better interchange between modes. Strategic interchanges at Hackney Downs and Hackney Central could provide an opportunity to link orbital services and reduce trips into central London termini.

2.17 The implementation of Cycle Superhighway 1 from Tottenham to the City in 2015 will help reduce pressures on car and public transport modes towards central London. There are opportunities to improve east to west and north to south links for walkers and commuter cyclists and to make the area attractive and safe after dark, encouraging modal shift.

2.18 The NLSRTP suggests that development in the OA should make the best use of existing infrastructure and service opportunities, without overloading these, and where significant development might be proposed (Tottenham High Road for example), new proposals for complementary transport interventions are likely to be required.

Upper Lea Valley Opportunity Area Planning Framework (OAPF) Transport Study

Background

2.19 TfL commissioned this transport study in 2012 to support the development of the ULV OAPF. It sets out the role of transport and movement in facilitating growth in the Upper Lea Valley, and identifies a range of measures to support predicted growth in the OA.

2.20 The study projects 24% growth in population and 20% growth in employment between 2007 and 2031, in turn generating over a 20% increase in peak period trips to, from and within the ULV. This growth would, without network enhancements, lead to increasing road congestion and crowding on public transport. This presents the opportunity to make a strong case for transport interventions to boost competitiveness and support sustainable growth in Tottenham.

2.21 Interventions include:

- Support for more walking and cycling;

- Better interchange at Tottenham Hale;
- Improving bus capacity through a package of new routes, extensions and increased service frequency for existing routes;
- Managing the road network; and
- Increased local rail services on the WAML and in the longer term, the implementation of Crossrail 2.

2.22 These measures are explained in greater depth later.

Current Issues and Future Constraints

2.23 Many of the existing transport issues highlighted in the ULV OAPF Transport Study were covered earlier in the North London Sub Regional Transport Plan (NLSRTP).

2.24 In terms of baseline highway impact, the OAPF Transport Study demonstrates that there will be a 7% overall increase in traffic and a 4% reduction in average speed by 2031, leading to a notable worsening of junction performance. This will be partly as a result of development growth in the OA. This increased road congestion will have a knock-on effect on the bus network, with potential to increase local journey times. The bus network may need to be re-aligned to support the key growth areas set out in planning policy.

Committed Network

2.25 The Upper Lea Valley OA Transport Study considers committed and funded developments to the existing transport network. These commitments are wide-ranging, including:

- A 40% capacity increase on the parallel running West Anglia Main Line and Southbury Loop lines is currently being implemented through train lengthening;
- The introduction of a 4 trains per hour service on the WAML between Stratford, Tottenham Hale and Angel Road (the STAR scheme), to be delivered in the period 2014-2019;
- Funding for a new station to be opened at Lea Bridge;
- The electrification of the Gospel Oak to Barking Overground line, as confirmed by central Government in June 2013;
- Capacity and journey time improvements to the Victoria line, completed in 2013 with the introduction of a new timetable. This has resulted in a capacity uplift of 21%with peak time frequency increasing from 27 trains per hour to 33 trains per hour. A similar capacity uplift on the Piccadilly line is also planned;
- The removal of the gyratory at Tottenham Hale to improve conditions for pedestrians and cyclists as well as improve access for residents and businesses. This includes the creation of a new public square and bus interchange;
- Highways Agency plans to widen sections of the M25 motorway between junctions 23 and 27, immediately to the north of the Opportunity Area (to be completed in 2015); and
- The completion of the 'Tottenham to City Cycle Superhighway 1' in 2015 to improve north-south linkages and provide incentives for people to choose to cycle to and from central London.

Transport Interventions

2.26 The Transport Study tested a series of additional interventions, over and above those already committed, which would stimulate and accommodate further growth in the opportunity area. 2021 and 2031 scenarios were developed with and without these interventions to better understand their impact and to refine priorities.

2.27 Each of the interventions was also assessed against the Mayor's Transport Strategy objectives and those expressed by north London boroughs.

2.28 In this process, the following list of priority interventions were identified:

- A four trains per hour service on the West Anglia Main Line at regular intervals throughout the day calling at all stations between Brimsdown and Stratford;
- A package of bus interventions, including a combination of frequency enhancements, extensions to existing routes and/or new services with further frequency increases by 2031;
- Further schemes to tackle peak time crowding on the Victoria line, such as additional frequency improvements (e.g. towards 36 trains per hour, compared to the 33 trains per hour achieved through the recent upgrade) or a new line such as Crossrail 2;
- Measures to achieve a mode share for walking/cycling of at least 33% by 2021 and at least 36% by 2031.

Growth up to 2021 with interventions

2.29 Transport outcomes with the identified package of interventions in place in 2021 are reported to be improved in comparison with the 'do-nothing' scenario, reflected especially in increased patronage on local stopping services on the WAML. The primary outcome, however, is improved connectivity to Stratford and the Isle of Dogs to the south rather than reduced crowding on the busiest parts of the network (e.g. Victoria line at Tottenham Hale and towards Finsbury Park). There is limited change to local highways congestion as a result of these interventions, with highways impacts seen primarily at or close to development sites.

2.30 In general, the ULV OA Transport Study demonstrates that interventions delivered up to 2021 including the committed interventions on the rail, Underground and road networks will deliver improvements, meaning that projected housing and job growth in the area can be delivered without worsening the existing transport situation.

Growth up to 2031 with interventions

2.31 By 2031, improved services on the WAML will have tackled crowding issues that would otherwise have arisen, alongside improving connections to Stratford, the Isle of Dogs and surrounding growth areas.

2.32 The forecast for the road network in 2031 remains mixed. Whilst there will be a slight reduction in traffic and an increase in average speed compared to the 2031 baseline, congestion remains at a number of junctions and further work will be required to identify ways to reduce this.

2.33 The Victoria line towards the West End would remain severely overcrowded - this issue could be tackled over the longer term through a new rail line, such as Crossrail 2.

2.34 The Transport Study demonstrates that improved local services on the WAML will deliver substantial benefits to crowding and connectivity on the National Rail network. However, the deep-rooted issues of local road congestion and Victoria line crowding are unlikely to be fully resolved through the identified priority interventions.

Tottenham Physical Development Framework

2.35 This framework was developed by Haringey Council and Arup in early 2014, and makes a series of recommendations for regeneration demonstrating how Tottenham could look in 20 years' time.

2.36 The document is generally high-level, with one committed improvement not mentioned in other studies - the planned transfer of Tottenham's suburban rail services from Greater Anglia to Transport for London. This would connect Seven Sisters, Bruce Grove and White Hart Lane stations with Liverpool Street as part of the London Overground Network and take place by early 2015. The improvement would likely lead to increased patronage on the line due to upgraded station facilities, as well as the benefits of incorporating these services into the "TfL Brand".

Summary of Previous Studies

2.37 The review of previous work provides an understanding of the key transport issues that are expected to occur over time, providing a benchmark against which the findings from the modelling work can be assessed.

2.38 The local road network is expected to experience significant levels of congestion, which are likely to increase over time even without the AAP proposals.

2.39 This is due in part to historical, physical, and policy constraints limiting scope for improvements on the highway network. Consequently, emphasis has been placed on expanding capacity on sustainable modes to accommodate the additional demand.

2.40 The public transport network is also subject to a number of constraints. The Victoria Line remains congested despite the recent increase in capacity. However, a number of planned other improvements should provide some capacity relief, including proposals to upgrade the Piccadilly Line in a similar manner (already committed by TfL) and additional services on the West Anglia Main Line.

2.41 Proposals are in place to improve the environment for walking and cycling, both locally (e.g. urban realm improvements) and strategically (e.g. TfL's Superhighway 1 and other nearby Quietways). However, the impact of these proposed initiatives on future modes shares is uncertain at this stage.

3 Transport Modelling and Analysis

3.1 The objective of this task is to understand the potential transport impacts of the latest AAP proposals over a 20-year planning horizon against the backdrop of the latest population and employment growth projections in line with the GLA's London Plan.

3.2 The development associated with the AAP will affect both the highway and public transport networks in and around the Tottenham area. To identify future constraints, we used models and data provided by TfL, namely NoLHAM (North London Highway Assignment Model) and Railplan (a public transport model).

Highway

Summary of Approach

3.3 The focus of this study is to examine the full impact of a package of future developments and transport interventions and therefore all highway modelling has been based on a future year (2031) NoLHAM model, provided by TfL. The NoLHAM model covers the following three time periods representing an average weekday:

- AM Peak Hour (08:00-09:00)
- OP Average Hour (10:00-16:00)
- PM Peak Hour (17:00-18:00)

3.4 Although the AM peak period shows the condition of the network between 08:00 and 09:00, the model also needs to consider the demand between 07:00 and 08:00, to take account of any queues formed in the network before 08:00. This is achieved by first simulating 07:00-08:00 and then loading any final queues from the 07:00-08:00 model as a starting input into the 08:00-09:00 AM peak hour model. The same method is used in the PM peak period by first running the model for 16:00-17:00 and then passing any queues which form by 17:00 to the PM peak hour model.

3.5 For this study it is necessary to test the model when it is under most stress with heavy traffic. Therefore the models were developed for the AM and PM peak periods only.

3.6 The future year model was developed from a recently calibrated 2009 Base Year model developed by TfL to a good standard. We carried out some high level checks on the local calibration and consider it to be fit for purpose in the study area.

3.7 The future year models provided by TfL are the latest 2031 reference case models. The reference case models include population and employment growth in line with the GLA's London plan. They also include network coding representing "committed" changes to the highway network. Committed changes represent those highway schemes which have funding allocated to build them or have been built since 2009.

3.8 These future year reference case models have then been adapted to test the impact of the Tottenham AAP development proposals. Separate models have been developed for the AM peak and PM peak periods.

3.9 By 2031, there will be a number of additional developments and changes to the road network. Some of these are already committed and will be implemented regardless of the AAPs and others form part of the AAP. To isolate the congestion effects that are explicitly attributable to the AAP, the following three scenarios have been developed:

- **Do Minimum Scenario** – DPD Site developments reflecting an increase in housing and employment in the wider Haringey area, and committed proposed changes to the road network, including the recently completed removal of the Tottenham Hale gyratory.
- **Do Something Scenario** – Do Minimum Scenario with addition of Tottenham and Northumberland Park AAP developments.
- **Do Something With Mitigation Scenario** – Do Something scenario with some mitigation to minimise the congestion impact of the AAP developments. This is discussed later in Chapter 4 and includes three sub-scenarios:
  - With Network Mitigation measures only
  - With Network Mitigation and constraints in future parking provision
  - With Network Mitigation and parking constraints and mode shift from car to cycle

Development of the Do Minimum Scenario

Network

3.10 The first step in building the Do Minimum scenario was to check that the Reference Case models included all committed network changes that are likely to affect routing in the AAP study area. All committed schemes were included in the network. Of particular relevance to the AAP study is:

- The A406 Bounds Green Safety and Environmental Improvement Scheme, which has been implemented since 2009; and
- The removal of the Tottenham Hale Gyratory, which again has been undertaken since 2009 with the full works almost completed.

3.11 Changes in flows and network coding between the reference case and the base year models were checked in detail to ensure that there were no errors in the network which could affect the study outcomes. Updates were then made to the model to improve the network coding, changes included;

- Fixed incorrect coding of a slip road onto A406 to remove excessive delay at this junction.
- Removal of a ban to general traffic Southbound on the Tottenham High Road north of West Green Road. This coding was left over from the base year model when the gyratory was in

place to represent the contra-flow bus lane. While the reference case included the updated junction coding needed to remove the gyratory, the ban on southbound traffic on the high road resulted in traffic still being forced round the old gyratory in the initial model.

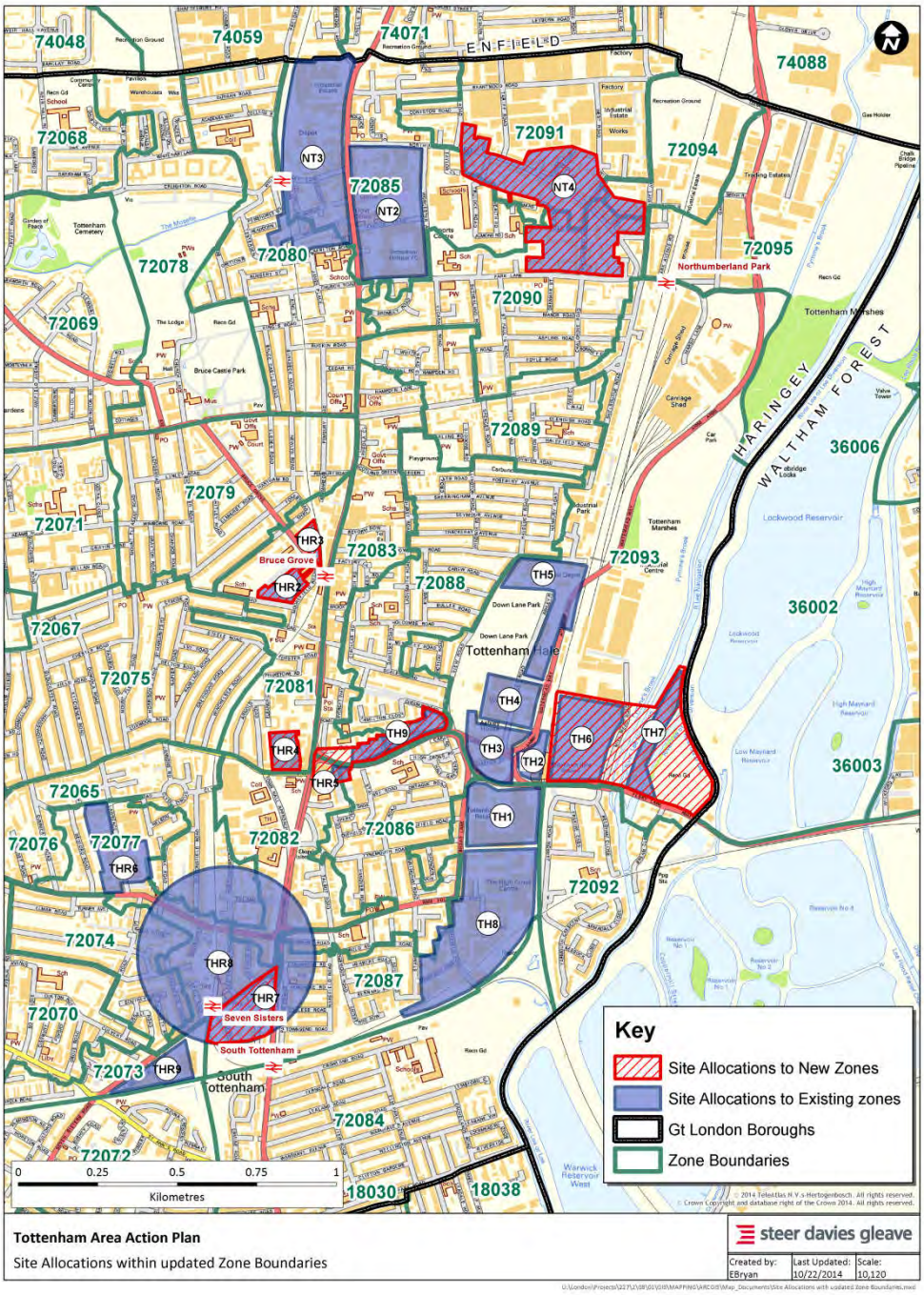
- The coding of signal junctions in Tottenham Hale was updated following a site visit to the area. This included changes to signal staging and timings. An important impact of these changes was increased flows on Watermead Way southbound, which in the initial model showed a significant reduction in flows in the 2031 reference case compared to the base year model. The signal staging coded into the model at the junction of Watermead Way and Monument Way did not represent the actual operation and caused unrealistic delays for traffic accessing Monument Way from Watermead Way (see Figure 3.1 below).
- Signal optimisation to reflect changes in traffic flows from 2009.

Figure 3.1: Junction of Watermead Way and Monument Way

3.12 A number of zones in the network were split in order to better represent the proposed development locations in the AAP area. This was done to ensure that the traffic to and from the AAP sites is loaded on the network in the correct locations. While the Tottenham AAP demand is not included in the Do Minimum, having a consistent zonal system improves the analysis of the networks and matrices when comparing scenarios.

3.13 Seven new zones have been created to represent each AAP site, in addition to the existing zones in the network. A map showing the location of the AAP sites and the new zones is shown in Figure 3.2. A small number of 'dummy nodes' have been added to accommodate connections from the new zones on to the network.

Figure 3.2: Tottenham AAP sites and corresponding model zones



Trip Generation and Matrix Uplift

3.14 As mentioned above, the reference case models include the GLA London Plan development assumptions which include many of the proposed developments in Haringey and therefore some of this demand is already included in the matrices. Checks were carried out to identify where the reference case models were consistent with Haringey's development plans, as identified in the Site Allocations DPD report.

3.15 Where analysis of the demand matrices identified missing development sites, it was necessary to add the demand to the matrices. The following sites were identified – see Table 3.1 below

Table 3.1: Wider Haringey Development Sites

DPD Site Name	Ref	DPD Site Name	Ref
Haringey Heartlands		Muswell Hill	
Clarendon Square	HH3	St Luke's Hospital	MH1
Clarendon Square Gateway	HH4	56 Muswell Hill	MH2
Clarendon Road South	HH5	Hornsey	
NW of Clarendon Square	HH6	Hornsey Depot	HO1
Land adjacent to Coronation Sidings	HH7	Hornsey Water Treatment Works	HO2
Wood Green		South of the Borough	
Civic Centre, Wood Green	WG1	St Ann's Hospital	S1
Arriva Bus Depot	WG2	Greater Ashfield Road	S2
Station Road Sites	WG3	Vale Rd/Tewkesbury Rd Emp Areas	S3
Wood Green Library	WG4	Arena Retail Park	S4
Highgate		Finsbury Park Bowling Alley	S5
Wellington Rbt/Highgate Rail Depot	HG1	Finsbury Park & Stroud Green Road	S6
Highgate Magistrates Court	HG2		
Highgate Bowl	HG4		
Summersby Road	HG5		

3.16 In order to translate the development assumption into trips to add to the peak hours matrices, the demand generated at each development site was calculated based on trip generation forecasts agreed with the London Borough of Haringey. These are shown in Table 3.2.

Table 3.2: Person Trip Generation Rates by Land Use

Land Use	Unit	AM Peak Arrivals	AM Peak Departures	PM Peak Arrivals	PM Peak Departures
C3 – Residential	per home	0.57	0.71	0.40	0.13
A1 – Retail	per 100m^2	52.34	25.70	77.74	39.46
A3 – Restaurant/café combined	per 100m^2	47.82	32.95	32.95	14.74
C1 – Hotel	per room	0.37	0.23	0.43	0.13
B1 - Office	per 100m^2	0.85	0.08	0.13	1.05

3.17 Trip rates for 'A3 – Restaurant/café combined' use have been assumed for generic 'Town Centre' uses and as shown, along with retail, generate large numbers of person trips. To convert from person trips to car trips (to add to the highway demand matrices), Census Travel to Work data (2011) has been used to derive an average car driver mode share of 20% across the borough. This mode share has been applied to residential, hotel, office and stand-alone retail land uses. Given the mode share forecasts are derived from journey to work data, it is not appropriate to apply the 20% factor to town centre uses. As such, a revised estimate of 5% of town centre trips by car has been agreed.

3.18 DPD Sites across the wider Haringey area amount to some 7,323 new dwellings, 275,000m^2 of office/commercial use, 12,700m^2 of retail and 31,020m^2 of town centre uses, generating approximately:

- 5700 additional two-way trips in the morning peak hour; and
- 5200 in the evening peak hour.

3.19 More detail of individual sites and their individual trip generation forecasts is presented in Appendix A.

3.20 Traffic associated with DPD growth in the wider Haringey area was added to existing zones. Demand was allocated to the appropriate SATURN zone with the aid of GIS software. To update the demand by zone, a furnessing approach was undertaken. Furnessing ensures that the updated demand matrices match the origin and destination totals calculated in the trip generation stage, while maintaining the original distribution of trips in the model.

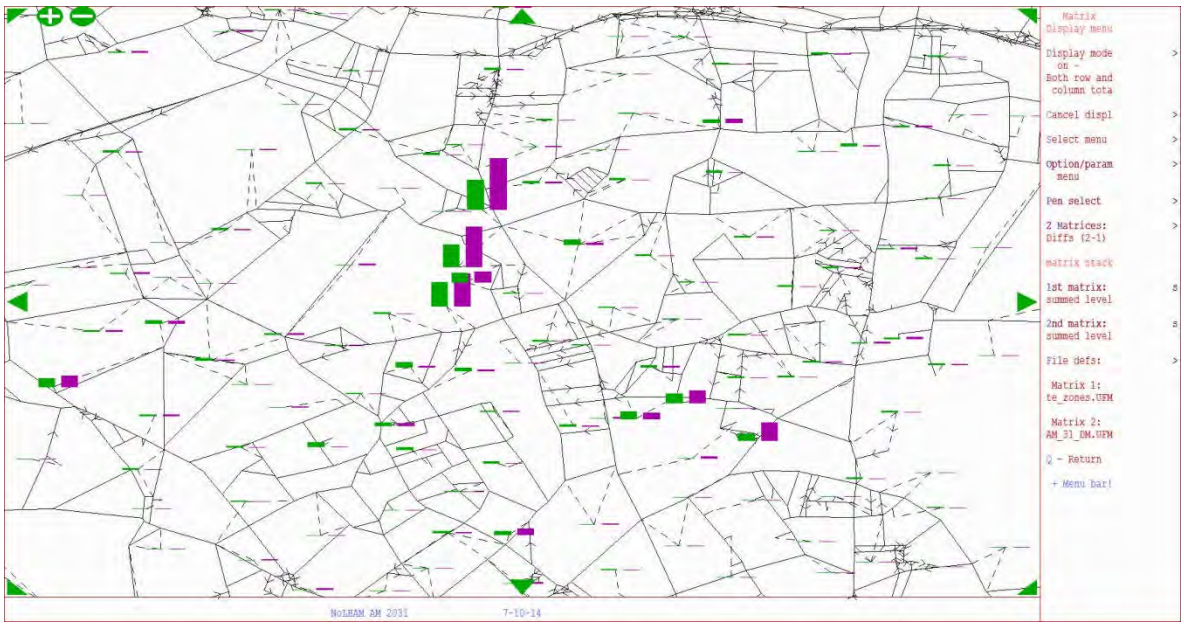
3.21 The following figures show the change in demand by origin/destination zone in the Do Minimum scenario relative to the reference case from TfL. Figure 3.3 shows the change in demand in the AM peak and Figure 3.4 shows the change in demand in the PM peak.

3.22 These figures show that most of the additional demand is generated at three development sites:

- Arriva Bus Depot;
- Wood Green Library; and
- Hornsey Depot

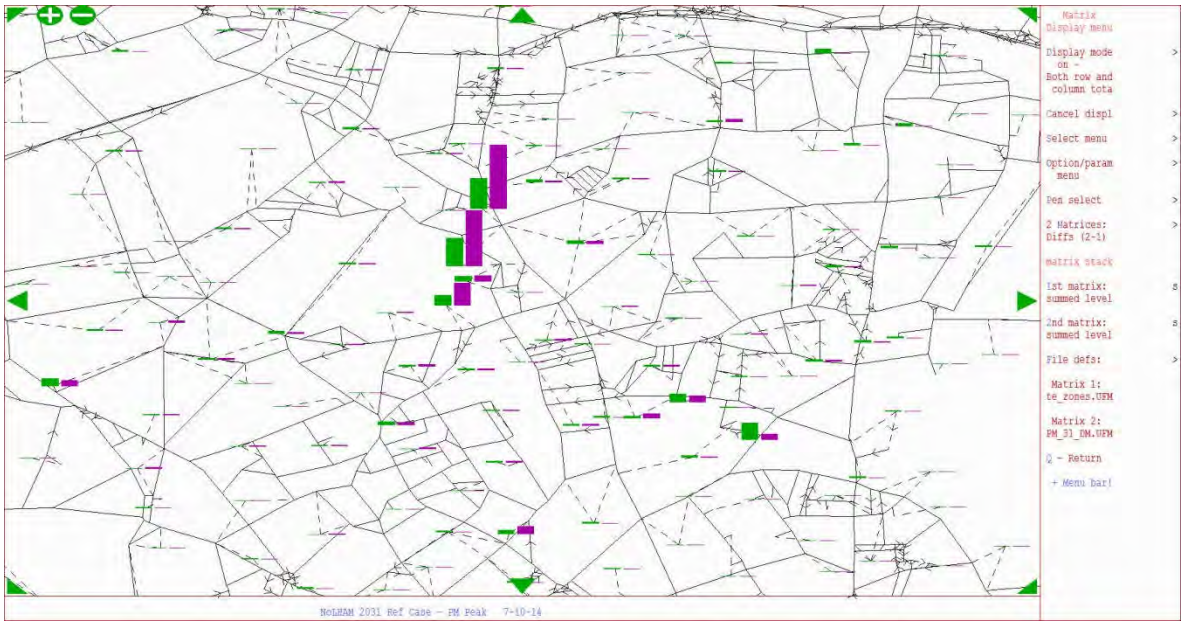
3.23 These sites contribute to around 50% of the total development.

Figure 3.3: Change in AM Peak demand (Do Minimum relative to reference case)[3]



[3] The green bars show the increase in the number of trips travelling from each zone ('origin trips'). The purple bars show the increase in the number of trips travelling to each zone ('destination trips'). The size of the bar is relative to the change in demand.

Figure 3.4: Change in PM Peak demand (Do Minimum relative to reference case)[3]



Development of the Do Something Scenario

Network

3.24 The Do Something network is predominantly the same as the Do Minimum network as at this stage only the demand impacts of the AAP are being tested in order to identify where mitigation measures are necessary. Some additional capacity has been added to junctions to ensure that developments trips can access the network. These changes only affect links which load directly from development zones and not the "real" highway network. If the capacities are not adjusted traffic will not be able to access the general road network underestimating the impact of the AAP traffic.

3.25 A particular example is at the south east of the gyratory where trips are generated by the planned Tottenham Retail Park. This is based on the assumption that the junctions would be altered as part of the detailed development plans to ensure that all demand generated can access the road network.

Trip Generation and Matrix Uplift

3.26 The starting point for the demand matrices in this scenario are those created in the Do Minimum scenario with the additional demand generated from the Tottenham AAP development site proposals.

Table 3.3: Tottenham AAP Development Sites

AAP Site Name	Ref	AAP Site Name	Ref
Tottenham Hale		Tottenham High Roadl	
Tottenham Retail Park	TH1	The Roundway at Bruce Grove	THR1
Over Station development	TH2	Tottenham Delivery Office	THR2
Station Square West	TH3	Bruce Grove Snooker Hall	THR3
Ashley Road South	TH4	Tottenham Green Bus Garage	THR4
Ashley Road North	TH5	Kwik Fit north of Saltram Close Estate	THR5
Hale Village	TH6	Lawrence Road	THR6
Hale Wharf	TH7	Seven Sisters Regeneration	THR7
South Tottenham Employment Area	TH8	Seven Sisters Station	THR8
Welbourne Centre	TH9	Gourlay Place & Wicks site	THR9
Northumberland Park			
500 White Hart Lane	NT1		
Tottenham Stadium Development	NT2		
High Road West	NT3		
Estate Renewal North Tottenham	NT4		

3.27 In the Tottenham AAP area, the DPD Sites generate 9,476 new homes, 444,500m^2 of office/commercial use, 5,000m^2 of retail and 96,600m^2 of town centre uses.

3.28 The person trip generation rates used in the Do Minimum, as shown in Table 3.2, have been used along with the same assumptions regarding conversion between person trips and car trips assumed for the analysis of the wider Haringey area for the different land use types. The exception is in that the lower car mode share rate of 5% has been used across all Tottenham Hale sites, to reflect the excellent public transport options available.

3.29 Overall, in the Tottenham AAP area:

- 5,900 additional two-way trips are generated in the morning peak; and
- 3,600 in the evening peak.

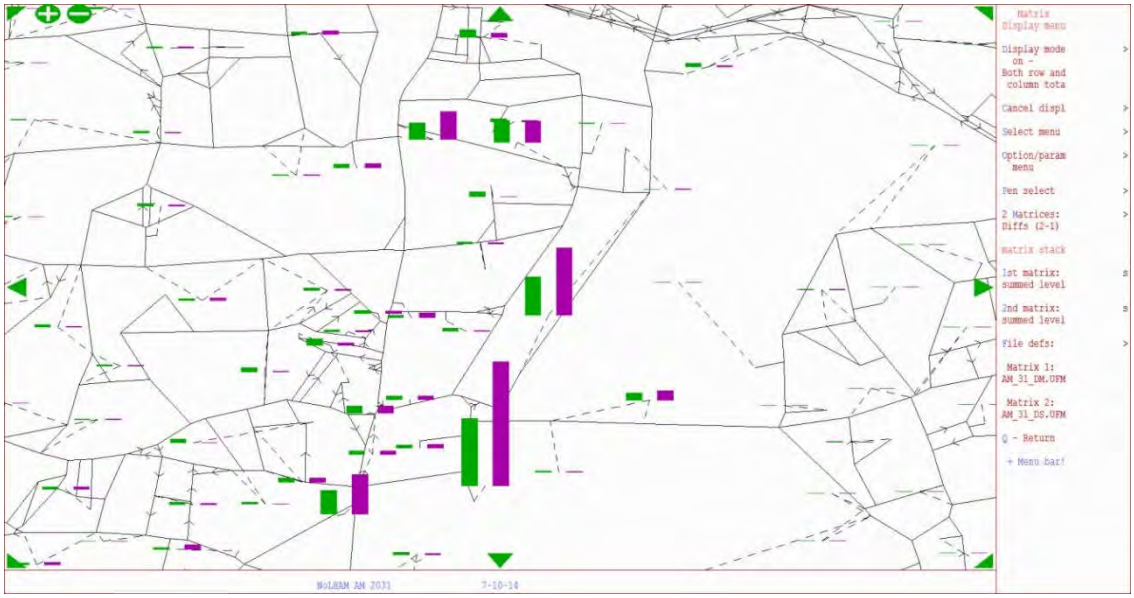
3.30 More detailed calculations are provided in Appendix A.

3.31 Demand has been added to the matrices using the same furnessing approach described in 3.20.

3.32 The following figures show the change in demand by origin/destination zone in the Do Something relative to the Do Minimum scenario. Figure 3.5 shows the change in demand in the AM peak and Figure 3.6 shows the change in demand in the PM peak.

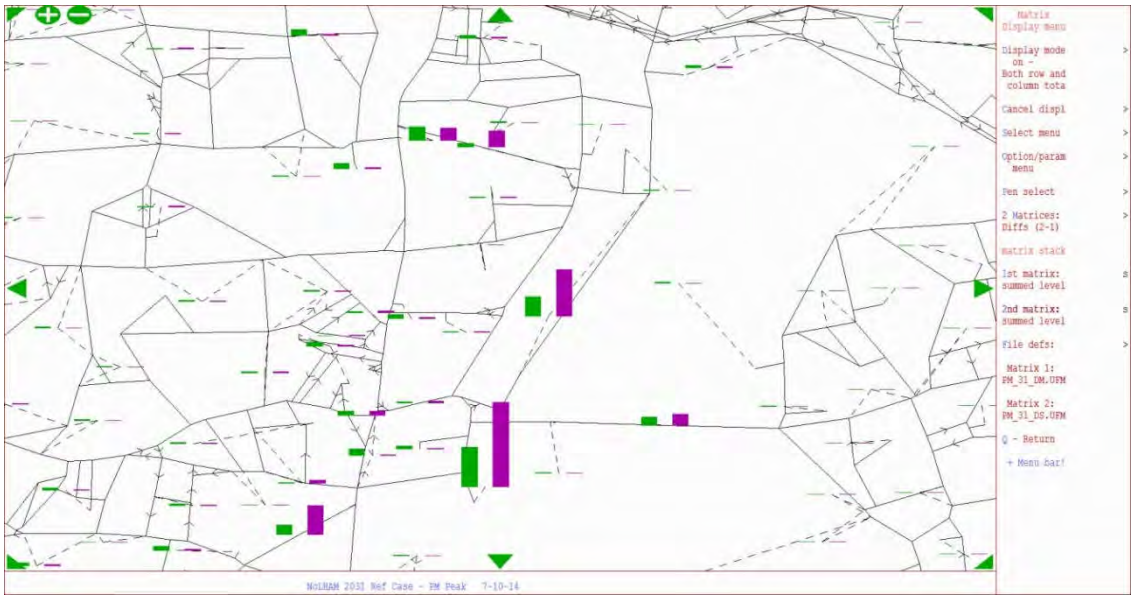
3.33 These figures show that the majority of additional demand is to/from three sites: Tottenham Retail Park (TH1), Station Square West (TH3) and Seven Sisters Regeneration (THR 7).

Figure 3.5: Change in AM Peak demand (Do Something relative to Do Minimum scenario)[4]



[4] The green bars show the increase in the number of trips travelling from each zone ('origin trips'). The purple bars show the increase in the number of trips travelling to each zone ('destination trips'). The size of the bar is relative to the change in demand.

Figure 3.6: Change in PM Peak demand (Do Something relative to Do Minimum scenario)[4]



Analysis of the impact of Tottenham AAP

3.34 The impact of the Tottenham AAP development sites is assessed by comparing outputs from the Do Minimum and Do Something models. Various analyses of the model outputs are shown below to assess the impact of the AAP on the highway network without any mitigation measures.

Network Plots

3.35 Figure 3.7 - Figure 3.12 show the impact of the Tottenham AAP development sites on:

- Demand Traffic flow;
- Link Delay; and
- Junction delay

Demand flow

3.36 In the AM peak, demand flows generally increase across the network particularly around the Tottenham gyratory which is close to a number of AAP development sites. An exception to this is Watermead Way where there is a reduction in traffic, particularly traffic travelling in the Southbound direction turning left on to Ferry Lane. This is caused by additional trips generated at the AAP development sites; Ashley Road, Station Square West and Hale Wharf, which are adding congestion to the network and therefore causing some traffic to choose alternative routes. For example, travelling north on High Road and then east on the North Circular Road.

3.37 In the PM peak, there is less of an increase throughout the network, due to less demand being generated in the PM peak hour as it is more evenly spread throughout the PM period in comparison to the AM. The AAP development sites at Watermead Way have less impact on the traffic and the road appears to 'cope with' the additional trips generated from the new AAP sites. There is however some re-routing in the PM peak with traffic avoiding High Road and choosing an alternate 'cut-through' route through Tottenham via Philip Lane.

Delay

3.38 In both the AM peak and PM peak periods, the delays shown correspond to the additional trips associated with the AAP development sites in Figure 3.5 and Figure 3.6. In general, many parts of the network can accommodate this increase in traffic and there are many areas in

Tottenham with no change in delay. However, there is additional delay in some areas particularly around the Tottenham gyratory and close to the A105 High Rd/A504 West Green Road near Turnpike Lane.

3.39 The PM period has significantly less delay than the AM peak however there are still issues at the gyratory.

Junction delay

3.40 In the AM peak, the majority of issues are at the eastbound approach of the Tottenham gyratory. There are also queues forming at this junction and at further junctions along West Green Road. In the PM peak, there are a few changes in delay, which are in similar areas to the changes observed in the AM peak but are smaller in comparison.

3.41 Junction delay is analysed in more detail later in this chapter.

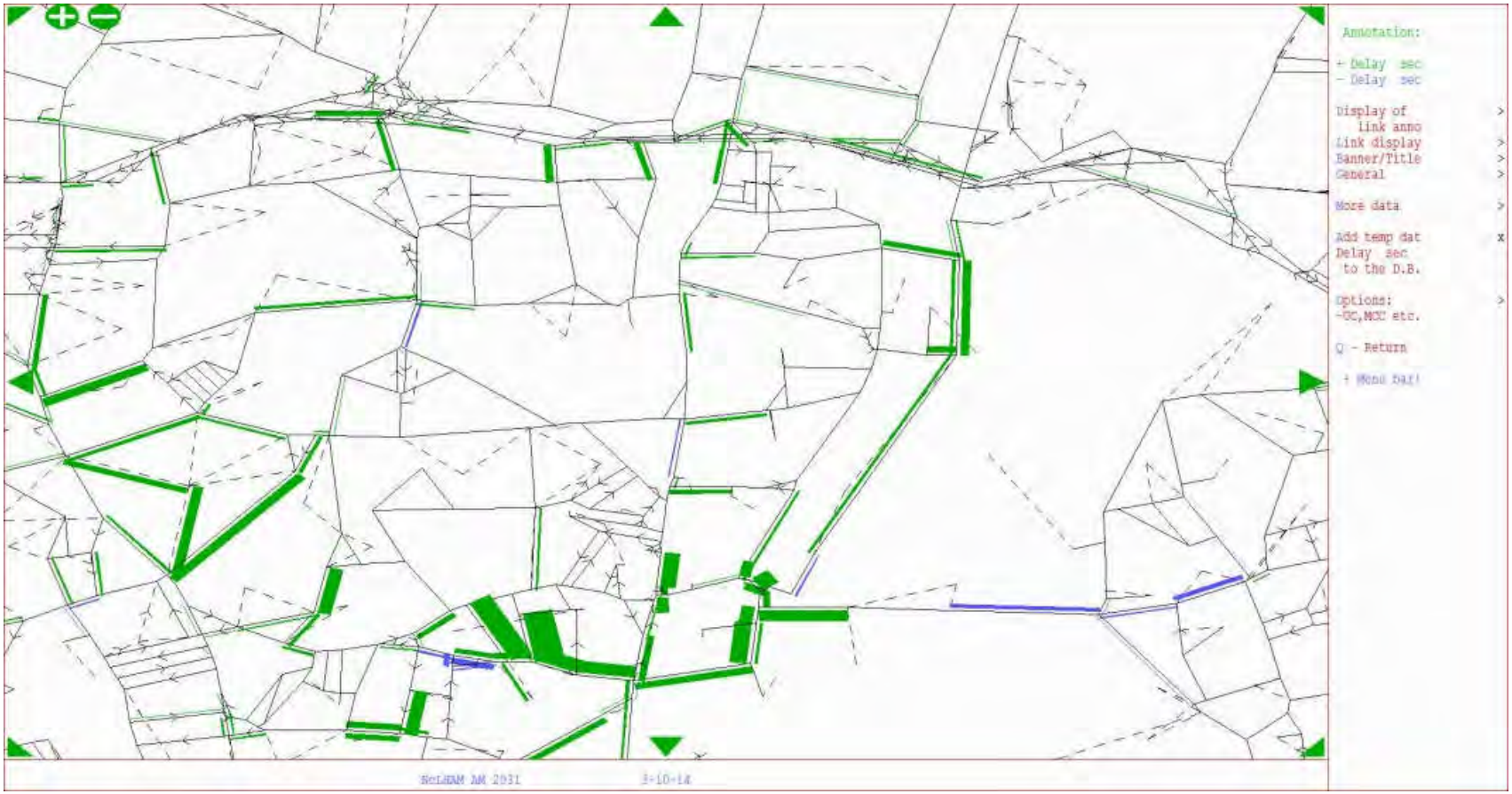
Figure 3.7: Change in total demand flow (Do Something relative to Do Minimum scenario) – AM peak[5]

[5] The green bars show an increase in demand on a particular link (a road) in the network. The blue bars show a reduction in demand on a particular link (a road) in the network. The size of the bar is relative to the change in demand.

Figure 3.8: Change in total demand flow (Do Something relative to Do Minimum scenario) – PM peak[6]

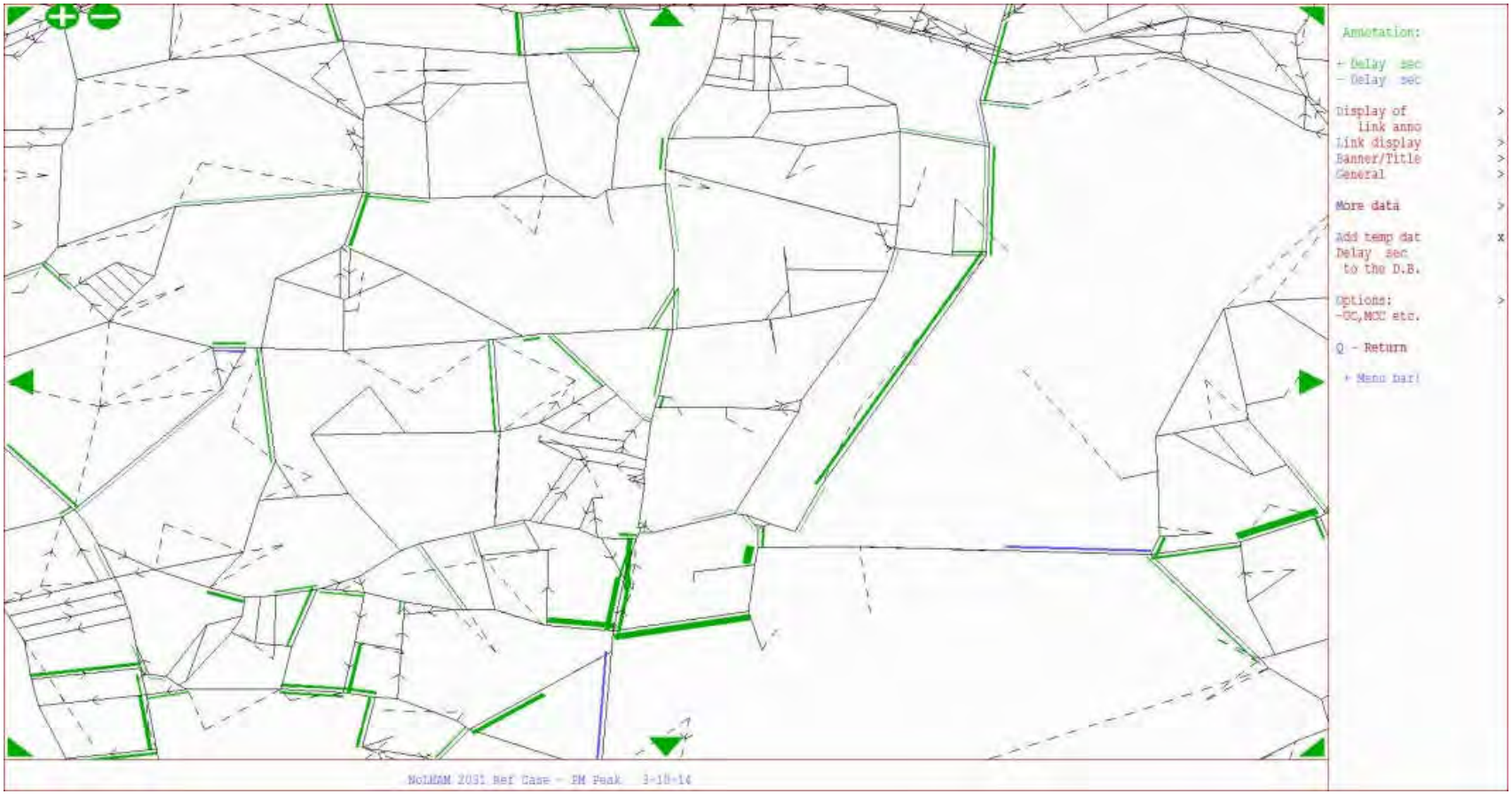
[6] The green bars show an increase in demand on a particular link (a road) in the network. The blue bars show a reduction in demand on a particular link (a road) in the network. The size of the bar is relative to the change in demand.

Figure 3.9: Change in delay (Do Something relative to Do Minimum scenario) – AM peak[7]



[7] The green bars show an increase in delay on a particular link (a road) in the network. The blue bars show a reduction in delay on a particular link (a road) in the network. The size of the bar is relative to the change in delay.

Figure 3.10: Change in delay (Do Something relative to Do Minimum scenario) – PM peak[8]

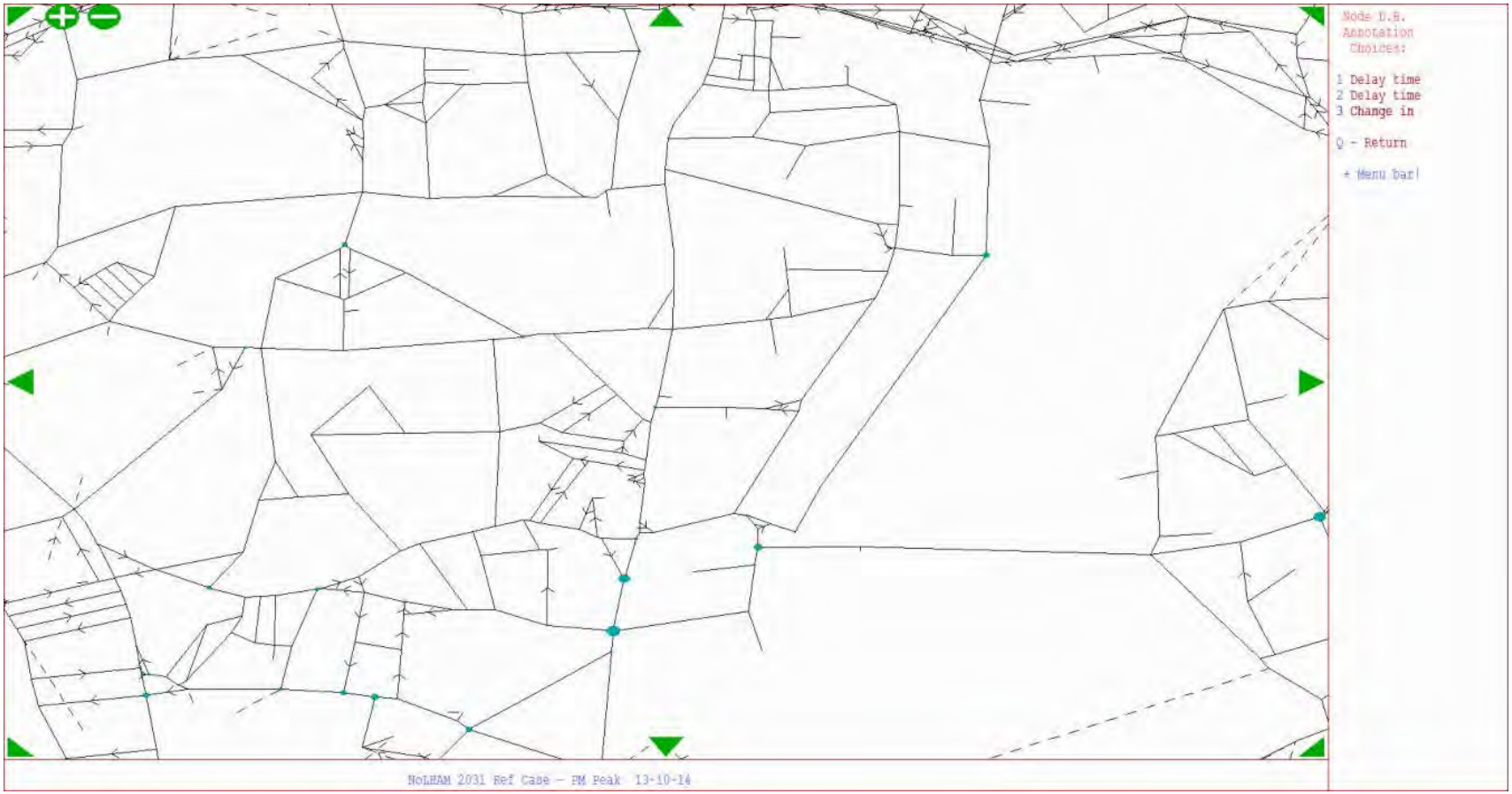


[8] The green bars show an increase in delay on a particular link (a road) in the network. The blue bars show a reduction in delay on a particular link (a road) in the network. The size of the bar is relative to the change in delay.

Figure 3.11: Change in junction delay (Do Something relative to Do Minimum scenario) – AM peak[9]

[9] The blue circles show an increase in delay at a junction in the network. The pink circles show a reduction in delay at a junction in the network. The size of the circle is relative to the change in delay.

Figure 3.12: Change in junction delay (Do Something relative to Do Minimum scenario) – PM peak[10]



[10] The blue circles show an increase in delay at a junction in the network. The pink circles show a reduction in delay at a junction in the network. The size of the circle is relative to the change in delay.

Borough statistics

3.42 In order to quantify the impacts on the highway network, TfL's borough statistics ('Borostats') tool has been run to show the network wide impacts of the Do Minimum and Do Something scenarios. The Borostats tool produces a summary of the network's performance at a borough level providing an assessment of how changes will affect the whole borough rather than just isolating the impacts at specific locations. The statistics are calculated by summing PCU weighted statistics across all links. Therefore when analysing network conditions across Haringey, the impacts of the new developments in the borough as well as "background" growth in through-traffic not related to Haringey will be captured.

3.43 The four statistics that are calculated and reported for the London Borough of Haringey are:

- Total Travel Distance (PCU kilometres) – Total vehicle (car equivalent) distance travelled.
- Total Travel Time (PCU hours) - Total vehicle (car equivalent) time travelled.
- Average Speed (kph)
- Level of congestion (PCu Hr Delay) – Total vehicle (car equivalent) delay.

3.44 Table 3.4 shows the percentage change in key links statistics between the 2009 AM Peak Base Year model and the 2031 Do Minimum and Do Something scenarios. The absolute values for average speeds in the model are shown in Table 3.5. Corresponding PM peak results are provided in Table 3.6 and Table 3.7.

3.45 The change in total distance travelled indicates that background traffic growth, (including the 'wider area' developments) has a much more significant impact than AAP demand, with a 16% increase in PCU kilometres from 2009 to the Do Minimum compared to only a 4% additional change from the AAP developments. Similar results are observed in the PM peak.

3.46 However the impact of concentrating this extra traffic on the AAP area without any mitigation measures causes a disproportionate increase in journey times, due mainly to additional delays incurred at the gyratory, with journey speeds and congestion worsening in the Do Something significantly compared to the increase in Do Minimum.

3.47 The borough statistics should be considered alongside the detailed link and junction analysis described above. The increases in delay shown in Haringey are mostly concentrated on the AAP area, especially around Tottenham Hale. There will also be some additional and more moderate increases in delay outside the AAP area caused by the increases in traffic generated by the AAPs.

3.48 It should be noted that the Do Something scenario, and hence the changes presented here, represent a "worst-case" scenario that may not be realistic, but nevertheless provides a useful benchmark for planning purposes, including the identification of the mitigation measures proposed. In reality, it is expected that without any mitigation measures to accommodate the developments there would be a reduction in trips in the Tottenham area, as users respond by switching from car to other modes (modal shift), other destinations (trip redistribution) or not make the trip at all. These potential demand responses are is not reflected in the modelling process.

Table 3.4: 2031 AM Peak – Percentage change in Key Link Statistics for Haringey Borough

Measure	Do Minimum change from 2009 Base Year	Do Something change from 2009	Do Something change from Do Minimum
Total Travel Distance (PCU Kms)	16%	21%	4%
Total Travel Time (PCU Hrs)	52%	103%	34%
Average Speed (Kph)	-24%	-41%	-22%
Level of Congestion (PCU Hr Delay)	105%	226%	59%

Table 3.5: 2031 AM Peak Average Speed in Haringey Borough

	2009 Base Year	Do Minimum	Do Something
Average Speed (Kph)	19	15	11

Table 3.6: PM Peak – Percentage change in Key Link Statistics for Haringey Borough

Measure	Do Minimum change from 2009 Base Year	Do Something change from 2009	Do Something change from Do Minimum
Total Travel Distance (PCU Kms)	20%	25%	4%
Total Travel Time (PCU Hrs)	38%	55%	13%
Average Speed (Kph)	-13%	-19%	-8%
Level of Congestion (PCU Hr Delay)	65%	103%	23%

Table 3.7: 2031 AM Peak Average Speed in Haringey Borough

	2009 Base Year	Do Minimum	Do Something
Average Speed (Kph)	19	17	16

Key links

3.49 In addition to the demand flow plots, individual flows on key links are presented in Table 3.8 and Table 3.9 for the morning and evening peak hours respectively. Flows presented are two-way actual flows and key links are defined as the main north-south A10/A1010 route through the Tottenham AAP along with connecting links from the east and west.

3.50 In the AM peak, we see a number of links where traffic is re-routed within the model and flows are reduced. This is consistent with Figure 3.7 earlier. In the PM peak, apart from Seven Sisters Road, the addition of AAP site development trips results in an increase in flow on all key links.

Table 3.8: Flows on Key Links – AM peak hour – Impact of AAP Development

Road section		Do-Minimum	Do-something	Do-something - Do-Minimum
A107 Amhurst Park		1000	1180	180
A10 High Road, S Tottenham		2160	2230	70
A503 Seven Sisters Road		1610	1240	-370
Tottenham High Road		3130	2970	-160
Broad Lane		1350	1560	210
Monument Way		3270	2930	-340
Broad La, s of Ferry La		1380	1490	110
Ferry Lane		2100	1700	-400
Watermead Way		2280	1920	-360
A1010 High Road		1500	1550	50
Bruce Grove		780	920	140
Lordship Lane		1310	1580	270
Lansdowne Road		900	1030	130
High Road (THFC)		1610	1790	180
White Hart Lane		1250	1370	120
Northumberland Park		170	430	260

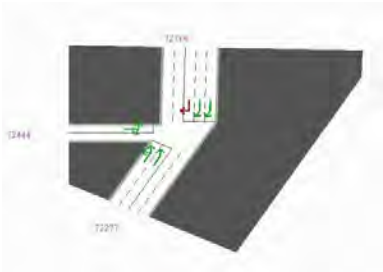
Table 3.9: Flows on Key Links – PM Peak hour – Impact of AAP Development

Road section		Do-Minimum	Do-something	Do-something – Do-Minimum
A107 Amhurst Park		1000	1040	40
A10 High Road, S Tottenham		2170	2210	40
A503 Seven Sisters Road		1470	1150	-320
Tottenham High Road		2940	3000	60
Broad Lane		1480	1550	70
Monument Way		3630	3860	230
Broad La, s of Ferry La		1470	1750	280
Ferry Lane		2130	2140	10
Watermead Way		2110	2290	180
A1010 High Road		1250	1320	70
Bruce Grove		760	830	70
Lordship Lane		1310	1680	370
Lansdowne Road		850	1110	260
High Road (THFC)		1350	1520	170
White Hart Lane		1010	1320	310
Northumberland Park		220	420	200

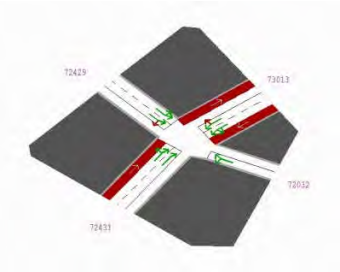
Detailed junction analysis

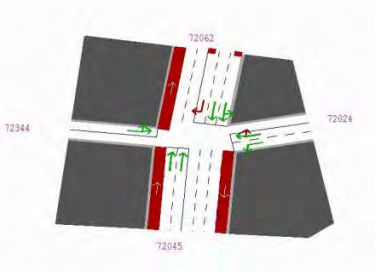
3.51 Figure 3.11 and Figure 3.12 earlier highlighted a number of junctions where there is expected to be an increase in delay when the Tottenham AAP proposals are implemented. Table 3.10 below presents the changes at these junctions in more detail particularly changes in delay (measured in seconds) and 'volume over capacity' (V/C).

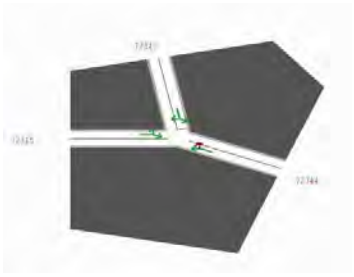
Table 3.10: Detailed Junction Analysis[11]

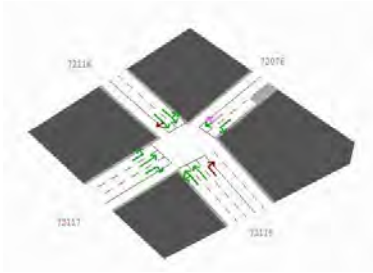
1. 72113 A1055 Watermead Way/Marigold Road	Road Name (Node number)	Delay[12]			V/C[13]		
		DM	DS	DS-DM	DM	DS	DS-DM
				AM Peak			
	72444	37.5	199.9	162.4	73.9	105.3	31.4
	72766	66.2	252.6	186.4	96.1	107.4	11.3
	72277	35.5	91.9	56.4	84.2	100.7	16.5
				PM Peak			
	72444	36.5	60.5	24.0	71.1	91.8	20.7
	72766	40.8	68.5	27.7	84	95.4	11.4
	72277	178.5	242.6	64.1	99.2	102.4	3.2

[11] The green and red arrows on the junction diagrams show the lanes on each approach to the junction and the possible turns that can be made in each lane.
[12] Average delay weighted by demand (actual flow) across all turns
[13] Average V/C weighted by demand (actual flow) across all turns

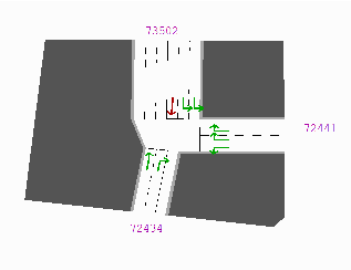
2. 72031 A503 Seven Sisters Road/Amhurst Park (near Woodberry Down)	Node	Delay			V/C		
		DM	DS	DS-DM	DM	DS	DS-DM
		AM Peak					
	72429	30.1	32.3	2.2	59	69.8	10.8
	73013	40.2	203.6	163.4	82.3	104.1	21.8
	72032	25.9	28.1	2.2	54.2	62.7	8.5
	72431	42.7	45.7	3.0	84.5	87.4	2.9
		PM Peak					
	72429	30.1	33.9	3.8	62.6	72.6	10.0
	73013	36.8	141.7	104.9	75.7	101.4	25.7
	72032	25.9	26.7	0.8	57.5	60.5	3.0
	72431	65.3	92.9	27.6	95.4	99.9	4.5

3. 72053 Seven Sisters Tube Station/High Road/West Green Road	Node	Delay			V/C		
		DM	DS	DS-DM	DM	DS	DS-DM
		AM Peak					
	72344	66	414.1	348.1	95	105.8	10.8
	72062	456.5	613.6	157.1	105.9	108.9	3.0
	72024	586.2	782.9	196.7	118.7	113.5	-5.2
	72045	51.8	122.3	70.5	98.1	103.1	5.0
		PM Peak					
	72344	40.6	183.4	142.8	82.7	104.8	22.1
	72062	51.2	113.8	62.6	88.9	97.8	8.9
	72024	70.3	259.6	189.3	93.3	105.7	12.4
	72045	39	36	-3.0	94.9	93.6	-1.3

4. 72061[14] A504 West Green Road/Lawrence Road (near Bedford Road bus stop)	Node	Delay			V/C		
		DM	DS	DS-DM	DM	DS	DS-DM
	AM Peak						
	72345	1.4	205.6	204.2	34.4	104.5	70.1
	72340	23.4	716.6	693.2	93.4	132.2	38.8
	72344	1	1.3	0.3	5	5.6	0.6
	PM Peak						
	72345	1.7	1.8	0.1	43.8	46.3	2.5
	72340	9.4	10.8	1.4	48.6	57.7	9.1
	72344	1.7	2.6	0.9	18.8	17	-1.8

5. 72063 Turnpike Lane Tube Station – A105 Green Lanes/A504 Turnpike Lane/Westbury Avenue	Node	Delay			V/C		
		DM	DS	DS-DM	DM	DS	DS-DM
	AM Peak						
	72117	150.1	143	-7.1	94.4	93.4	-1.0
	72116	50	106.3	56.3	89.4	100.5	11.1
	72076	806.2	1041.3	235.1	124.7	127.9	3.2
	72118	116.3	121.4	5.1	95.5	97.9	2.4
	PM Peak						
	72117	96.3	117.1	20.8	79.9	74.1	-5.8
	72116	211.4	257.2	45.8	104.6	106	1.4
	72076	59.3	39.8	-19.5	96.5	90	-6.5
	72118	145.7	137	-8.7	100.9	100.7	-0.2

[14] The delay at this junction causes queues which extend to neighbouring junctions, particularly 72345. Neighbouring junctions are not considered separately since mitigating the impact at this junction will also mitigate the impact at neighbouring junctions.

6. 72069 Ferry Lane/ Broad Lane/ The Hale	Node	Delay			V/C		
		DM	DS	DS-DM	DM	DS	DS-DM
				AM Peak			
	73502	32	178	146	49	88	39
	72441	32	351	319	63	79	16
	72434	58	364	306	82	103	21
				PM Peak			
	72345	12	40	28	49	51	2
	72340	40	63	23	37	73	36
	72344	120	93	182	302	105	12

Journey Time Analysis

3.59 Analysis of changes in journey times along Tottenham High Road and around the Tottenham Gyratory has been carried out as another measure of the performance of the local network, before and after introduction of additional demand associated with the AAP sites.

3.60 Figure 3.13-Figure 3.20 present the changes in time for the High Road between St Ann's Road and the A406 junction and both clockwise and anti-clockwise around the gyratory from the junction of High Road/Broad Lane.

3.61 For each route and for each peak period, journey times are shown to increase following the addition of AAP development trips, particularly around the gyratory.

Figure 3.13: Journey Time Analysis – High Road – AM Peak Northbound

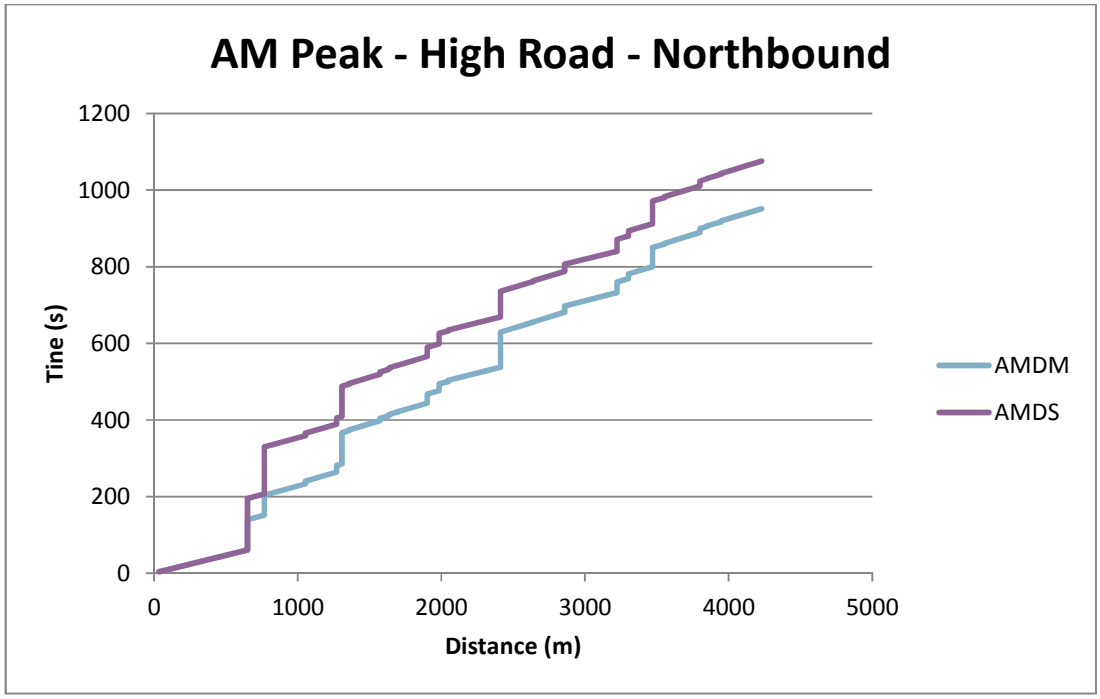


Figure 3.14: Journey Time Analysis – High Road – AM Peak Southbound

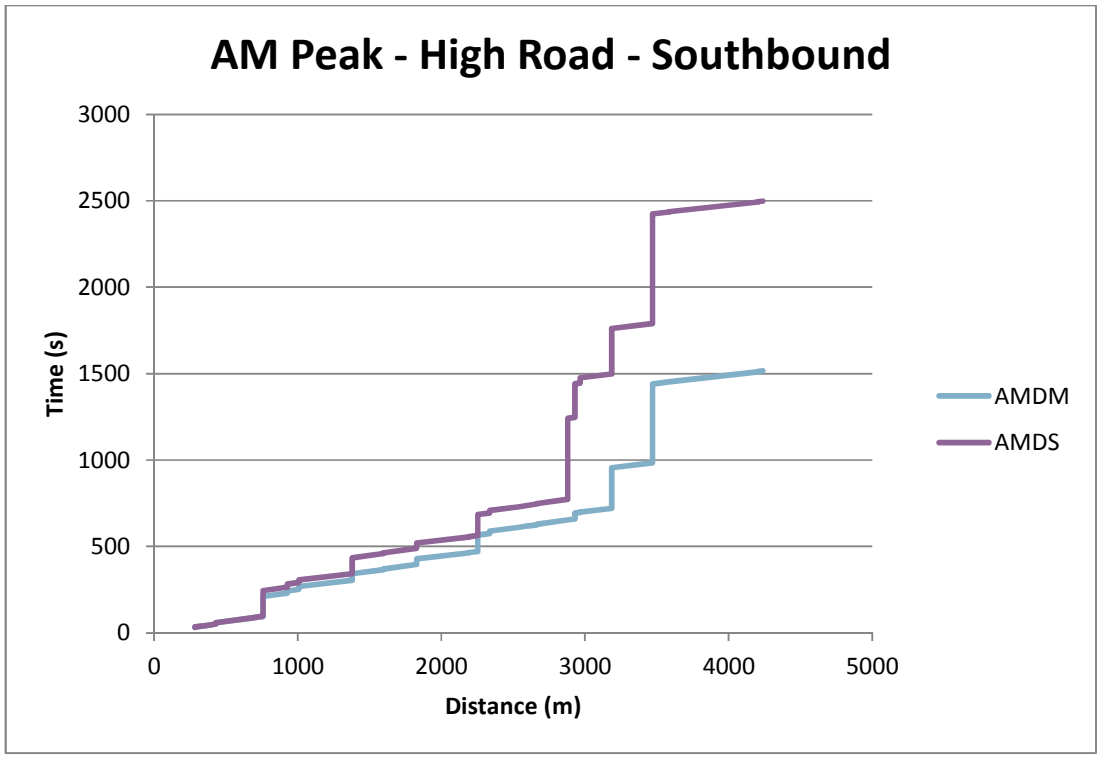


Figure 3.15: Journey Time Analysis – High Road – PM Peak Northbound

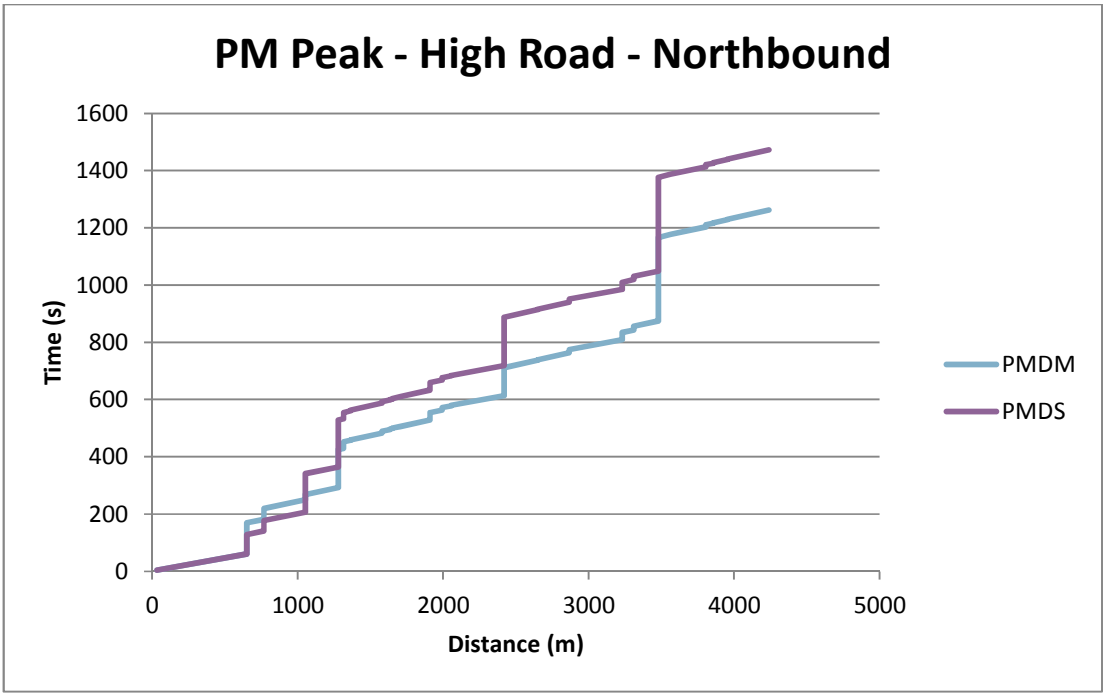


Figure 3.16: Journey Time Analysis – High Road – PM Peak Southbound

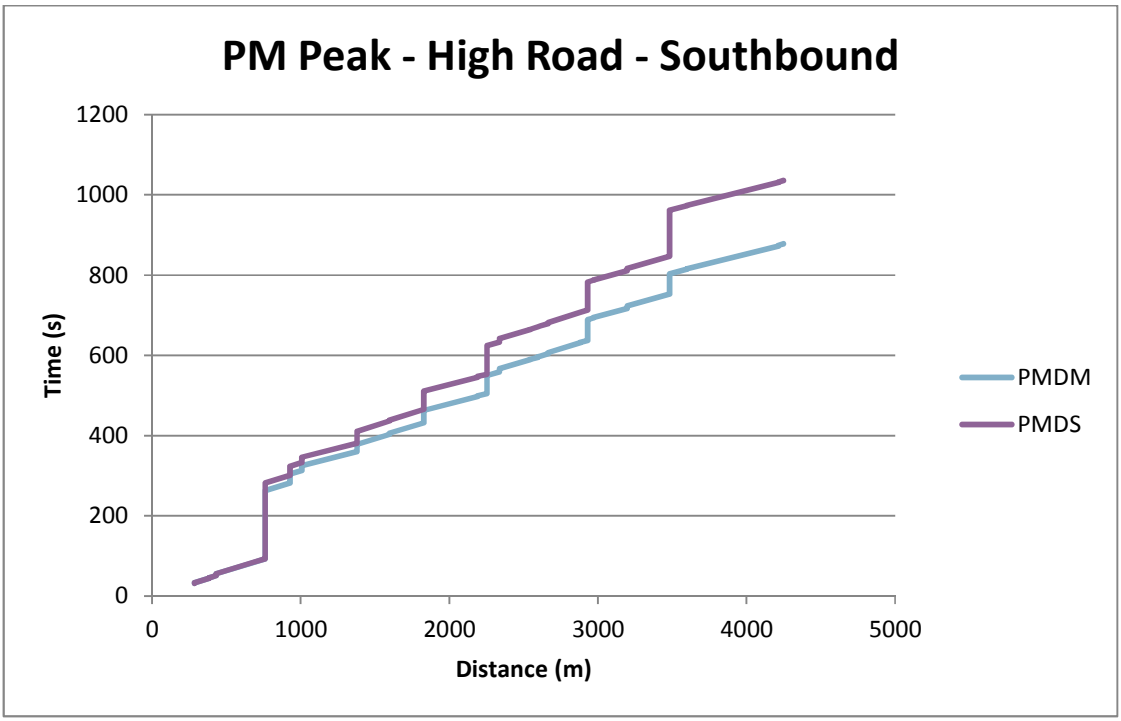


Figure 3.17: Journey Time Analysis – Tottenham Gyratory – AM Peak Clockwise

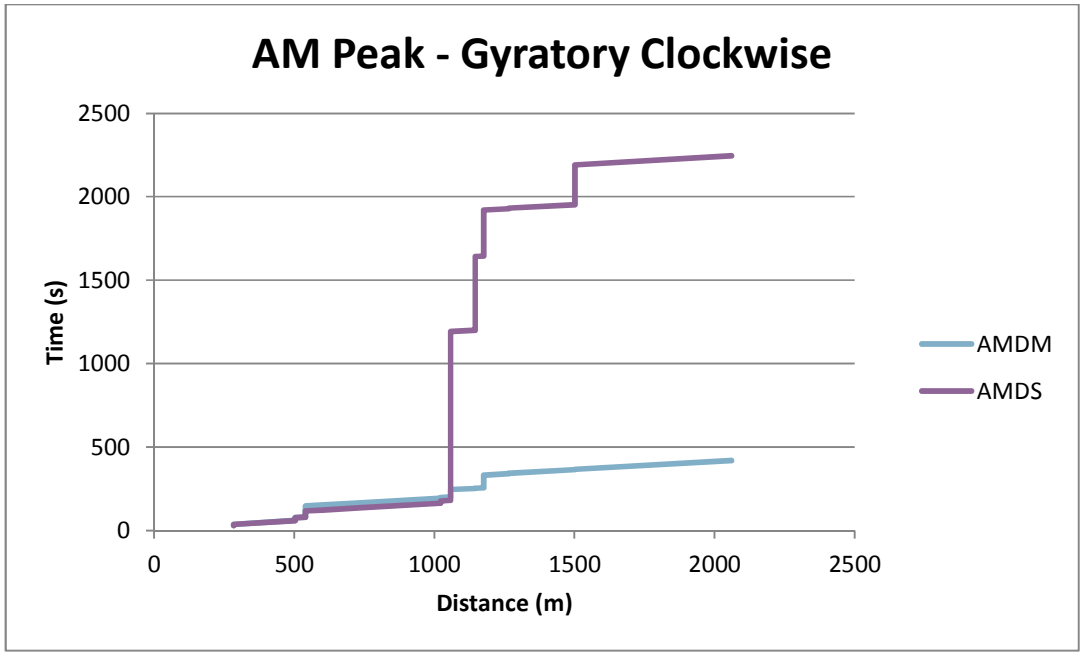


Figure 3.18: Journey Time Analysis – Tottenham Gyratory – AM Peak Anticlockwise

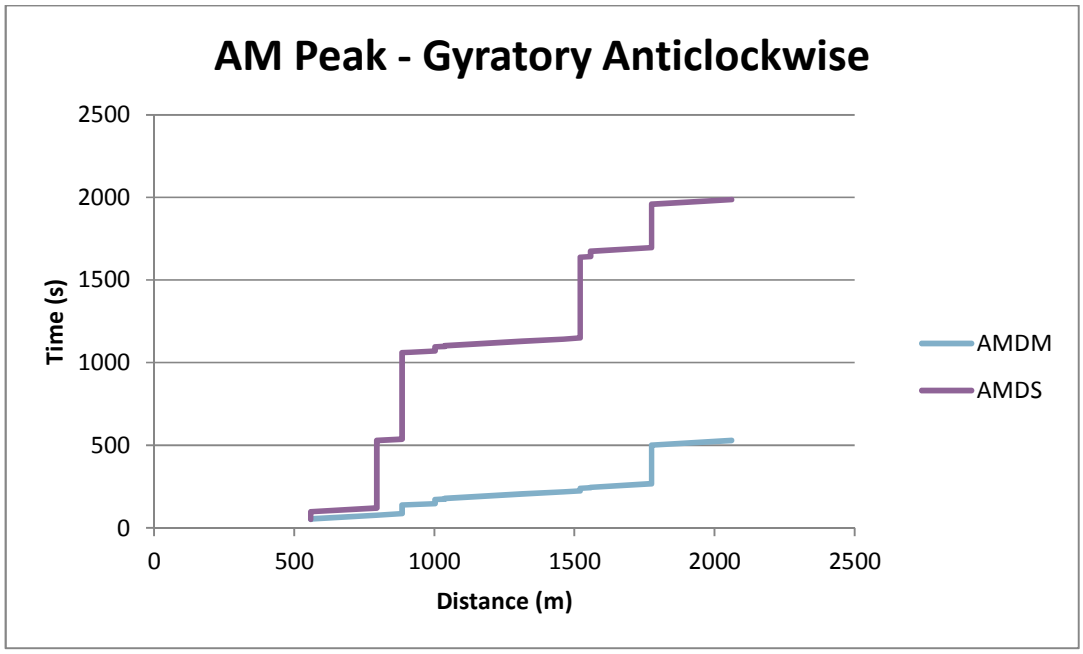


Figure 3.19: Journey Time Analysis – PM Peak – Tottenham Gyratory Clockwise

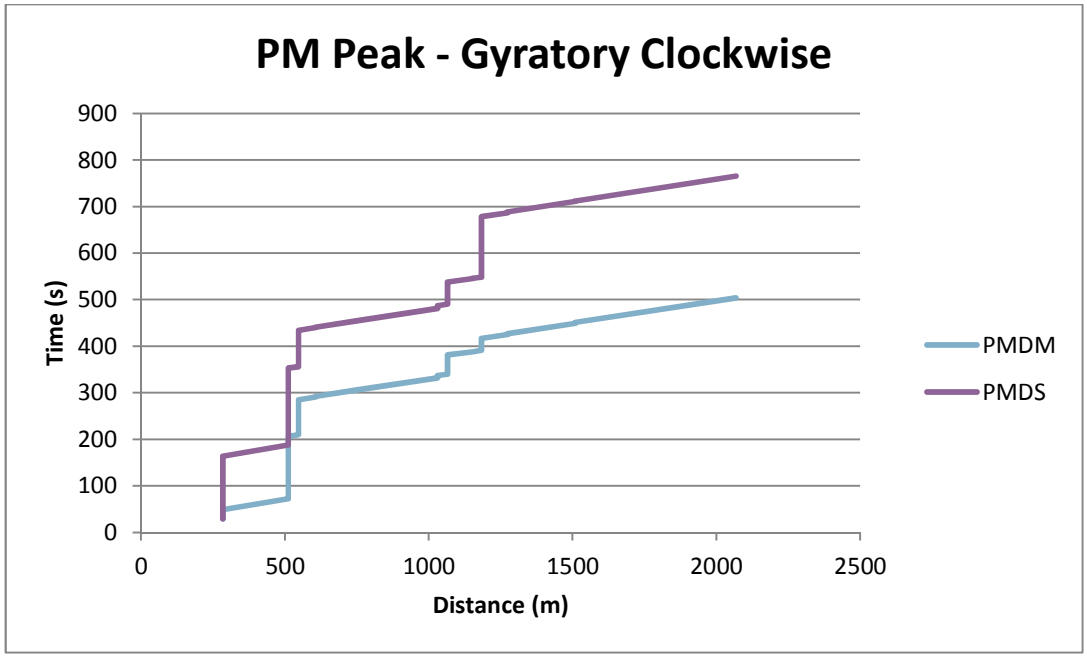
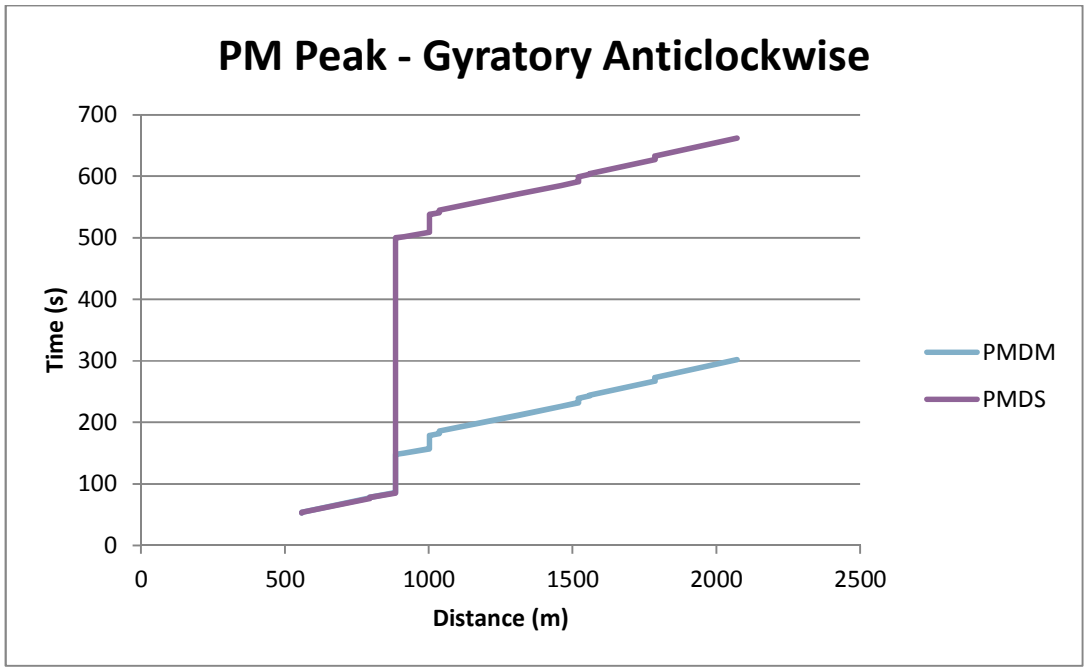


Figure 3.20: Journey Time Analysis – PM Peak – Tottenham Gyratory Anticlockwise



Public Transport

Introduction

3.62 The AAP area is served principally by the Victoria Line, where Tottenham Hale station lies at the heart of many of the largest proposed development sites. Seven Sisters also provides access to the Victoria Line. The Piccadilly Line is also reasonably accessible – Turnpike Lane and Wood Green are situated around 1km from the western boundary of the AAP area, with various buses providing feeder access from the Tottenham area.

3.63 A number of National Rail services also serve the Tottenham area, most notably West Anglia services into Liverpool Street from Tottenham Hale and Seven Sisters – the latter service is due to be transferred to TfL's control in 2015 and will become part of the London Overground network. In addition, the Gospel Oak to Barking Line, also part of the London Overground network, provides a series of orbital rail connections from South Tottenham station.

3.64 There are also a large number of buses services providing connections in all directions from the Tottenham Hale interchange. There are also many other routes along Tottenham High Road that will not directly serve the interchange but will nevertheless be easily accessible from some of the AAP sites in the wider Tottenham Hale/Seven Sisters area.

Summary of Approach

3.65 The impacts of the AAP proposals on public transport services serving the Tottenham area were assessed with the aid of TfL's Railplan model. The analysis adopted TfL's standard 'Reference Case' forecasts for 2031.

3.66 Passenger demand and crowding data were obtained from the forecasts for the years 2011 and 2031. The 2031 forecasts assume that all committed future public transport schemes are implemented, most notably:

- Victoria Line upgrade to 33 trains per hour (not implemented in 2011);
- Piccadilly Line capacity upgrade to 33 trains per hour;
- Implementation of the STAR scheme on West Anglia Main Line i.e. enhanced 4tph service between Stratford, Tottenham Hale, and Angel Road following the three/four tracking of the existing two-track sections during Network Rail's Control Period 5 (2014-19)
- Incorporation of Greater Anglia services serving Liverpool Street (serving Enfield Town, Cheshunt and Chingford) into London Overground Network;
- Other London Overground Capacity upgrades e.g. higher capacity four-car trains on Gospel Oak to Barking services; and
- Implementation of Crossrail 1

3.67 Crossrail2 has not been included as it is currently not a committed scheme. This creates a degree of uncertainty regarding whether or not the scheme will be in place by 2031, and also the scheme specification if and when it is implemented. For example, where the proposed new stations will be located. Consequently, and given the high-level objectives of this initial study, Crossrail2 has not been included in the analysis. Similarly, the four-tracking of the West Anglia main line is also excluded given that it is envisaged that much of this scheme would be delivered as part of Crossrail 2.

Public Transport Demand generated by AAP

3.68 The public transport analysis was focused on commuting movements from the Tottenham area towards central London in the AM peak hour, which was in turn based on the number of new homes that the AAP is expected to add. This approach was deemed sufficient since:

- Any 'background' capacity constraints (i.e. constraints that are expected to occur whether or not the AAP proposals are implemented) are found on services towards central London in the AM peak hour;
- Regarding the AAP itself, the majority of public transport demand generated will also be concentrated on these particular movements; and
- Impacts in the PM peak will be similar to those of the AM peak, but in the opposite direction.

3.69 As noted before, the AAP proposals will add around 9,476 homes. Based on an average estimate of two working persons per home, and an expected trip rate of 0.31 AM peak period working trips per head of population (based on TfL's London Transport Studies model), the number of work trips expected to be generated by the AAP is (9,476 x 2 x 0.31) = 5875 commuting trips in the AM peak period.

3.70 The 2011 Census journey to work data suggests that 76% of Tottenham residents will use public transport. Of these, around 44% will use LUL and 15% will use National Rail services (including Overground) with the remainder (41%) using bus. Using these assumptions, the AAP is expected to generate the following trips on these three modes:

- LUL: 76% x 44% x 5,875 = 1,964 commuting trips
- Rail: 76% x 15% x 5,875 = 669 commuting trips
- Bus: 76% x 41% x 5,875 = 1,831 commuting trips

3.71 Of the 1,964 LUL trips, it is expected that the majority will use the Victoria Line, though some will use the Piccadilly line, depending on each user's precise journey origin location in the Tottenham area and precise journey destination in central London. The Piccadilly Line is typically less crowded than the Victoria Line and it is expected that some users would be prepared to trade some additional journey time in favour of a less-crowded journey experience.

3.72 Consequently, it has been assumed that 80% of the 1,964 LUL users will use the Victoria Line and the remaining 20% will use the Piccadilly Line, (1,572 and 392 users respectively).

Demand and Crowding Analysis

LUL Impacts

3.73 The Victoria Line is amongst the busiest on the LUL network, carrying up to 60,000 passengers during the three-hour AM peak period in 2011 on the core central London section (between Euston and Oxford Circus). In 2031 without the AAP this figure is forecast to reach 72,000 due to additional capacity (from the upgrade to 33tph, see 3.66) and general growth in population and employment throughout London. As noted previously, the implementation of the AAP is expected to add a further 1,572 trips.

3.74 Figure 3.21 illustrates the forecast levels of crowding on inbound Piccadilly and Victoria Line services during the AM peak hour. It illustrates how crowding patterns are forecast to change

between 2011 and 2031, the latter both with and without the impact of implementing the AAP proposals.

3.75 It can be seen that in 2011, both the Piccadilly and Victoria lines experience significant levels of crowding, particularly south of Finsbury Park where the number of standing passengers typically exceeds four per square metre. This is consistent with the findings from the analysis of previous studies. In 2031, the implementation of additional capacity on both lines provides some relief for the Piccadilly Line (a reduction of one standing passenger per square metre). The Victoria line experiences a modest reduction on the most congested section (down from 6.0 to 5.6 standing passengers per square metre between Euston and Warren Street), though levels of crowding remain high.

3.76 If the AAP is implemented in 2031, there is a modest increase in crowding levels on the Victoria Line – around 0.2 additional passengers per square metre between Tottenham Hale and Oxford Circus. This shows that even with the implementation of the AAP, the maximum level of crowding (seen between Euston and Warren Street) will not exceed 2011 levels as the capacity upgrades offset the additional demand.

3.77 The impact of the AAP on the Piccadilly Line crowding is negligible – remaining significantly below 2011 levels. Forecast crowding levels on the Piccadilly Line are lower than those seen for the Victoria Line, and the AAP is expected to add fewer trips to the Piccadilly line than to the Victoria line.

Figure 3.21: Impact of AAP Proposals on LUL Crowding – AM Peak Period Inbound

		Absolute Standing Pax/Sqm Ratio			Change Standing Pax/Sqm Ratio		
From	To	2011 Base	2031 Ref Case (No AAP)	2031 Ref case (With AAP)	2011 -> 2031 No AAP	2011 -> 2031 With AAP	2031 AAP Impact
Piccadilly Line WB							
COCKFOSTERS PICCADILLY (WB)	OAKWOOD PICCADILLY (WBOUND)	-1.6	-1.7	-1.7	-0.04	-0.04	0.00
OAKWOOD PICCADILLY (WBOUND)	SOUTHGATE PICCADILLY (WB)	-1.2	-1.4	-1.4	-0.23	-0.23	0.00
SOUTHGATE PICCADILLY (WB)	ARNOS GROVE PIC (WBOUND)	-0.1	-0.8	-0.8	-0.68	-0.68	0.00
ARNOS GROVE PIC (WBOUND)	BOUNDS GREEN PICCADILLY (WB)	-0.2	-0.6	-0.6	-0.42	-0.42	0.00
BOUNDS GREEN PICCADILLY (WB)	WOOD GREEN PICCADILLY (WB)	0.6	0.0	0.0	-0.67	-0.67	0.00
WOOD GREEN PICCADILLY (WB)	TURNPIKE LANE PICCADILLY (WB)	1.8	0.9	0.9	-0.92	-0.85	0.07
TURNPIKE LANE PICCADILLY (WB)	MANOR HOUSE PICCADILLY (WB)	3.0	1.9	2.0	-1.05	-0.99	0.07
MANOR HOUSE PICCADILLY (WB)	FINSBURY PARK PICCADILLY (WB)	4.0	2.8	2.9	-1.18	-1.11	0.07
FINSBURY PARK PICCADILLY (WB)	ARSENAL PICCADILLY (EB)	3.8	2.8	2.9	-0.96	-0.85	0.11
ARSENAL PICCADILLY (EB)	HOLLOWAY ROAD PICCADILLY (WB)	4.2	3.2	3.3	-1.03	-0.91	0.11
HOLLOWAY ROAD PICCADILLY (WB)	CALEDONIAN RD PICCADILLY (WB)	4.5	3.4	3.5	-1.07	-0.96	0.11
CALEDONIAN RD PICCADILLY (WB)	KING'S CROSS (M) PICCAD'Y (WB)	4.9	3.8	3.9	-1.11	-1.00	0.11
KING'S CROSS (M) PICCAD'Y (WB)	RUSSELL SQUARE PICCADILLY (WB)	5.3	3.4	3.4	-1.89	-1.81	0.08
RUSSELL SQUARE PICCADILLY (WB)	HOLBORN PICCADILLY (EB)	5.0	3.2	3.3	-1.76	-1.69	0.07
HOLBORN PICCADILLY (EB)	COVENT GARDEN PICCADILLY (WB)	3.8	2.3	2.4	-1.49	-1.43	0.05
COVENT GARDEN PICCADILLY (WB)	LEICESTER SQUARE PICCAD'Y (WB)	3.2	1.9	1.9	-1.28	-1.24	0.05
LEICESTER SQUARE PICCAD'Y (WB)	PICCADILLY CIRCUS PICC (WB)	2.8	2.1	2.1	-0.74	-0.70	0.03
PICCADILLY CIRCUS PICC (WB)	GREEN PARK PICCADILLY (WB)	2.3	1.8	1.8	-0.49	-0.47	0.02
GREEN PARK PICCADILLY (WB)	HYDE PARK CORNER PICCAD'Y (WB)	3.0	2.3	2.3	-0.70	-0.68	0.02
HYDE PARK CORNER PICCAD'Y (WB)	KNIGHTSBRIDGE PICCADILLY (WB)	2.6	2.0	2.0	-0.62	-0.60	0.01
KNIGHTSBRIDGE PICCADILLY (WB)	SOUTH KENSINGTON PICC (WB)	1.4	1.0	1.0	-0.39	-0.39	0.00
SOUTH KENSINGTON PICC (WB)	GLOUCESTER RD PICCADILLY (WB)	0.7	0.3	0.3	-0.36	-0.36	0.00
GLOUCESTER RD PICCADILLY (WB)	EARL'S COURT PICCADILLY (WB)	0.6	0.2	0.2	-0.36	-0.36	0.00
EARL'S COURT PICCADILLY (WB)	BARONS COURT PIC (EB)	0.5	0.1	0.1	-0.37	-0.37	0.00
BARONS COURT PIC (EB)	HAMMERSMITH (DIS) PICC'Y (WB)	0.2	-0.2	-0.2	-0.48	-0.48	0.00
Victoria Line SB							
WALTHAMSTOW CENTRAL VICT (SB)	BLACKHORSE ROAD VICTORIA (SB)	0.5	-0.3	-0.3	-0.84	-0.84	0.00
BLACKHORSE ROAD VICTORIA (SB)	TOTTENHAM HALE VICTORIA (SB)	1.6	0.5	0.5	-1.20	-1.20	0.00
TOTTENHAM HALE VICTORIA (SB)	SEVEN SISTERS VICTORIA (SB)	2.9	1.8	2.0	-1.14	-0.87	0.27
SEVEN SISTERS VICTORIA (SB)	FINSBURY PARK VICTORIA (SB)	2.3	3.0	3.2	0.64	0.91	0.27
FINSBURY PARK VICTORIA (SB)	HIGHBURY & ISLINGTON VICT (SB)	4.4	4.6	4.9	0.24	0.47	0.23
HIGHBURY & ISLINGTON VICT (SB)	KING'S CROSS (M) VICTORIA (SB)	5.1	5.3	5.5	0.22	0.45	0.23
KING'S CROSS (M) VICTORIA (SB)	EUSTON VICTORIA (SB)	5.0	5.2	5.3	0.14	0.33	0.19
EUSTON VICTORIA (SB)	WARREN STREET VICTORIA (SB)	6.0	5.6	5.8	-0.33	-0.15	0.18
WARREN STREET VICTORIA (SB)	OXFORD CIRCUS VICTORIA (SB)	5.4	5.2	5.4	-0.13	0.04	0.17
OXFORD CIRCUS VICTORIA (SB)	GREEN PARK VICTORIA (SB)	3.7	3.7	3.7	-0.09	0.00	0.09
GREEN PARK VICTORIA (SB)	VICTORIA VICTORIA (SB)	2.7	2.7	2.8	0.00	0.07	0.07
VICTORIA VICTORIA (SB)	PIMLICO VICTORIA (SB)	0.0	0.0	0.0	-0.05	-0.05	0.00
PIMLICO VICTORIA (SB)	VAUXHALL VICTORIA (SB)	-0.5	-0.3	-0.3	0.12	0.12	0.00
VAUXHALL VICTORIA (SB)	STOCKWELL VICTORIA (SB)	-1.2	-1.0	-1.0	0.17	0.17	0.00
STOCKWELL VICTORIA (SB)	BRIXTON VICTORIA (SB)	-1.6	-1.5	-1.5	0.10	0.10	0.00

3.78 In summary, the forecast crowding changes on the Piccadilly and Victoria Lines between 2011 and 2031 are mainly attributable to the introduction of the capacity upgrades; the additional impact of the AAP is relatively modest.

National Rail & London Overground Impacts

3.79 Greater Anglia services into Liverpool Street, serving Northumberland park and Tottenham Hale typically carry up to 19,000 passengers during the three-hour AM peak period in 2011 on the

section immediately north of Tottenham Hale. South of Tottenham Hale, passenger numbers fall to 15,000 since around 4,000 alight at Tottenham Hale and interchange onto the Victoria Line which provides fast and direct connections to key destinations in central London e.g. Oxford Circus, Green Park.

3.80 In 2031, passenger flows on board southbound train services arriving at Tottenham Hale are expected to increase to around 27,000 due in part to the implementation of the frequency increase from two to four trains per hour (from the STAR scheme), as well as general population and employment growth throughout the corridor towards Stansted, Cambridge, and beyond. Of these around 11,000 are expected to alight at Tottenham Hale and interchange onto the Victoria Line.

3.81 In addition, Tottenham Hale is served by some Greater Anglia services that terminate at Stratford (instead of Liverpool Street). These services will also serve the Lea Valley Opportunity Area via the newly-reopened Lea Bridge Station from 2015. The Railplan forecasts suggest the crowding levels between Tottenham Hale and Stratford will be low, with spare seating capacity – even in 2031. However, there is the possibility that the combination of the Tottenham AAP and Lea Valley OAPF proposals in particular could encourage additional rail demand along this corridor over-and-above the levels suggested in the forecasts.

3.82 On the parallel rail service via Bruce Grove and Seven Sisters (which is due to be transferred to London Overground in 2015), typical southbound passenger flows in 2011 are around 10,000 in the AM peak period towards Seven Sisters. Similarly to Tottenham Hale, a significant number (around 4,500) interchange here onto the Victoria Line, resulting in a significantly lower flow (around 6,000 passengers) south of Seven Sisters.

3.83 In 2031, passenger flows are forecast to remain steady, with a modest increase in interchange to the Victoria Line at Seven sisters to around 5,000 passengers. The lack of a significant increase in demand is attributable to the significant capacity increases due to be implemented on the various competing Rail and LUL services.

3.84 As noted previously, the implementation of the AAP proposals is expected to add a further 669 trips to these rail services. This will have a modest impact on passenger numbers (compared to the passenger volumes seen for LUL services), and it should also be noted that over half of this additional AAP demand will board at Seven Sisters or Tottenham Hale i.e. south of where significantly greater numbers alight to interchange on the Victoria Line. The remaining rail demand will be distributed amongst the other stations within the AAP area, including Bruce Grove and White Hart Lane, given their close proximity to the proposed developments.

3.85 The crowding impacts of these demand patterns are illustrated in Figure 3.22 where it can be seen that crowding levels are lower in both 2011 and 2031 than the levels seen previously along the Victoria and Piccadilly lines. Nevertheless, some services experienced crowding levels of over two standing passengers per square metre in 2011. Also, crowding levels are forecast to decrease south of Tottenham Hale and Seven Sisters, in line with the demand patterns outlined earlier.

3.86 In 2031 without the AAP proposals, crowding levels are lower than those seen for 2011 due to the Greater Anglia frequency upgrade. If the AAP proposals are implemented, then crowding levels

are expected to increase – though no higher than the levels seen for 2011 i.e. prior to the implementation of additional train capacity.

3.87 Overground services on the Gospel Oak to Barking Line experience significant levels of crowding (up to 4.5 standing passengers per square metre) in 2011. However, this is expected to fall significantly by 2031 due to the provision of longer trains. If the AAP is implemented, then crowding levels could increase over-and-above the levels seen in the 2031 forecasts. However, this is also dependent on the levels of growth seen in other Opportunity Areas e.g. Old Oak Common or Wembley. For example, the creation of new jobs in Old Oak Common (and the construction of a new Old Oak Common Overground station) could encourage some Overground commuting movements between Tottenham and Old Oak Common.

Figure 3.22: Impact of AAP Proposals on London Overground/National Rail Crowding – AM Peak Period Inbound

		Absolute Standing Pax/Sqm Ratio			Change Standing Pax/Sqm Ratio		
From	To	2011 Base	2031 Ref Case (No AAP)	2031 Ref case (With AAP)	2011 -> 2031 No AAP	2011 -> 2031 With AAP	2031 AAP Impact
WAGN Up (to Liverpool Street)							
ANGEL ROAD WAGN (UP)	NORTHUMBERLAND PK WAGN (UP)	2.6	1.2	1.2	-1.41	-1.41	0.00
NORTHUMBERLAND PK WAGN (UP)	TOTTENHAM HALE WAGN (UP)	2.6	1.4	1.9	-1.20	-0.74	0.47
TOTTENHAM HALE WAGN (UP)	CLAPTON WAGN (UP)	1.6	0.5	1.6	-1.08	-0.07	1.02
CLAPTON WAGN (UP)	HACKNEY DOWNS WAGN (CLAPTON) (UP)	1.7	0.6	1.7	-1.08	-0.06	1.02
HACKNEY DOWNS WAGN (CLAPTON) (UP)	LONDON FIELDS WAGN (UP)	1.7	0.7	1.7	-1.03	-0.01	1.02
LONDON FIELDS WAGN (UP)	CAMBRIDGE HEATH WAGN (UP)	1.1	0.4	1.3	-0.69	0.12	0.81
CAMBRIDGE HEATH WAGN (UP)	BETHNAL GREEN (BR) WAGN (UP)	1.0	0.4	1.2	-0.66	0.15	0.81
BETHNAL GREEN (BR) WAGN (UP)	LIVERPOOL STREET WAGN (UP)	0.9	0.3	1.1	-0.65	0.17	0.81
WAGN Up (to Stratford)							
TOTTENHAM HALE WAGN (UP)	LEA BRIDGE (UP)	-0.6	-2.1	-2.1	-1.56	-1.56	0.00
LEA BRIDGE (UP)	STRATFORD (UP)	-0.6	-2.1	-2.1	-1.49	-1.49	0.00
Overground Up (to Liverpool Street)							
EDMONTON GREEN WAGN (UP)	SILVER STREET WAGN (UP)	0.7	0.5	0.5	-0.18	-0.18	0.00
SILVER STREET WAGN (UP)	WHITE HART LANE WAGN (UP)	1.6	1.2	1.2	-0.36	-0.36	0.00
WHITE HART LANE WAGN (UP)	BRUCE GROVE WAGN (UP)	2.0	1.7	1.9	-0.35	-0.11	0.24
BRUCE GROVE WAGN (UP)	SEVEN SISTERS WAGN (UP)	2.4	2.0	2.5	-0.35	0.11	0.47
SEVEN SISTERS WAGN (UP)	STAMFORD HILL WAGN (UP)	-0.6	-0.9	-0.3	-0.36	0.24	0.60
STAMFORD HILL WAGN (UP)	STOKE NEWINGTON WAGN (UP)	-0.4	-0.7	-0.1	-0.29	0.32	0.60
STOKE NEWINGTON WAGN (UP)	RECTORY ROAD WAGN (UP)	-0.3	-0.5	0.1	-0.23	0.38	0.60
RECTORY ROAD WAGN (UP)	HACKNEY DOWNS WAGN (RECTORY RD)	-0.1	-0.3	0.3	-0.19	0.41	0.60
HACKNEY DOWNS WAGN (RECTORY RD) (UP)	LONDON FIELDS WAGN (UP)	-0.3	-0.5	0.1	-0.16	0.44	0.60
LONDON FIELDS WAGN (UP)	CAMBRIDGE HEATH WAGN (UP)	1.1	0.4	1.3	-0.69	0.12	0.81
CAMBRIDGE HEATH WAGN (UP)	BETHNAL GREEN (BR) WAGN (UP)	1.0	0.4	1.2	-0.66	0.15	0.81
BETHNAL GREEN (BR) WAGN (UP)	LIVERPOOL STREET WAGN (UP)	0.9	0.3	1.1	-0.65	0.17	0.81
Overground - Barking to Gospel Oak							
BARKING NORTH LONDON (BOTH)	WOODGRANGE PARK N L (WB)	3.0	1.8	1.8	-1.18	-1.18	0.00
WOODGRANGE PARK N L (WB)	WANSTEAD PARK N LONDON (WB)	3.6	2.2	2.2	-1.40	-1.40	0.00
WANSTEAD PARK N LONDON (WB)	LEYTONSTONE HIGH ROAD N L (WB)	3.6	2.2	2.2	-1.39	-1.39	0.00
LEYTONSTONE HIGH ROAD N L (WB)	LEYTON MIDLAND RD N L (WB)	4.0	2.5	2.5	-1.52	-1.52	0.00
LEYTON MIDLAND RD N L (WB)	WALTHAMSTOW QUEENS RD N L (WB	4.4	2.7	2.7	-1.79	-1.79	0.00
WALTHAMSTOW QUEENS RD N L (WB	BLACKHORSE RD N LONDON (WB)	4.5	2.6	2.6	-1.97	-1.97	0.00
BLACKHORSE RD N LONDON (WB)	SOUTH TOTTENHAM N LON (WB)	3.6	1.8	1.8	-1.79	-1.79	0.00
SOUTH TOTTENHAM N LON (WB)	HARRINGAY GREEN LANES N L (WB)	3.8	1.8	1.9	-2.02	-1.91	0.11
HARRINGAY GREEN LANES N L (WB)	CROUCH HILL NORTH LONDON (WB)	4.0	1.8	1.9	-2.25	-2.13	0.11
CROUCH HILL NORTH LONDON (WB)	UPPER HOLLOWAY N L (WB)	3.5	1.4	1.5	-2.19	-2.08	0.11
UPPER HOLLOWAY N L (WB)	GOSPEL OAK (BARKING) (BOTH)	1.7	0.2	0.3	-1.48	-1.37	0.11

3.88 In summary, the AAP proposals are not expected to have any adverse impact on crowding levels on National Rail and London Overground services, as the affected services are typically less crowded than the Victoria and Piccadilly lines in the absence of the AAP, and the additional passenger demand that is expected to arise from the AAP itself is relatively modest.

Demand at Tottenham Hale and Seven Sisters

3.89 As noted previously, demand at Tottenham Hale station will be significantly higher in 2031, dominated by the increase in interchange movements from National Rail services onto the Victoria Line from approximately 4,000 to 11,000 users in the AM peak period. A more modest

increase was seen for the equivalent movement at Seven Sisters – from around 4,500 to 5,000 users.

3.90 The AAP itself is expected at add a further 1,572 passengers to the Victoria Line, the majority of these are expected to board at Tottenham Hale station.

3.91 TfL are currently implementing improvements to Tottenham Hale station, which include the ability to accommodate larger levels of passenger demand (including interchange movements between LUL, Rail, and bus services). Furthermore, the additional demand that is expected to arise from the AAP is relatively modest compared to the expected growth in interchange movements between 2011 and 2031. Nevertheless, it is recommended that some pedestrian modelling work is undertaken (with the aid of TfL's LEGION models) to determine whether Tottenham Hale and Seven Sisters stations can accommodate the additional AAP movements.

Demand at other Rail Stations

3.92 Whilst the majority of rail users will board services at Tottenham Hale and Seven Sisters, other stations including Bruce Grove and White Hart Lane are expected to also experience an increase in demand given their close proximity to some of the AAP sites. Although the additional demand expected at Bruce Grove and White Hart Lane is more modest compared to Tottenham Hale and Seven Sisters, it should also be noted that the current capacity of these stations is also somewhat lower and so may need to be enhanced.

3.93 Consequently, it is recommended that further analysis is undertaken to determine whether these stations can accommodate any additional demand arising from the AAP, in particular at Bruce Grove where no capacity improvements are currently planned. Capacity improvements are planned at White Hart Lane station so this further analysis may not be necessary.

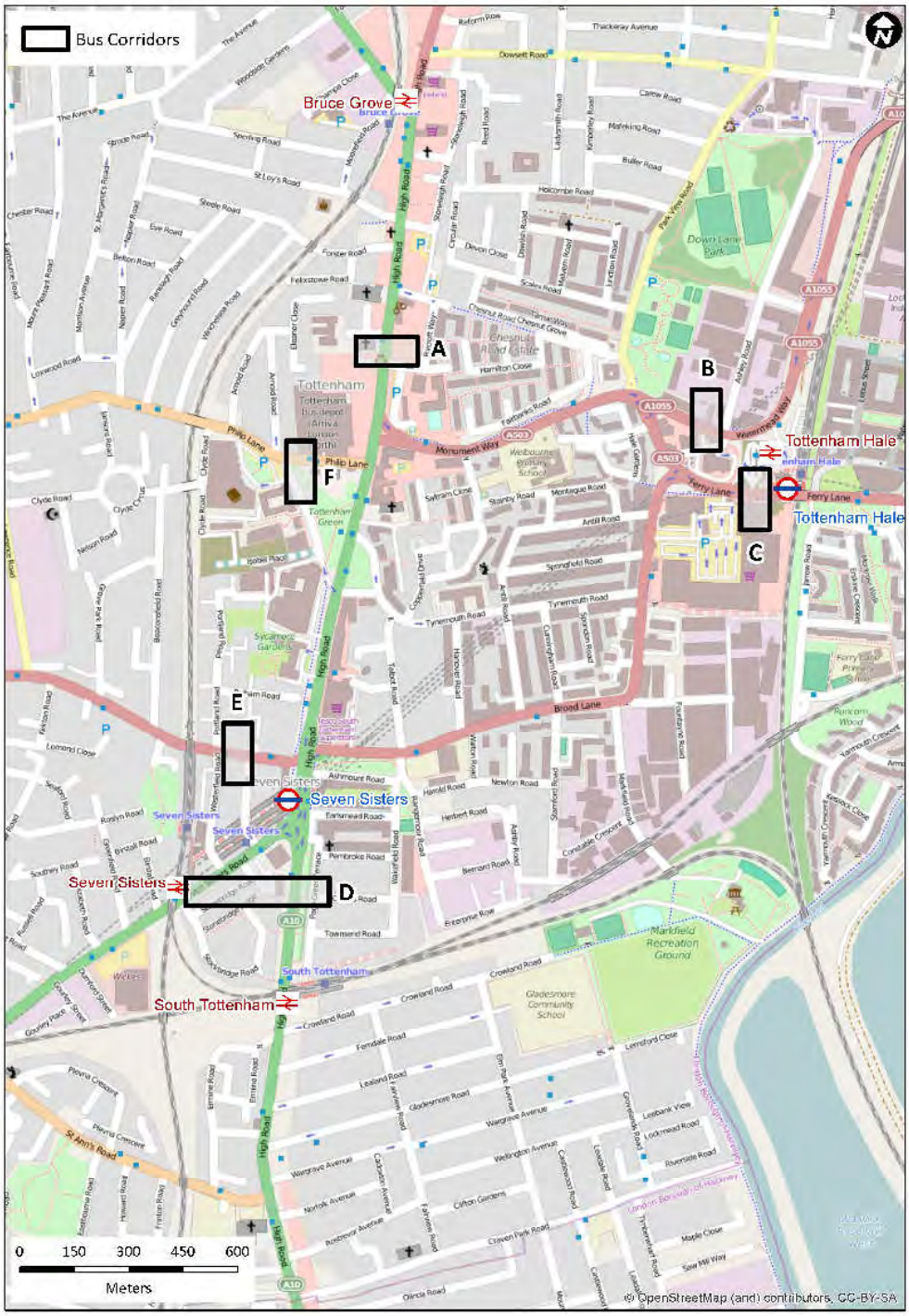
Bus Impacts

3.94 Tottenham is served by a large number of bus services from all directions in particular Tottenham High Road which is served by over 60 buses per hour in each direction during peak hours. The local bus network provides services towards central London as well as Archway, Wood Green, Enfield, Ilford, and Walthamstow. It is expected that a significant proportion of bus commuting trips from Tottenham will be to destinations outside of central London.

3.95 Most of these buses serve the public transport interchanges at Tottenham Hale and Seven Sisters, consequently the local bus network also plays an important role in facilitating access to nearby LUL and rail services.

3.96 Analysis was undertaken of modelled bus passenger flows from Railplan along the corridors shown in Figure3.23 below. This analysis here was undertaken for modelled years 2011 and 2031 without the AAP proposals, in a similar manner to the LUL and rail analysis described earlier.

Figure3.23: Bus Corridors Subjected to Demand Analysis



3.97 As shown in the tables below, the analysis was undertaken at a corridor level, separately for inbound (towards Tottenham - Table 3.11 and Table 3.12) and then outbound (away from Tottenham - Table 3.13 and Table 3.14) passenger flows for the AM peak three-hour period (07:00 to 10:00).

Table 3.11: Year 2011 AM Peak Period Bus Flows - Inbound

Corridor	Total Passengers	Total buses	Average Passengers per bus	Total seats	Average seat occupancy
A – High Road southbound	8255	221	37	12288	67%
B – Watermead Way southbound	360	18	20	450	80%
C – Ferry Lane westbound	763	87	9	4827	16%
D – High Road northbound	1222	182	7	10515	12%
E - - West Green road eastbound	502	36	14	2268	22%
F – Philip Lane eastbound	323	45	7	2835	11%

Table 3.12: Year 2031 (No AAP Proposals) AM Peak Period Bus Flows - Inbound

Corridor	Total Passengers	Total buses	Average Passengers per bus	Total seats	Average seat occupancy
A – High Road southbound	8663	230	38	12789	68%
B – Watermead Way southbound	468	19	25	468	100%
C – Ferry Lane westbound	643	91	7	5025	13%
D – High Road northbound	1396	190	7	10947	13%
E - - West Green road eastbound	665	38	18	2364	28%
F – Philip Lane eastbound	454	47	10	2952	15%

3.98 For inbound flows towards Tottenham Table 3.11 and Table 3.12 above), it can be seen that buses along the two corridors from the north (corridor A - High Road southbound, and corridor B - Watermead Way southbound) experience the highest passenger occupancy – with over 60% of total seating capacity occupied across the three-hour AM peak period during 2011.

3.99 In 2031, without the AAP proposals, there is expected to be little change in bus crowding for services along the High Road, but there is a notable increase seen along Watermead Way, where the number of peak period passengers is expected to, on average, match the number of available seats. This suggests that consideration should be given towards increasing the level of service along Watermead Way in particular.

3.100 The two southbound corridor movements where occupancy is expected to be particularly high comprise a significant number of commuters travelling southwards towards central London, some of whom will alight at Tottenham Hale or Seven Sisters and interchange onto LUL or rail services, whilst others will remain in the bus for their entire journey.

Table 3.13: Year 2011 AM Peak Period Bus Flows - Outbound

Corridor	Total Passengers	Total buses	Average Passengers per bus	Total seats	Average seat occupancy
A – High Road northbound	738	249	3	14019	5%
B – Watermead Way northbound	18	18	1	450	4%
C – Ferry Lane eastbound	1297	87	15	4827	27%
D – High Road southbound	5318	184	29	10611	50%
E - - West Green road westbound	616	36	17	2268	27%
F – Philip Lane westbound	318	16	20	1008	32%

Table 3.14: Year 2031 (No AAP Proposals) AM Peak Period Bus Flows - Outbound

Corridor	Total Passengers	Total buses	Average Passengers per bus	Total seats	Average seat occupancy
A – High Road northbound	803	259	3	14592	6%
B – Watermead Way northbound	3	19	0	468	1%
C – Ferry Lane eastbound	1872	91	21	5025	37%
D – High Road southbound	5195	191	27	11046	47%
E - - West Green road westbound	609	38	16	2364	26%
F – Philip Lane westbound	309	17	19	1050	29%

3.101 For outbound flows away from Tottenham (Table 3.13 and Table 3.14 above) it can be seen that the highest bus seat occupancy levels are expected along corridor D, again along the High Road southbound towards central London. However, occupancy levels along these services are expected to be somewhat lower (around 50% of seats on average during the AM peak period) than the levels seen earlier on corridors A and B southbound. This provides evidence that, whilst some bus commuters from the Tottenham area use the bus the whole way into central London, a

significant number are expected to alight at Tottenham Hale or Seven sisters onto LUL and rail services, as outlined earlier.

Recommendations

3.102 Considering inbound and outbound movements together, the analysis seen here suggests that without the AAP proposals in 2031, bus passenger demand will be close to capacity north of Tottenham Hale, with some spare capacity available further south between Tottenham Hale and central London. As noted previously, the AAP proposals are expected to generate an additional 1830 bus commuting trips during the three-hour AM peak period. This figure is expected to be comprised mainly but not exclusively of commuters travelling into central London.

3.103 Consequently, if the AAP is implemented then it is expected that additional bus services into the Tottenham area from the north will be required, particularly along Watermead Way as this is where the largest increases in demand are expected.

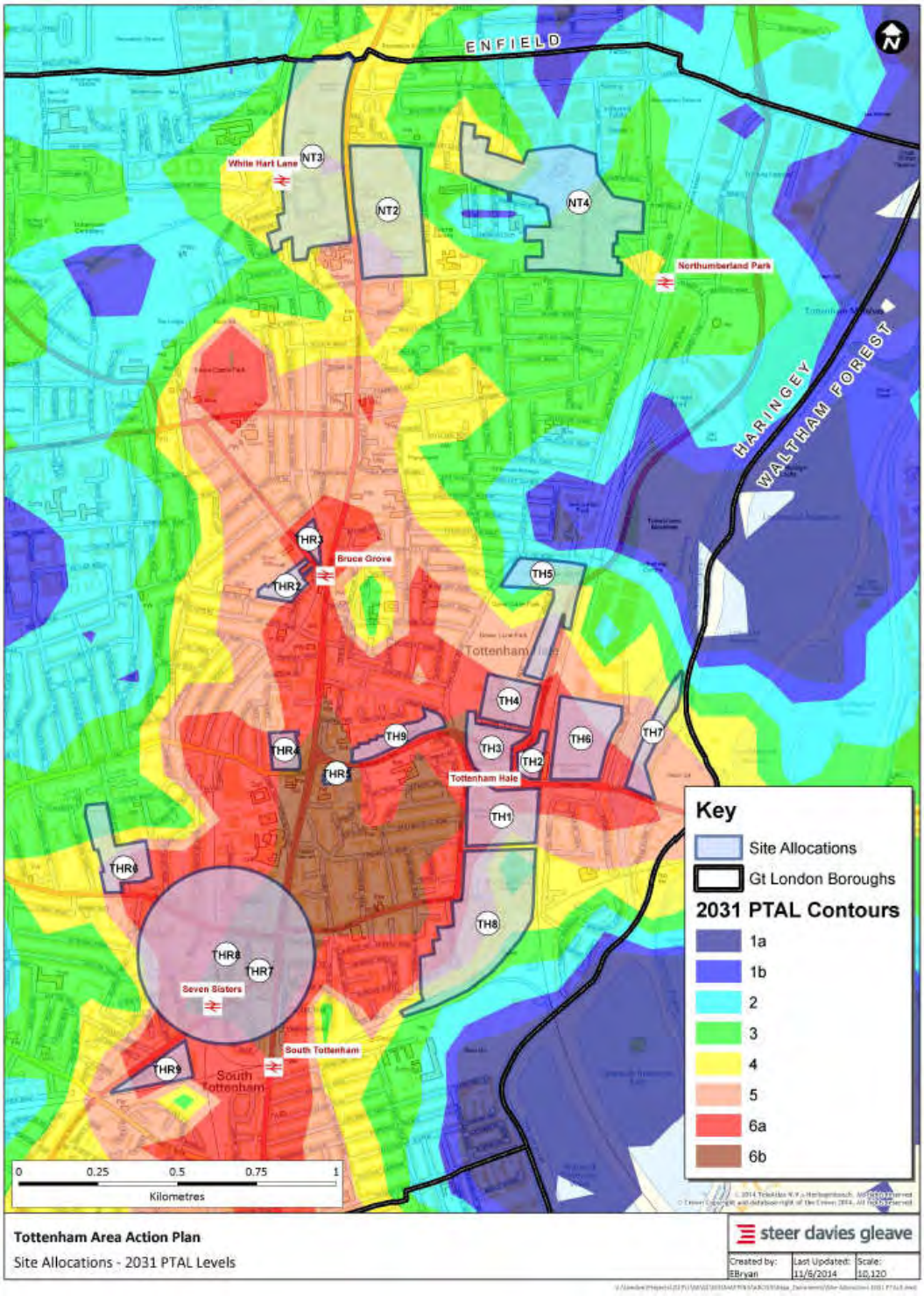
3.104 Further south i.e. between Tottenham and central London, it is expected that the current level of service provision will be able to accommodate any additional APP demand, particularly given the high frequency (over 60 buses per hour).

PTAL Assessment

3.105 A PTAL accessibility assessment has been undertaken to determine the levels of accessibility of the various AAP sites to the public transport network. This has been based on TfL's standard PTAL proforma using a scale of 1 to 6 where 1a/1b implies poor accessibility to the public transport network, whilst 6a/6b implies excellent accessibility. The analysis here is based on access to the public transport network 'as a whole', not focused on individual public transport services.

3.106 The analysis was undertaken using the year 2031 shown in Figure 3.24. The PTAL analysis is based on data obtained from the 2031 Reference Case in the Railplan model, so the network and service assumptions will be consistent with those underpinning the analysis of public transport demand outlined earlier.

Figure 3.24: PTAL Analysis of proposed AAP sites – Year 2031[15]



[15] Areas shown in blue/green represent poor accessibility to the public transport network whereas areas shown in red/yellow represent excellent accessibility.

3.107 It can be seen that the majority of the AAP development proposals are located in areas where public transport accessibility will be excellent (i.e. PTAL ratings of 6a and 6b)

3.108 Very few elements of the proposals will be located in areas with a PTAL rating of below 4. The most notable examples are parts of site NT4 in the North Tottenham area, and some sections of sites TH5, TH8, and THR6. This analysis shows that the sites will generally be well connected to London's public transport network.

3.109 This analysis also shows that the ability to further improve accessibility to the public transport network will be limited. As seen previously, committed improvements to the LUL, Overground, and National Rail Networks are forecast to provide sufficient additional capacity to ensure that if the AAP is implemented by 2031, crowding levels will remain below current levels.

3.110 There is nevertheless some potential to improve the accessibility of the sites that experience a lower PTAL rating. Consideration should be given to modifying nearby bus services to better serve the new sites, and/or improve the walking environment between these sites and the nearest station.

Summary of Transport Constraints and Issues

3.111 With the addition of future highway demand associated with DPD Sites in the Tottenham and Northumberland Park AAP area and the wider Haringey area, there are changes in distance travelled, speeds and congestion in the borough. The impact of background traffic growth and wider Haringey developments has a greater impact than the AAP developments in isolation. However, the impact of concentrating this extra traffic on the AAP area without any mitigation measures causes a disproportionate increase in journey times, with speeds and congestion worsening significantly compared to the increase incurred by development in the wider area.

3.112 On the public transport network, committed improvements to LUL and rail services will be sufficient to mitigate the additional public transport demand that is expected to arise from the AAP. Nevertheless, crowding is expected to remain severe on parts of the Victoria Line due to the significant journey time advantage it enjoys for most key destinations in central London. For National Rail and Overground services, interchange is required for all destinations beyond Liverpool Street. On bus, some additional capacity should be considered to accommodate additional users of bus as a feeder mode to access LUL and rail services north of Tottenham Hale.

3.113 The PTAL analysis has shown that the AAP sites offer good access to the public transport network and so public transport services will play a pivotal role in accommodating the additional demand arising from the AAP.

4 Identification of Mitigation Measures

Highway mitigation

4.1 In order to mitigate the impacts of the AAP developments on the highway network a number of scenarios have been developed. These scenarios involve 3 different types of intervention:

1. Changes to the road network to reduce delays by improving the operation of junctions to better reflect the traffic flows once the AAP sites have been opened;
2. Reduction in traffic generated in the AAP area thorough parking control and associated smarter choice interventions
3. Increase in walking and cycling reducing highway traffic demand across London

4.2 The mitigation scenarios have been developed by first using the analysis of the network conditions described in Chapter 3 to develop interventions on the highway network. This has been implemented by amending the network coding at a number of junctions. The different demand scenarios have then been run using this network to understand the combined effects of the mitigation measures. For the walk/ cycle tests a number of scenarios have been developed with different assumptions of the increase in these slow modes.

4.3 This chapter describes the assumptions used to develop the different scenarios and some detailed analysis of the key scenarios. Finally the borough statistics for Haringey are compared for all the demand scenarios.

Network Mitigation

4.4 Based on the analysis outlined in Chapter 3, an additional scenario has been devised - 'Do Something with mitigation' - which includes modest mitigation measures to reduce congestion caused by the additional AAP development sites.

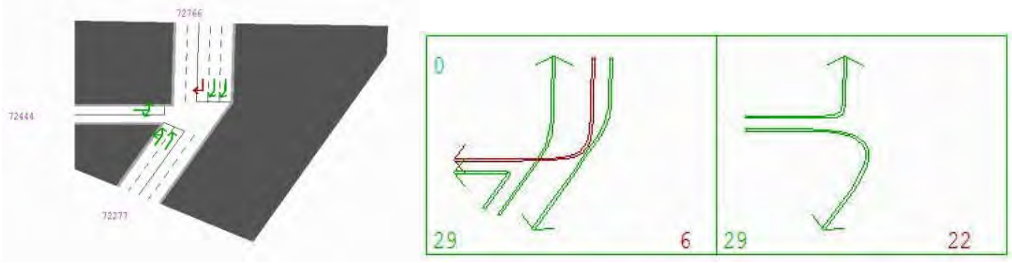
4.5 Further analysis showed that the additional delay observed in Chapter 3 was predominantly caused by delay at junctions and therefore mitigation has been focused on junction improvements.

4.6 In Chapter 3 (para 3.50), issues were identified at six junctions. For four of these junctions, mitigation measures have been identified. These measures reduce congestion at the junctions thereby reducing delay in the highway network.

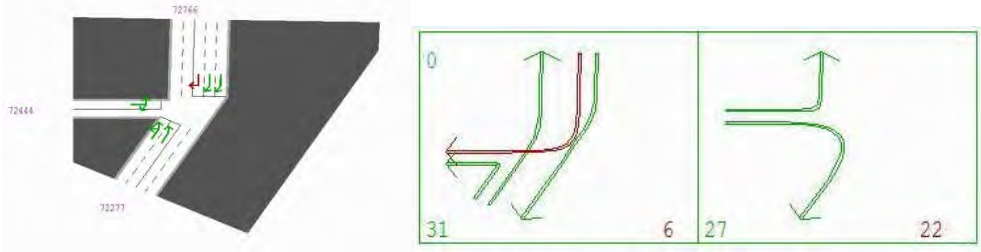
- Node 72113 - A1055 Watermead Way/Marigold Road: For this junction, the signals have been optimised to allow more green time for traffic travelling on Watermead Way (72277/72766). This is shown in Figure 4.1.
- Node 72031 - A503 Seven Sisters Road/Amhurst Park (near Woodberry Down): For this junction, the signals have been optimised to allow more green time for traffic travelling on Seven Sisters Road (72431/73013). This is shown in Figure 4.2.
- Node 72053 - High Road/Broad Lane/West Green Road: For this junction, a number of movements that do not carry significant traffic have been banned to increase capacity for the important movements. The movements banned are the left turn from the High Road SB, the left turn from West Green Road and the right turn from Broad Ln (except for buses) This is shown in Figure 4.3 – Broad lane approach is labelled 72024.
- Node 72069 - Ferry Lane/ Broad Lane/ The Hale: The right turn from The Hale to Broad Lane is given sole use of the outer two lanes, with the left turn to Ferry Lane reduced to one lane. This is shown in Figure 4.4.

Figure 4.1: Proposed mitigation for 72113 A1055 Watermead Way/Marigold Road[16]

Original



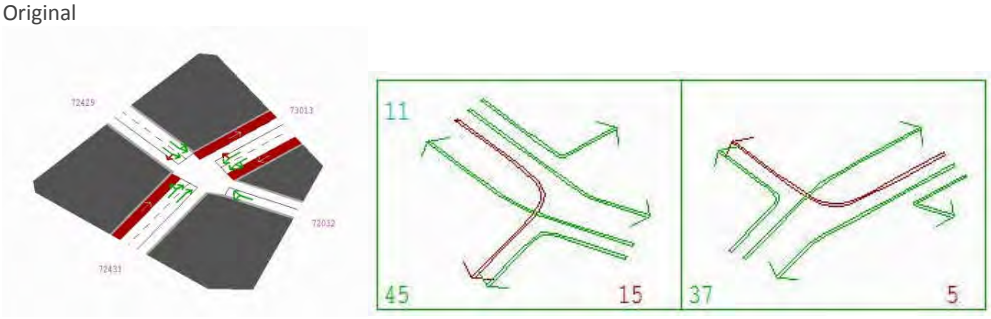
With Mitigation



[16] The green and red arrows on the junction diagrams show the lanes on each approach to the junction and the possible turns that can be made in each lane.

Figure 4.2: Proposed mitigation for 72031 A503 Seven Sisters Road/Amhurst Park (near Woodberry Down)

Original



With Mitigation

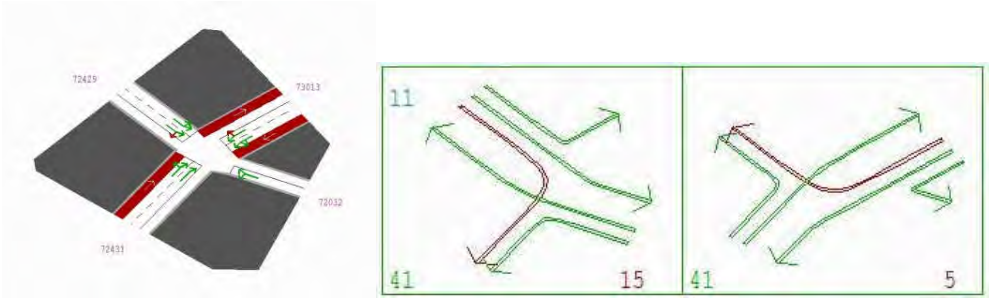
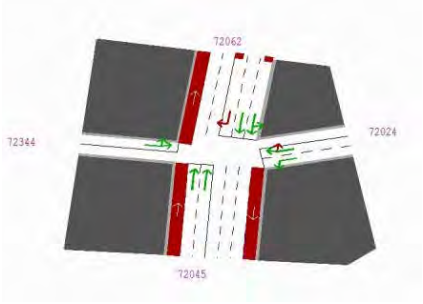
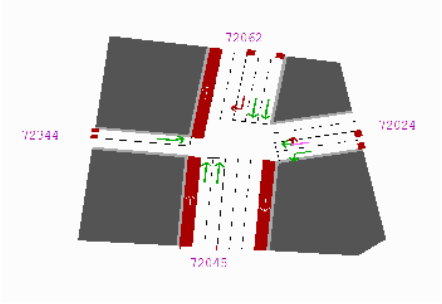


Figure 4.3: Proposed mitigation for 72053 Seven Sisters Tube Station/High Road/West Green Road[17]

Original



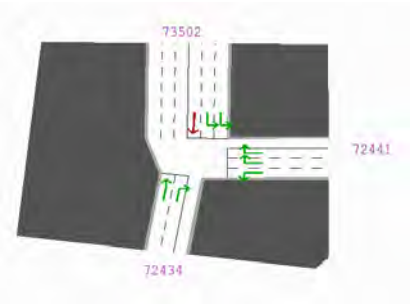
With Mitigation



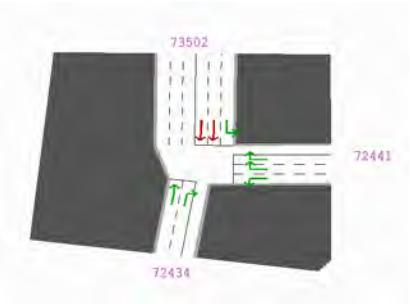
[17] The green and red arrows on the junction diagrams show the lanes on each approach to the junction and the possible turns that can be made in each lane.

Figure 4.4: Proposed mitigation for 72069 Ferry Lane/ Broad Lane/ The Hale

Original



With Mitigation



4.7 The following two junctions do not have any obvious potential mitigation measures. The signals could not be optimised since the V/C is already >100% on all approaches. There is also no scope to widen the roads at these junctions or options to change the lane allocation:

- A504 West Green Road/Lawrence Road – however this junction is improved by the mitigation measures at the junction of West Green Road/ High Road as this reduces the queues on West Green Road which blocked back to the junction with Lawrence road in the DS.
- Turnpike Lane Tube Station – A105 Green Lanes/A504 Turnpike Lane/Westbury Avenue

4.8 Figure 4.5 to Figure 4.8 show the overall change in delay on the network, by link and by junction, when the mitigation measures are applied, comparing with the do minimum and do something respectively (Figure 4.10 to Figure 4.13 show the same information for the PM). These delay plots show that changes to the network alone cannot mitigate the impacts of the AAP, however it does show that significant improvements can be made through reallocating capacity on the gyratory.

4.9 The delay plots shown comparing do something with and without mitigation (Figure 4.6 and Figure 4.10) should also be compared with the changes in actual flows between the two scenarios (Figure 4.9). Actual flows are the flows that can get through the network during the modelled hour rather than demand which includes traffic still queued on the network due to insufficient capacity on the network. The additional flows seen in the Tottenham Hale area show that the mitigation measures have not only reduced delays, but also result in less diversion away from Tottenham Hale and reduced the queueing in the AAP area.

4.10 Table 4.1 shows the impact of the mitigation measures on delay at each junction where mitigation has been identified. Most locations have shown a decrease in delays for some movements when compared to the Do Something scenario. For a smaller number of movements delays are improved compared to the Do Minimum.

4.11 From this analysis, it can be seen that the mitigation measures offer some relief to the additional congestion following the implementation of the AAP. However, further mitigation would be required to fully alleviate the impact of the AAP development proposals on the highway network.

Figure 4.5: Change in delay (Do Something with mitigation relative to Do Minimum scenario) – AM peak

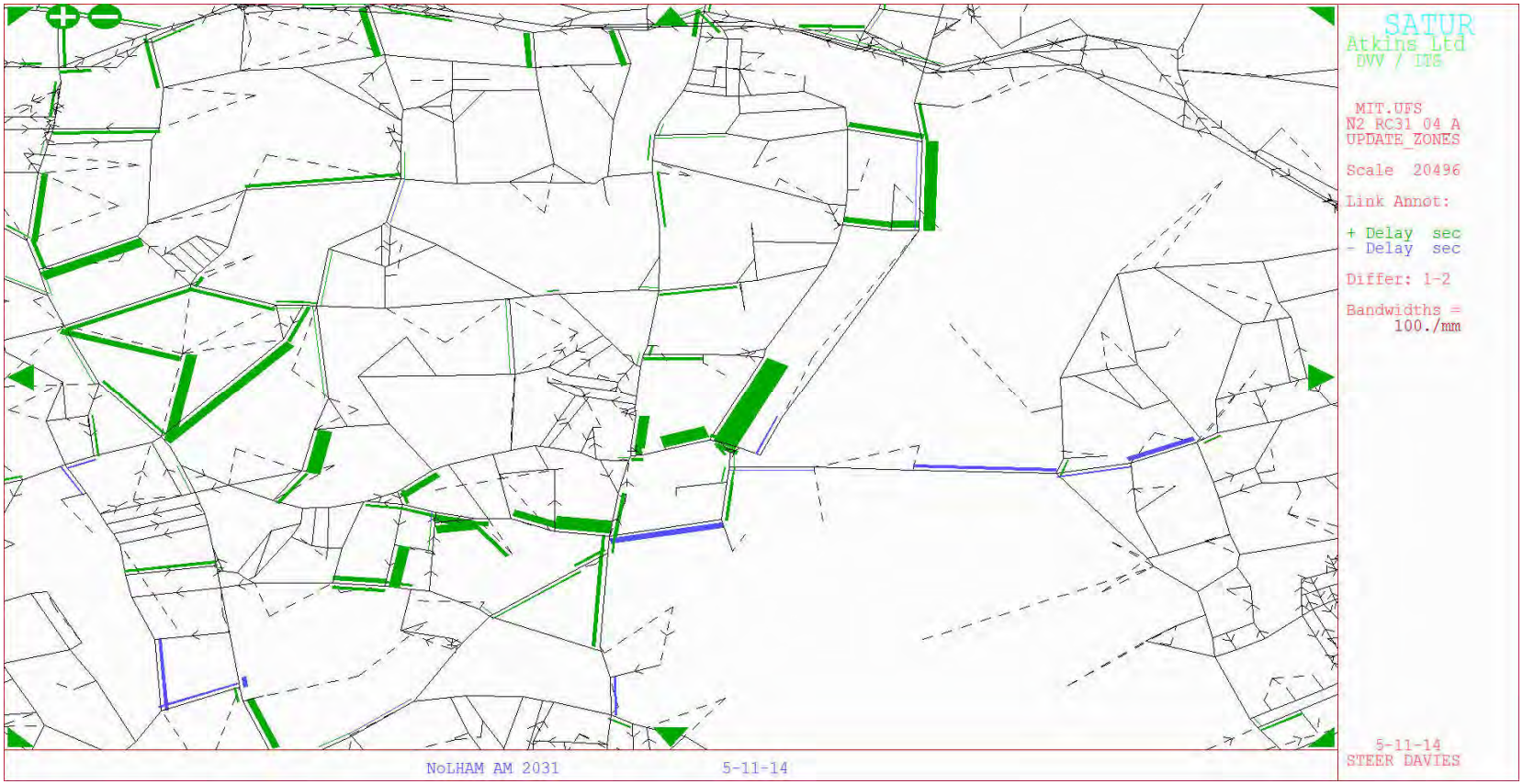
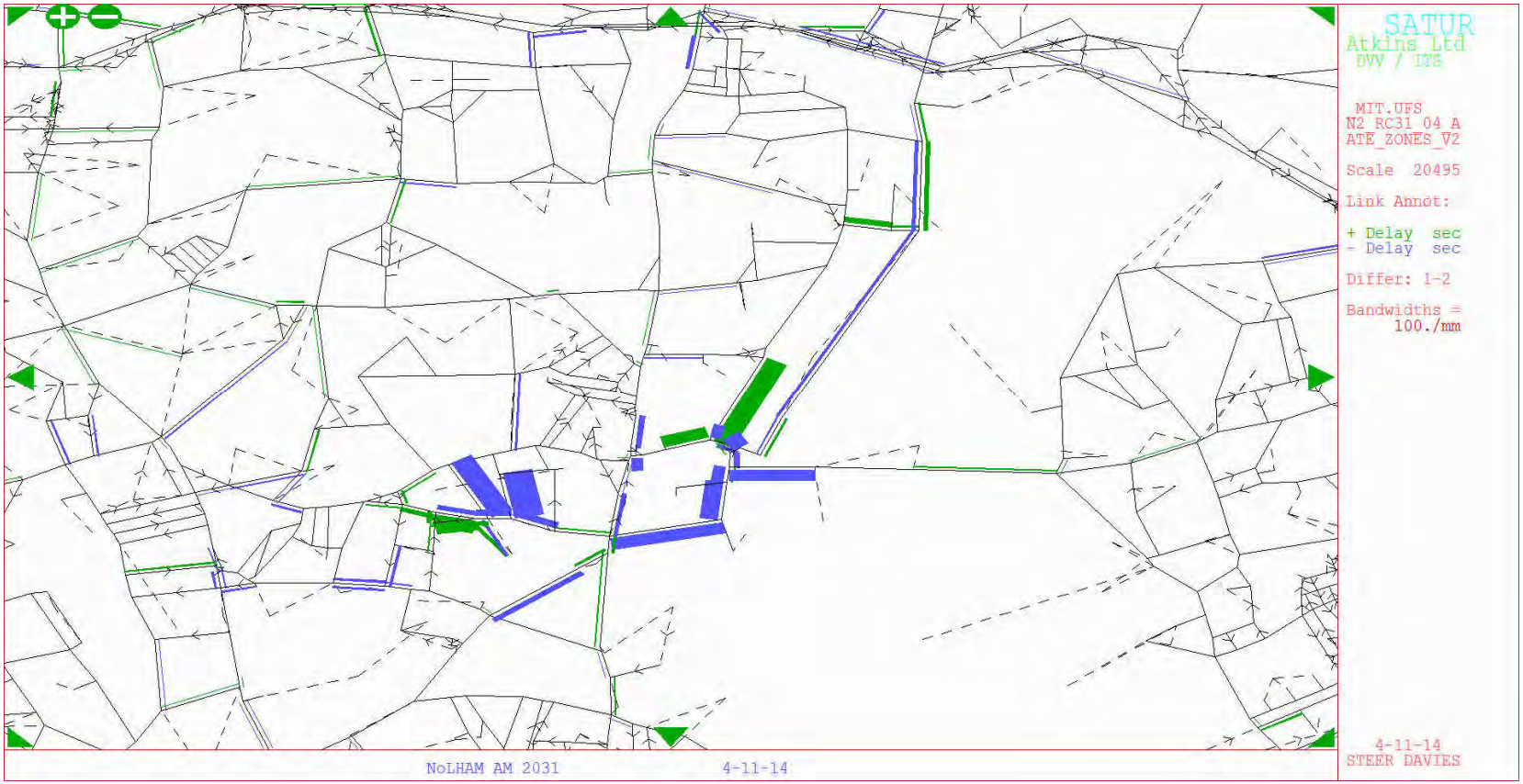
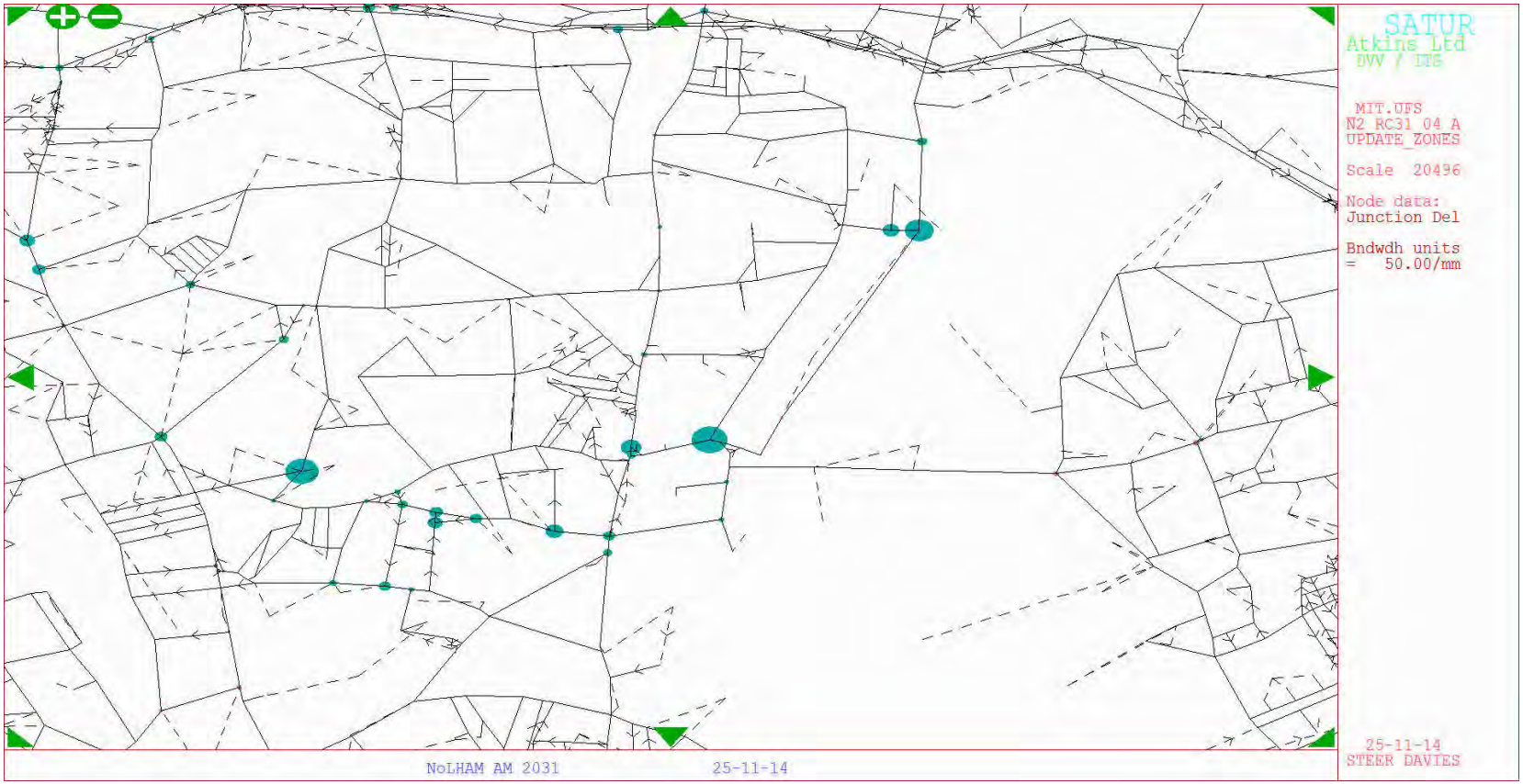


Figure 4.6: Change in delay (Do Something with mitigation relative to Do Something scenario) – AM peak[18]



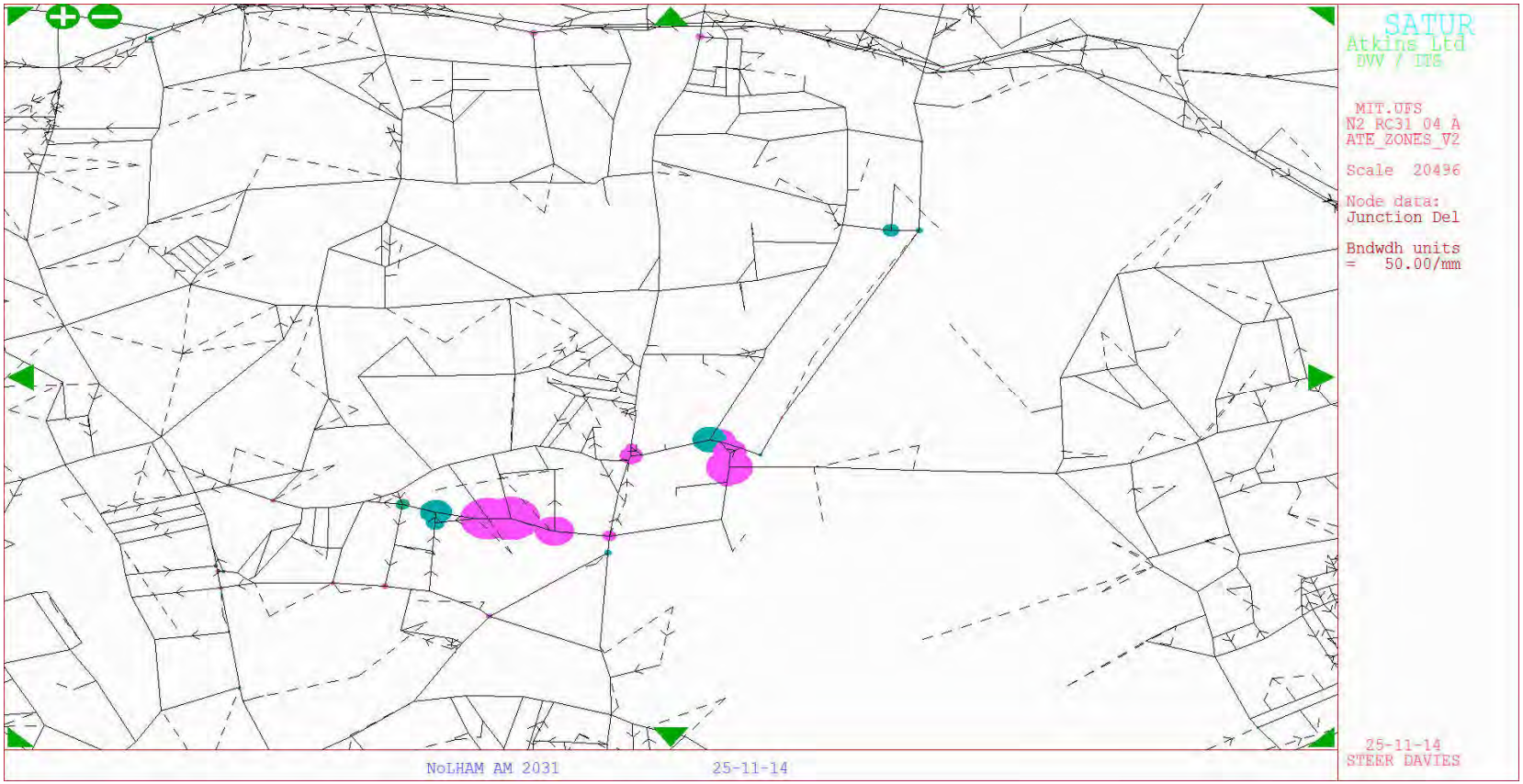
[18] The green bars show an increase in delay on a particular link (a road) in the network. The blue bars show a reduction in delay on a particular link (a road) in the network. The size of the bar is relative to the change in delay.

Figure 4.7: Change in junction delay (Do Something with mitigation relative to Do Minimum scenario) – AM peak[19]



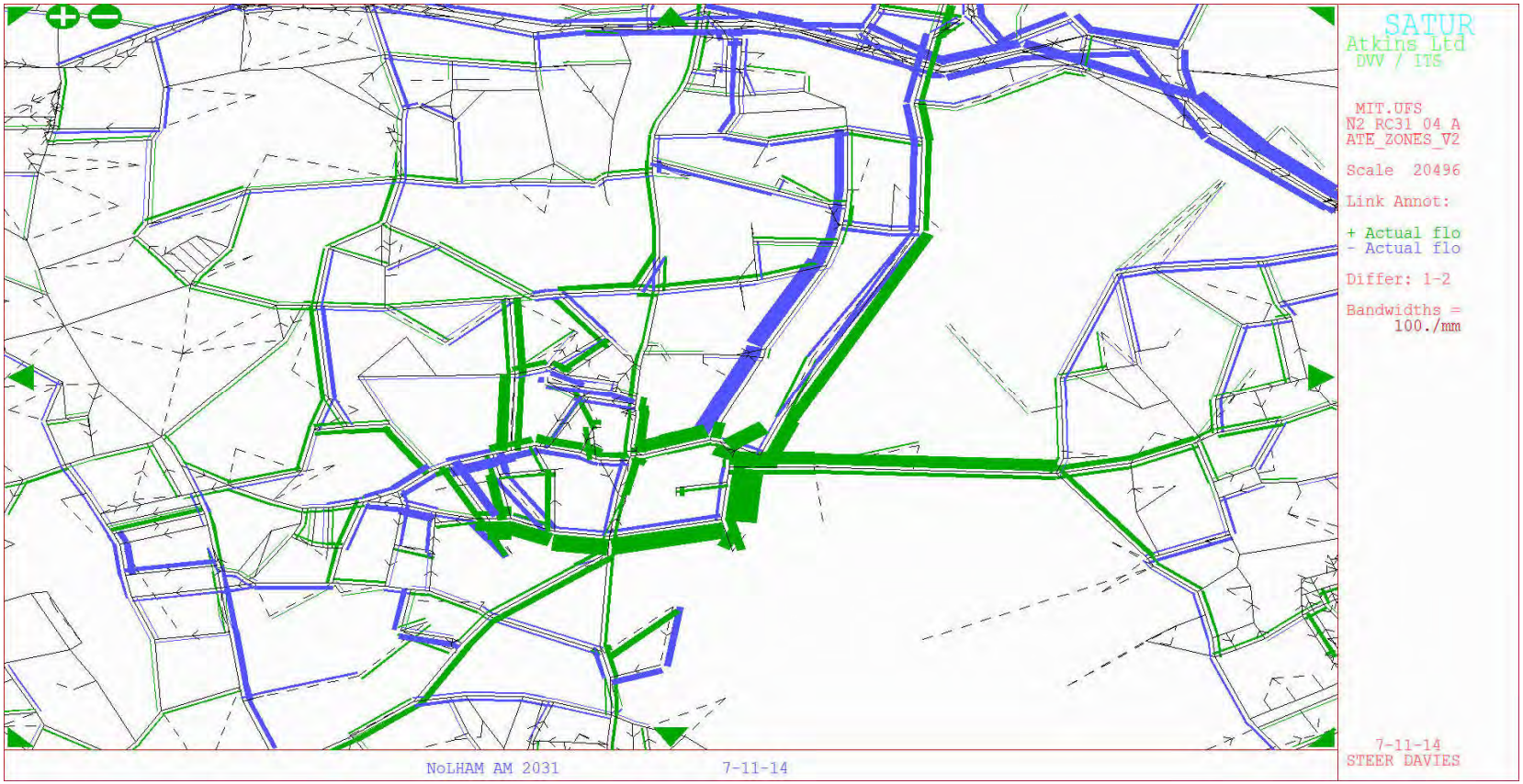
[19] Circles shows change in junction delay between scenarios with larger circles showing bigger changes – blue shows an increase in delay in the Do Something with mitigation and pink a decrease

Figure 4.8: Change in junction delay (Do Something with mitigation relative to Do Something scenario) – AM peak[20]



[20] Circles shows change in junction delay between scenarios with larger circles showing bigger changes – blue shows an increase in delay in the Do Something with mitigation and pink a decrease

Figure 4.9: Change in Actual Flows (Do Something with mitigation relative to Do Something scenario) – AM peak [21]



[21] The green bars show an increase in actual flows on a particular link (a road) in the network. The blue bars show a reduction in actual flows on a particular link (a road) in the network. The size of the bar is relative to the change in flow.

Figure 4.10: Change in delay (Do Something with mitigation relative to Do Minimum scenario) – PM peak

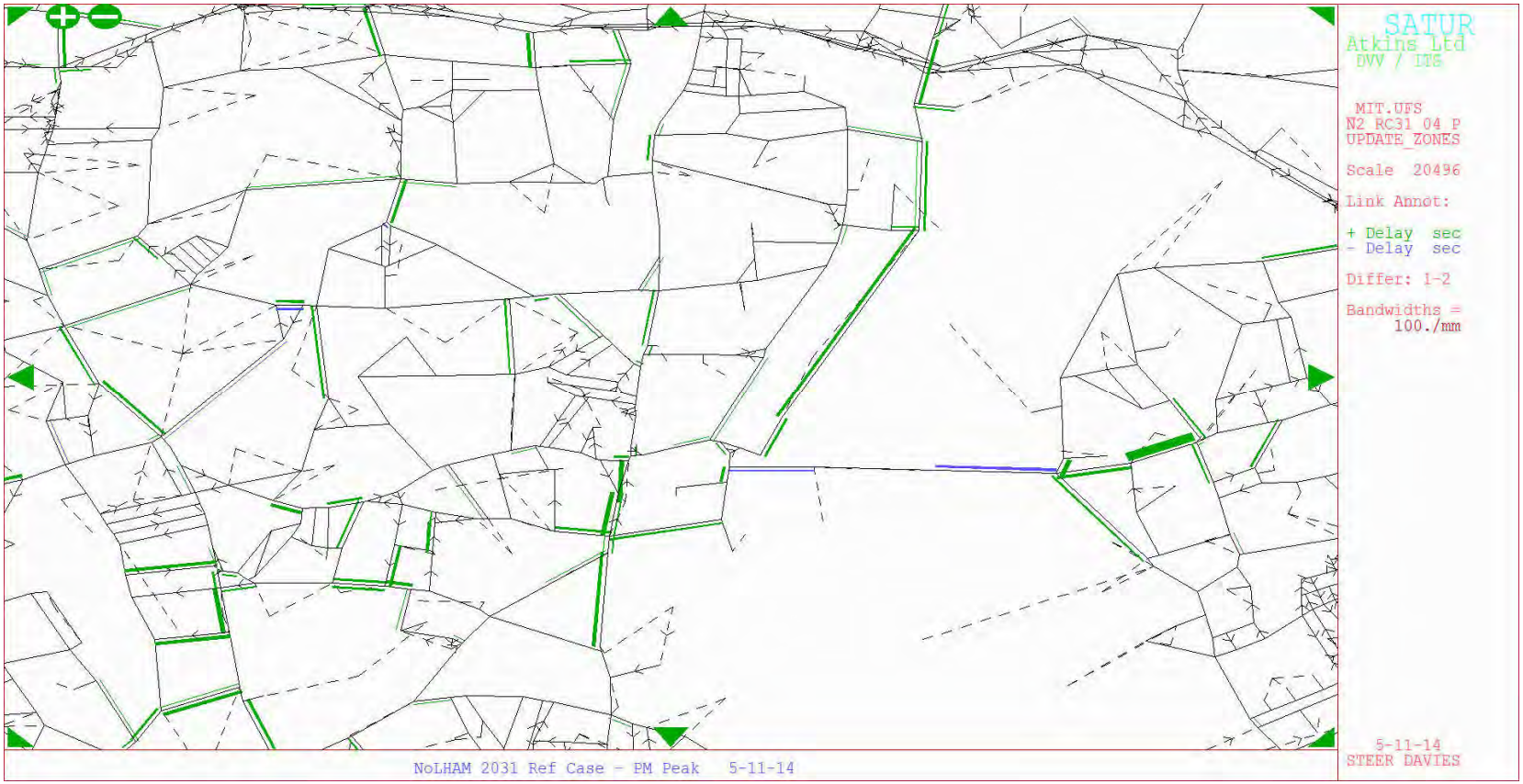
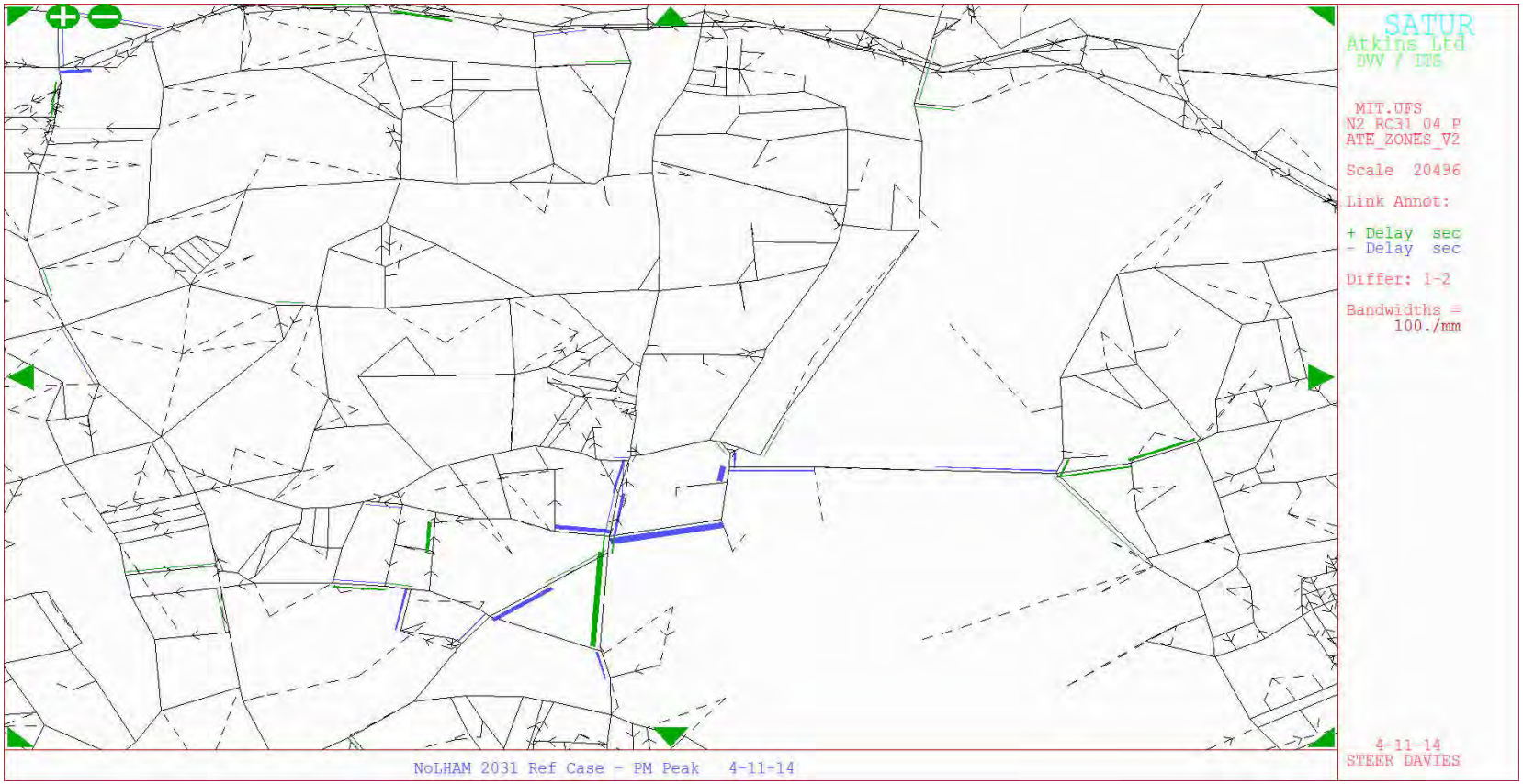


Figure 4.11: Change in delay (Do Something with mitigation relative to Do Something scenario) – PM peak[22]



[22] The green bars show an increase in delay on a particular link (a road) in the network. The blue bars show a reduction in delay on a particular link (a road) in the network. The size of the bar is relative to the change in delay.

Figure 4.12: Change in junction delay (Do Something with mitigation relative to Do Minimum scenario) – PM peak

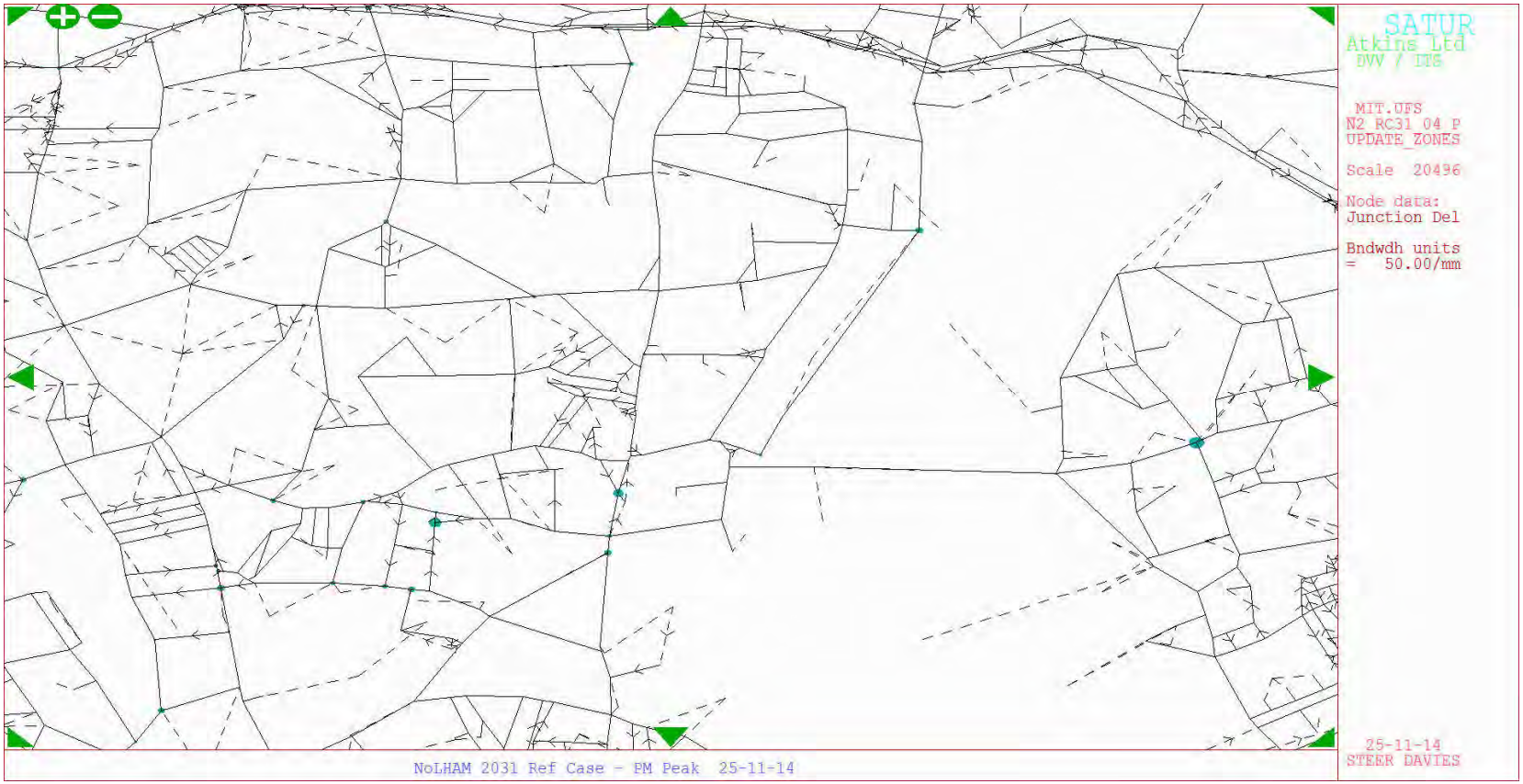


Figure 4.13: Change in junction delay (Do Something with mitigation relative to Do Something scenario) – PM peak

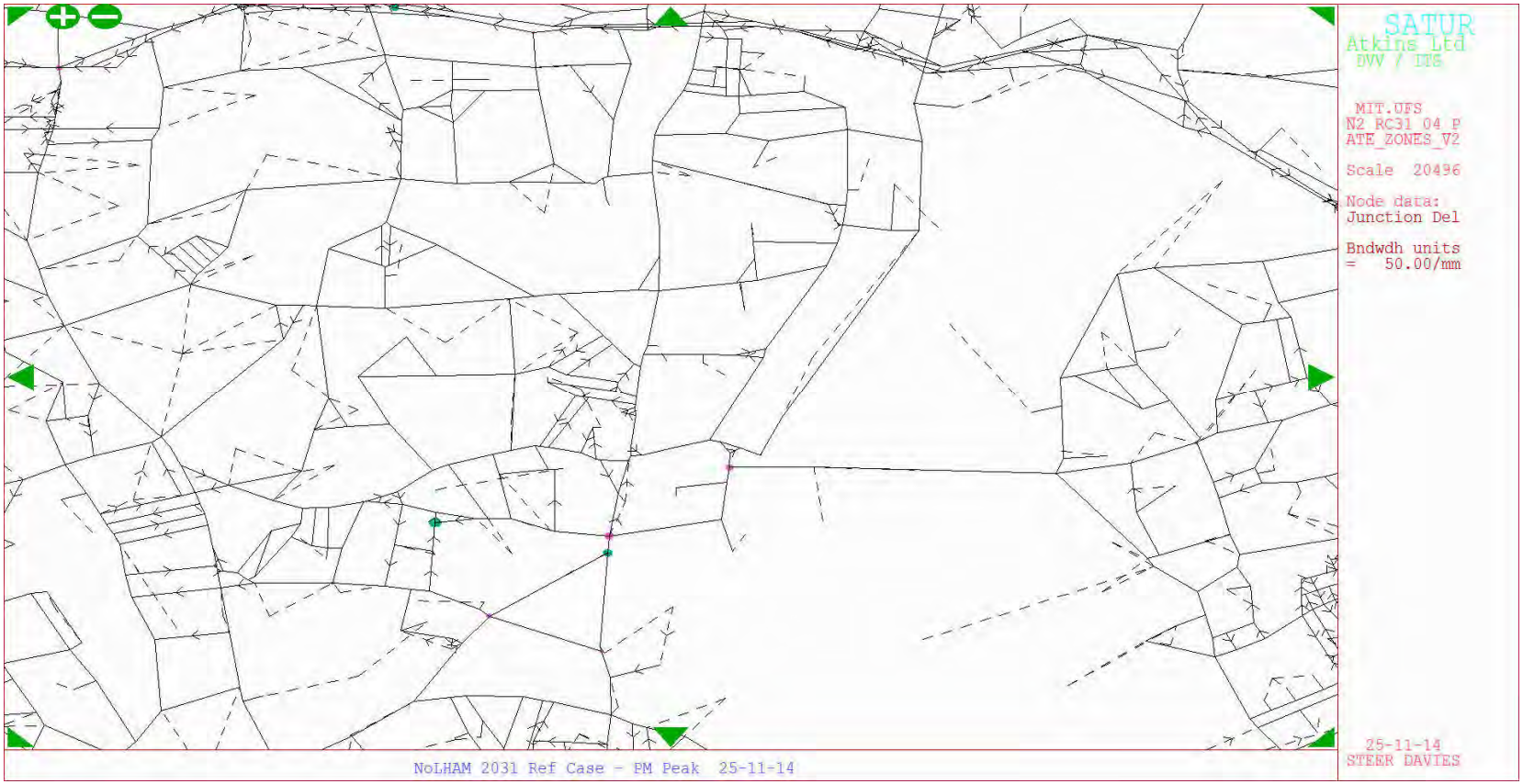


Figure 4.14: Change in Actual Flows (Do Something with mitigation relative to Do Something scenario) – PM peak

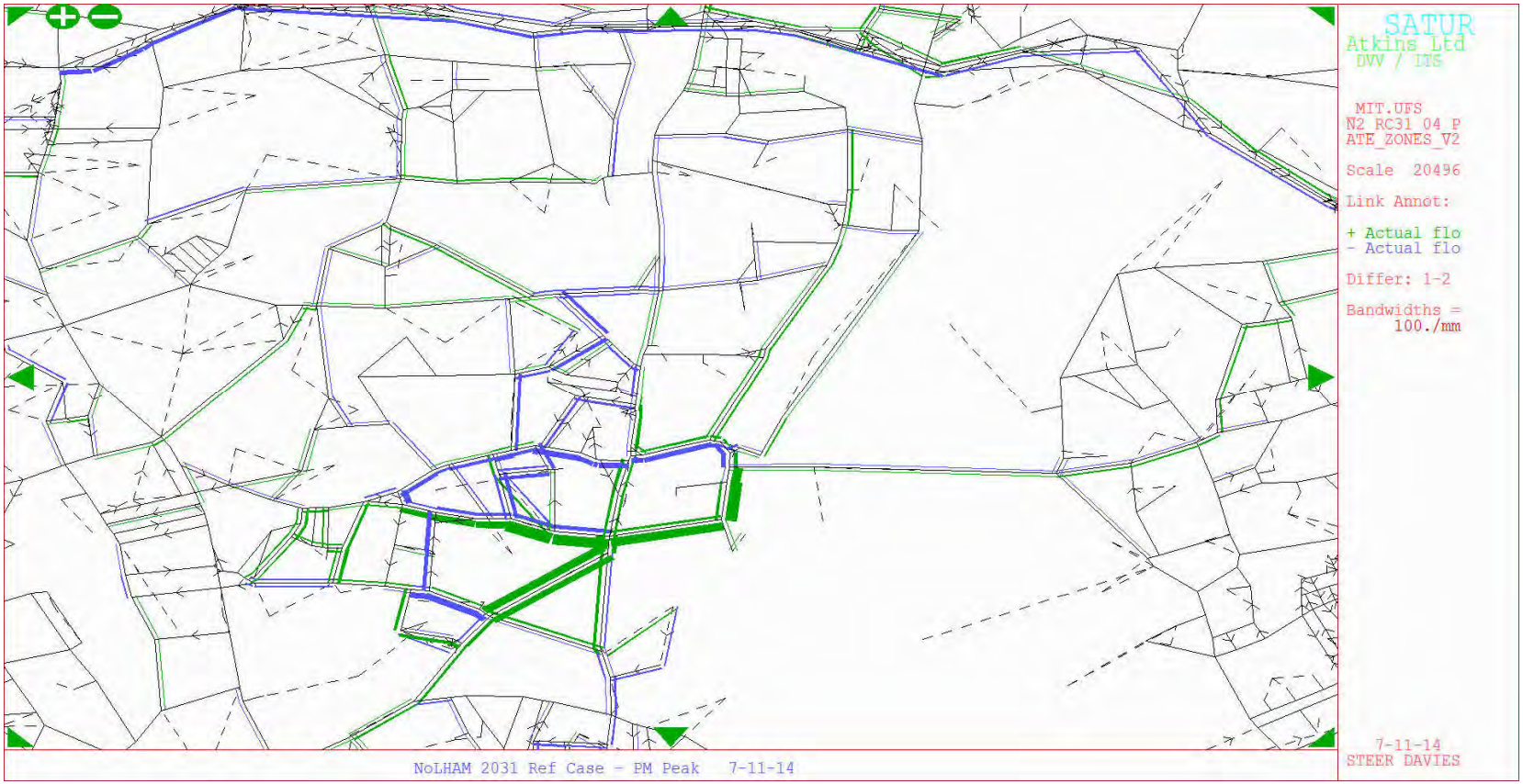
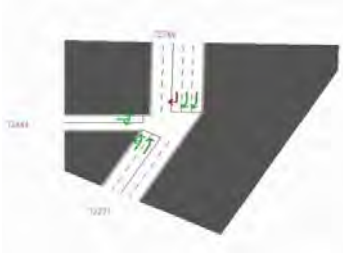
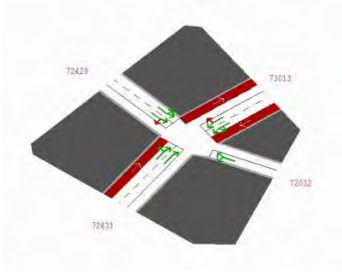
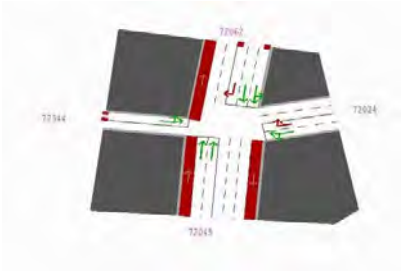


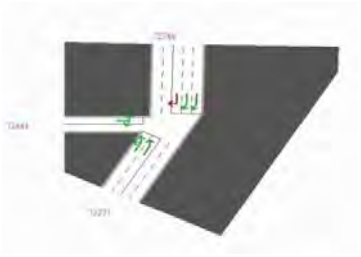
Table 4.1: Detailed Junction Analysis[23]

1. 72113 A1055 Watermead Way/Marigold Road	Road Name (Node number)	DM	DS	DS_mit	DS_mit - DS
			AM Peak		
	72444	38	200	241	41
	72766	66	253	324	71
	72277	36	92	34	-58
			PM Peak		
	72444	37	61	60	-1
	72766	41	69	76	8
	72277	179	243	244	1

2. 72031 A503 Seven Sisters Road/Amhurst Park (near Woodberry Down)	Road Name (Node number)	DM	DS	DS_mit	DS_mit - DS
			AM Peak		
	72429	30	32	49	17
	73013	40	204	65	-139
	72032	26	28	32	4
	72431	43	46	38	-8
			PM Peak		
	72429	30	34	35	1
	73013	37	142	44	-98
	72032	26	27	26	-1
	72431	65	93	68	-25

[23] Average delay weighted by demand (actual flow) across all turns. The green and red arrows on the junction diagrams show the lanes on each approach to the junction and the possible turns that can be made in each lane.

3. 72053 High Road/ Broad Lane/West Green Road	Road Name (Node number)	DM	DS	DS_mit	DS_mit - DS
					
			AM Peak		
	72344	66	414	438	24
	72062	457	614	528	-86
	72024	586	783	438	-345
	72045	52	122	116	-6
			PM Peak		
	72344	41	183	81	-102
	72062	51	114	72	-42
	72024	70	260	100	-160
	72045	39	36	57	21

6. 72069 Ferry Lane/ Broad Lane/ The Hale	Road Name (Node number)	DM	DS	DS_mit	DS_mit - DS
					
			AM Peak		
	73502	32	178	43	-135
	72441	32	351	18	-333
	72434	58	364	85	-279
			PM Peak		
	73502	12	40	18	-22
	72441	40	63	15	-48
	72434	120	93	181	88

Key Links

4.12 Further analysis of the impact of mitigation on key link flows has been carried out and the results reported in Table 4.2 and Table 4.3.

4.13 The significant increases in flows on a number of links close to Tottenham Hale and Seven Sisters: particularly in the AM peak where flows are highest, illustrates the impact of the mitigation measures where more traffic can flow through the area.

Table 4.2: Flows on Key Links – AM Peak hour – Impact of Mitigation

Road section		Do-Minimum	Do-something	Do-something + Mitigation	DS (with mitigation) - DS
A107 Amhurst Park		1000	1180	1103	-73
A10 High Road, S Tottenham		2160	2230	2278	47
A503 Seven Sisters Road		1610	1240	1475	237
Tottenham High Road		3130	2970	2970	1
Broad Lane		1350	1560	1978	417
Monument Way		3270	2930	3384	454
Broad Lane, S of Ferry Lane		1380	1490	2162	669
Ferry Lane		2100	1700	2139	438
Watermead Way		2280	1920	2227	309
A1010 High Road		1500	1550	1626	79
Bruce Grove		780	920	912	-7
Lordship Lane		1310	1580	1712	128
Lansdowne Road		900	1030	1111	79
High Road (THFC)		1610	1790	1865	77
White Hart Lane		1250	1370	1390	25
Northumberland Park		170	430	381	-50

Table 4.3: Flows on Key Links – PM Peak hour – Impact of Mitigation

Road section		Do-Minimum	Do-something	Do-something + Mitigation	DS (with mitigation) - DS
A107 Amhurst Park		1000	1040	1026	-12
A10 High Road, S Tottenham		2170	2210	2243	36
A503 Seven Sisters Road		1470	1150	1516	363
Tottenham High Road		2940	3000	3090	86
Broad Lane		1480	1550	1825	278
Monument Way		3630	3860	3781	-79
Broad Lane, S of Ferry Lane		1470	1750	2056	311
Ferry Lane		2130	2140	2141	-1
Watermead Way		2110	2290	2313	27
A1010 High Road		1250	1320	1334	15
Bruce Grove		760	830	772	-54
Lordship Lane		1310	1680	1623	-57
Lansdowne Road		850	1110	1088	-25
High Road (THFC)		1350	1520	1505	-18
White Hart Lane		1010	1320	1319	-4
Northumberland Park		220	420	412	-6

Parking Mitigation Tests

4.14 The network mitigation measures will alleviate some of the most significant delays in the area. However network conditions would still be significantly worse than the Do Minimum unless further mitigation measures are introduced. An effective policy measure that Haringey Council could introduce is additional parking controls in the Tottenham area. If this is coupled with other smarter travel measures then it is expected there will be a reduction in traffic demand to and from the AAP area. To test the impacts of the parking mitigation measures we have undertaken a sensitivity tests with the following assumptions:

- The new AAP sites will be developed so that car mode shares are 5% for all AAP sites.
- A reduction in traffic of 5% for trips that are to and from the AAP study area, but not to or from the AAP development sites themselves.

4.15 This test has been run with the inclusion of all network mitigation measures described earlier, to provide a combined assessment of the intervention measures. Figure 4.15 to Figure 4.17 on the following pages show the change in delay and actual flows, comparing the Do Something with Network and Parking mitigation, against the Do Something with Network (only) mitigation. Figure 4.18 to Figure 4.20 show the same information for the PM peak.

4.16 These interventions provide a further reduction in delay spread across junctions in the AAP area (particularly in the AM peak). The changes are more moderate compared to the network mitigation measures, where the largest and most extreme delays were addressed.

Figure 4.15: Change in Link Delay (Do Something Parking and Network Mitigation compared to Do Something with Network Mitigation) AM Peak

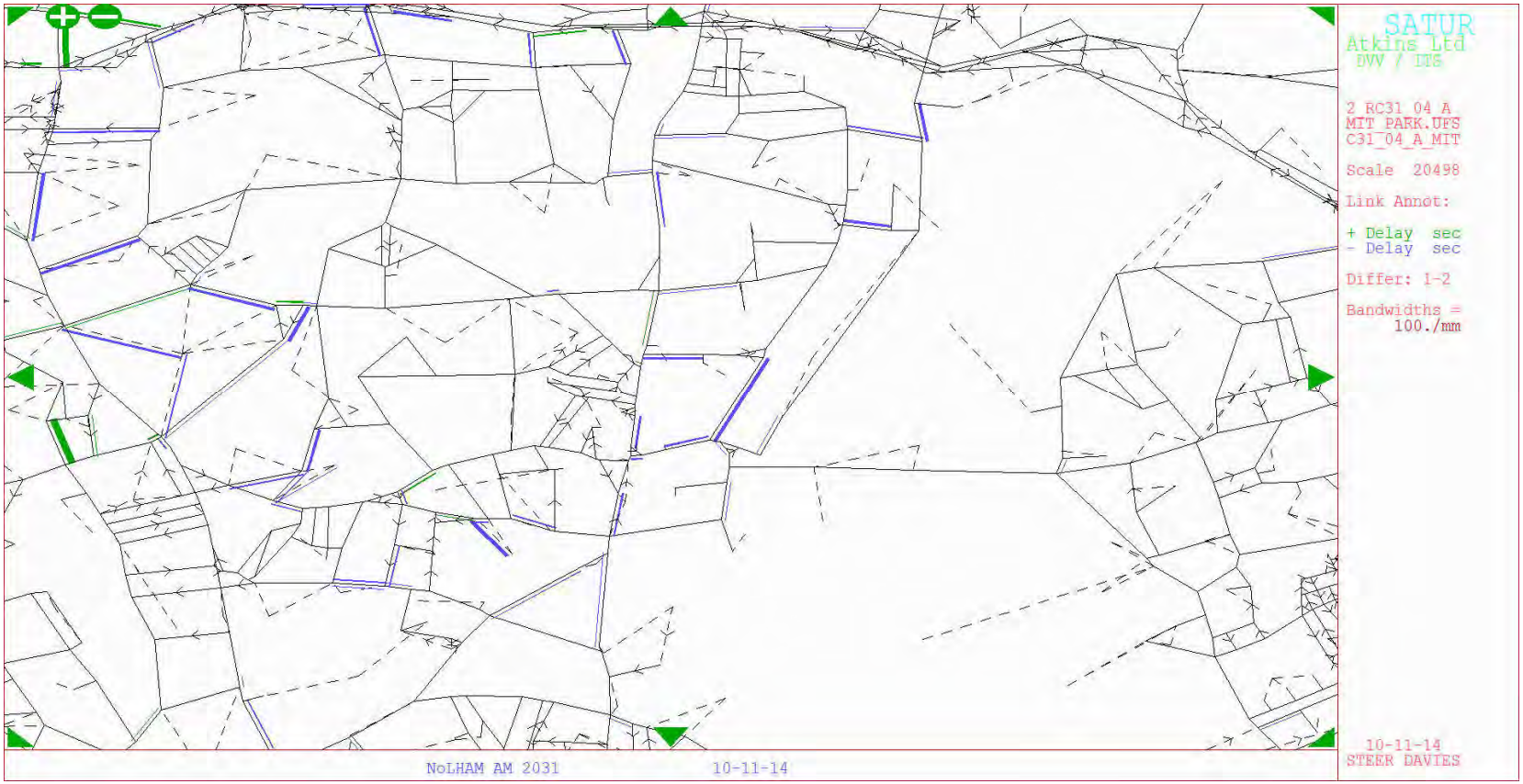


Figure 4.16: Change in Junction Delay (Do Something Parking and Network Mitigation compared to Do Something with Network Mitigation) AM Peak

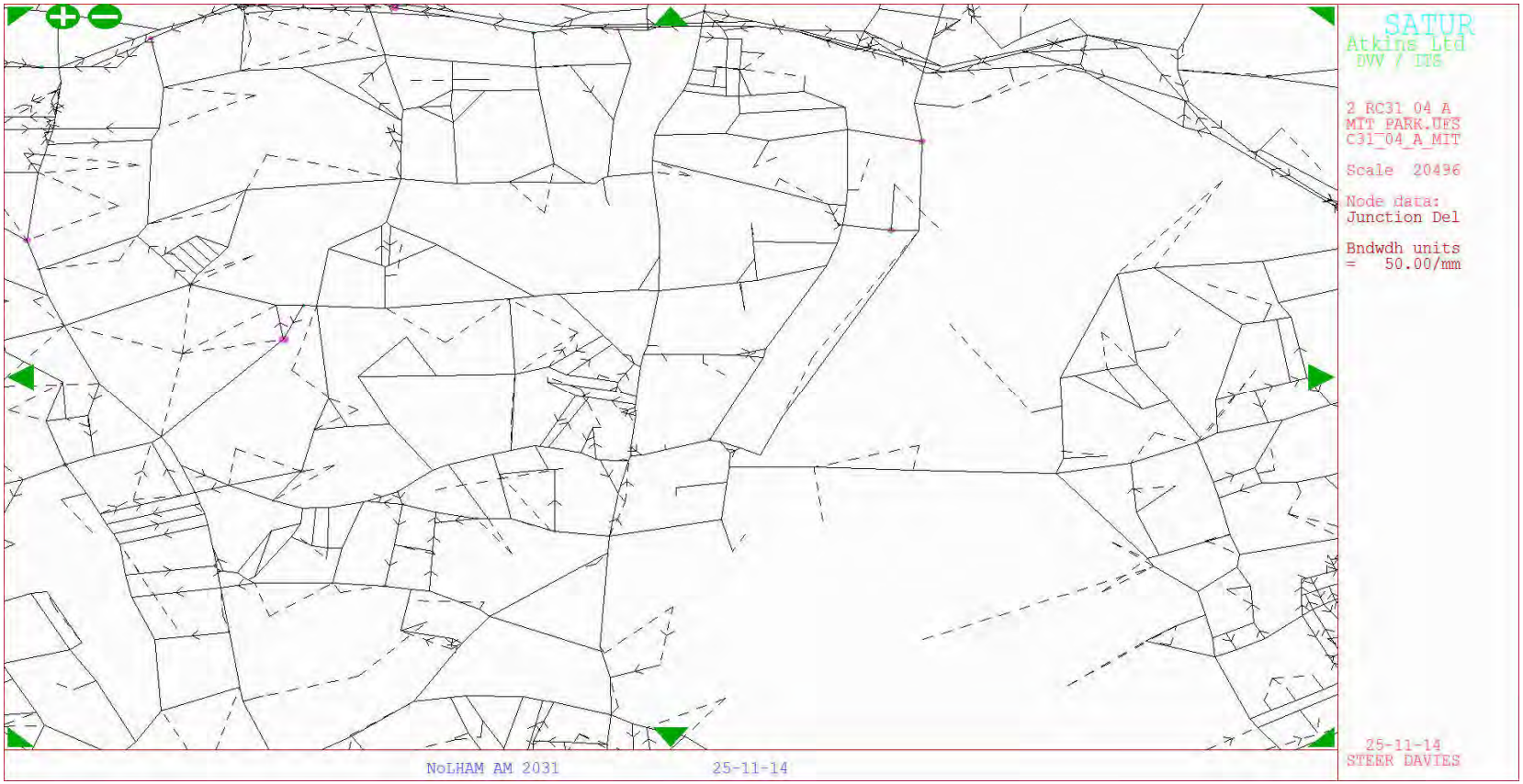


Figure 4.17: Change in Actual Flows (Do Something Parking and Network Mitigation compared to Do Something with Network Mitigation) –AM Peak

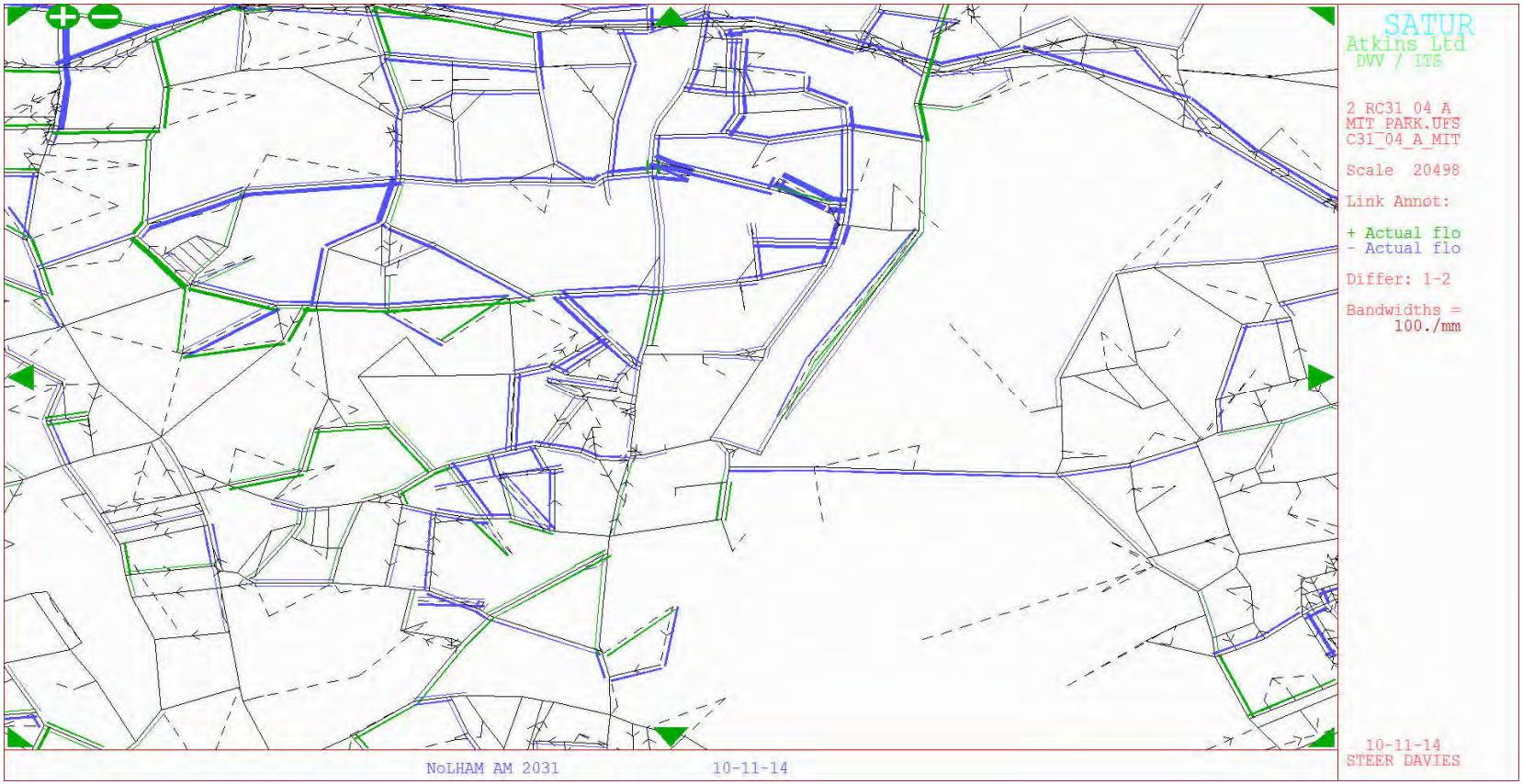


Figure 4.18: Change in Link Delay (Do Something Parking and Network Mitigation compared to Do Something with Network Mitigation) PM Peak

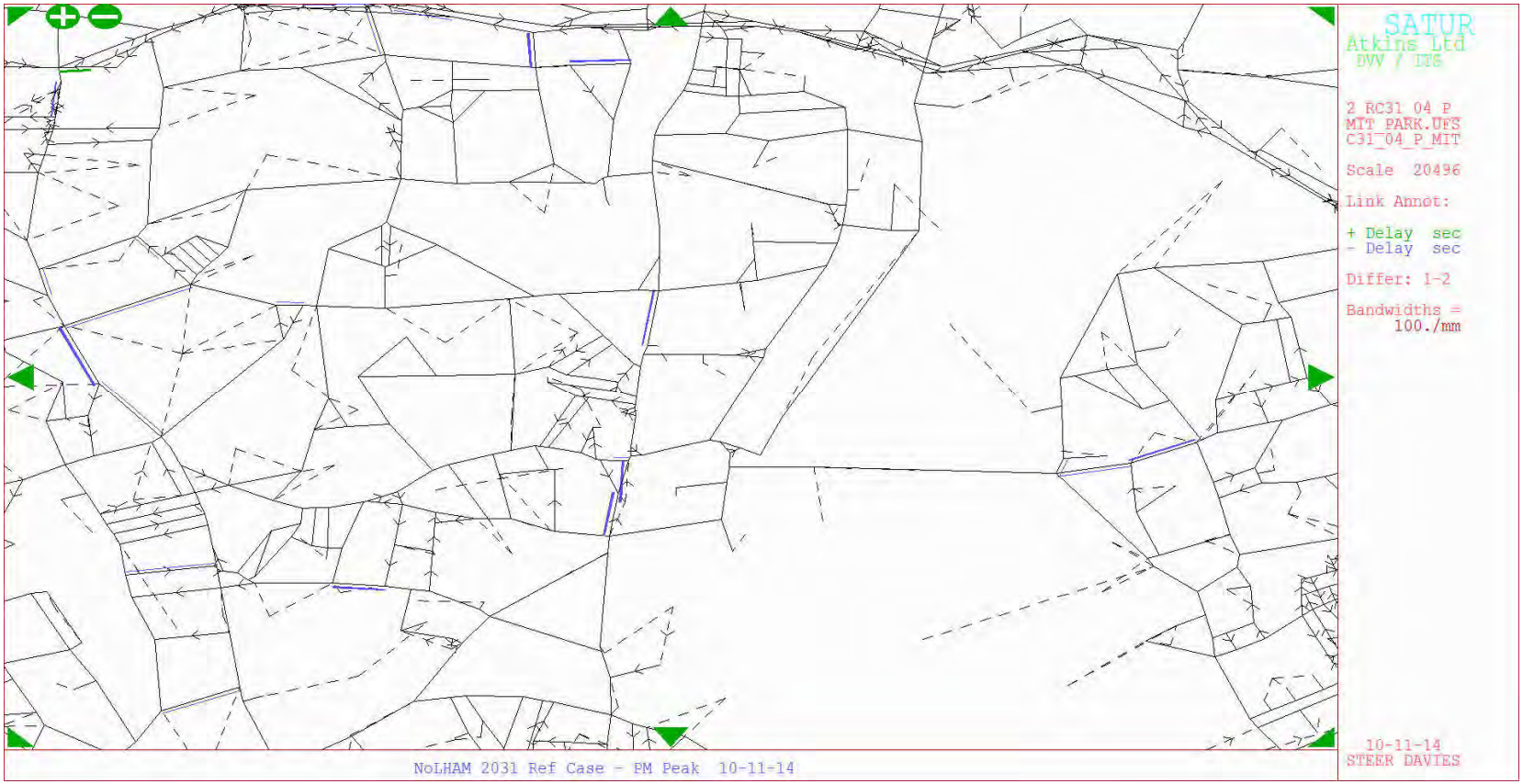


Figure 4.19: Change in Junction Delay (Do Something Parking and Network Mitigation compared to Do Something with Network Mitigation) PM Peak

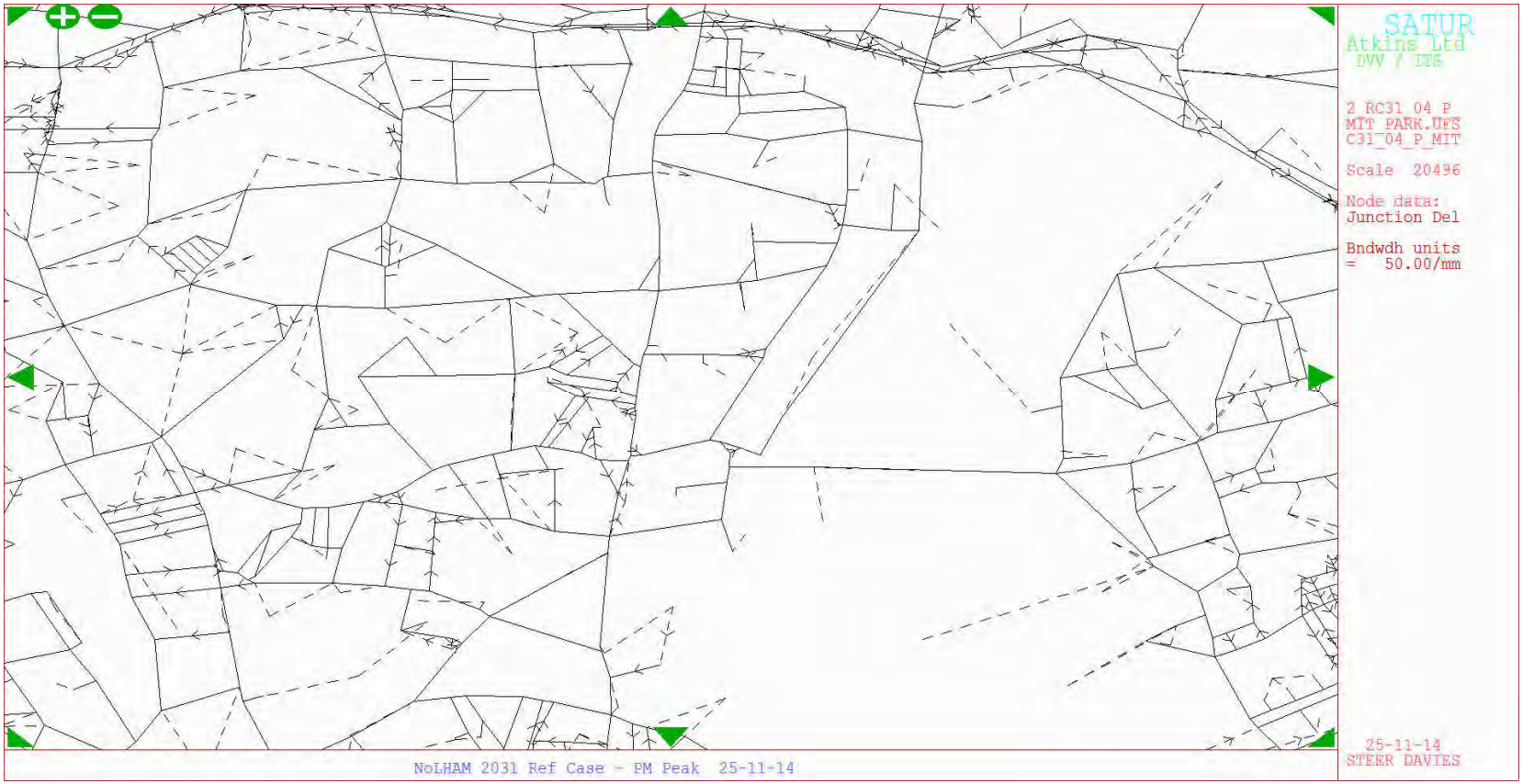
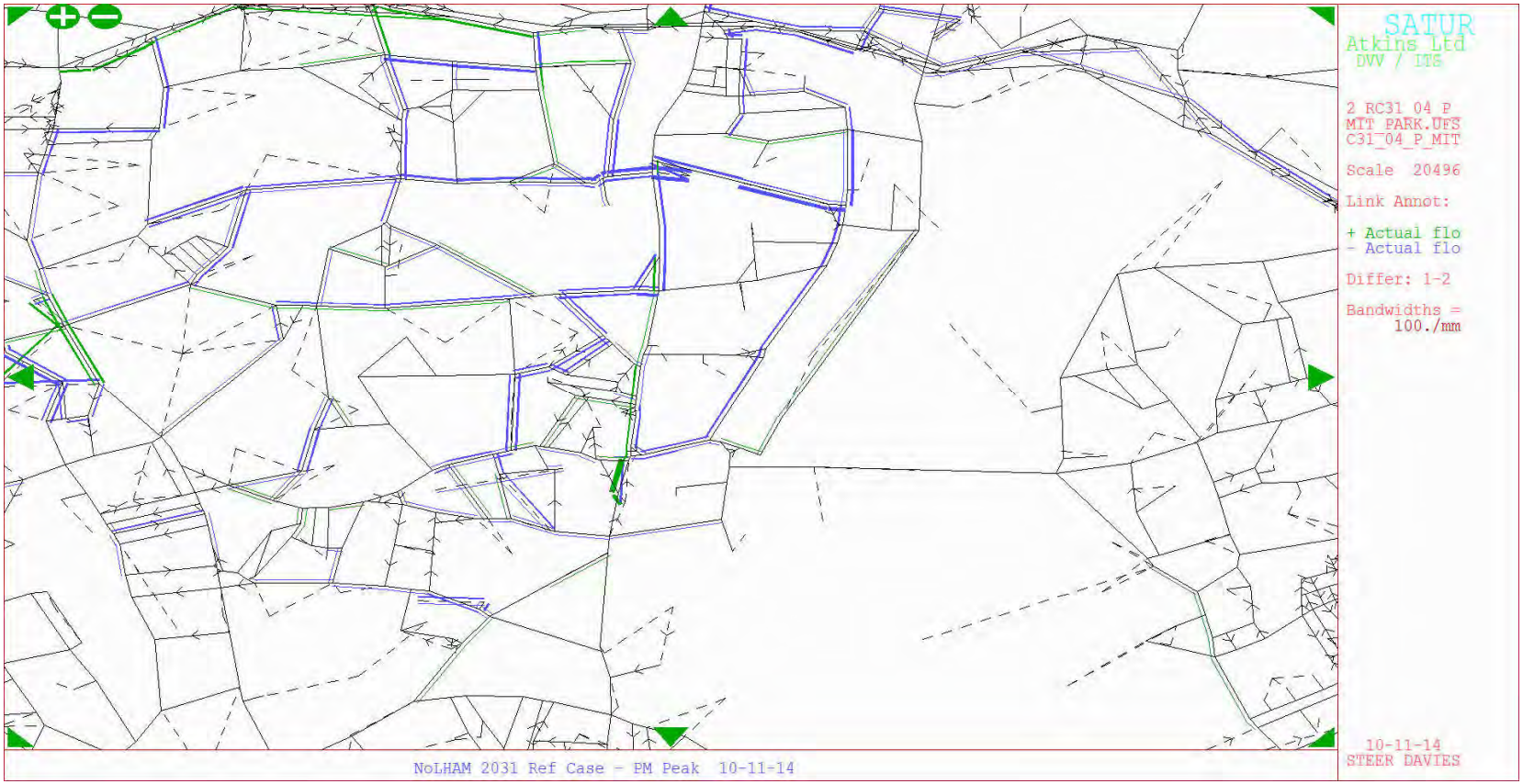


Figure 4.20: Change in Actual Flows (Do Something Parking and Network Mitigation compared to Do Something with Network Mitigation) –PM Peak



Walking and Cycling Tests

4.17 Transport for London (TfL) are working with the London Boroughs to deliver the Mayor's Transport Strategy, which includes a commitment to increase the cycling and walking mode shares. This involves major investment in cycling infrastructure in particular, including Cycle Superhighway 1 running through Tottenham into the City, and mini-Holland schemes in the neighbouring boroughs of Waltham Forest and Enfield.

4.18 There is uncertainty about how this investment in cycling and walking will affect the levels of car usage in London. Therefore a number of tests have been run with different assumptions about how the Mayor's strategy could affect the numbers of people driving. The assumptions have been developed by adjusting the car demand in London by analysing current mode shares and then adjusting down the demand to meet the Mayor's target.

4.19 According to the London Travel Demand Survey[24], in 2009/10, approximately a third of London residents travelled by car, a third by walking and a third by public transport and other modes. The mode share for cycling was 2.1%. Three tests have been developed to reduce the car demand:

- Cycling Mode share to increase to Mayor's Target of 5% with the proportion of cyclists coming evenly from existing mode shares (Walk/ Car/ PT) – This amounts to a **3% reduction in car demand in London**.
- Cycling Mode share to increase to Mayor's Target of 5% and walking mode share increases by 3%. All new cycle trips assumed to come from Car. This amounts to a **15.5% reduction in car demand in London.**

4.20 All these tests have been run with the network mitigation included. There are also versions with and without the parking mitigation so that the impacts can be analysed separately. The figures on the following pages show the differences in delay and actual flows between 3% reduction test (with parking mitigation), followed by the 15.5% reduction test(with the parking mitigation) n comparison with the Do Something (without mitigation) for the AM Peak and PM peaks.

4.21 The full mitigation test shows considerable reduction in delay across the AAP and in particular around Tottenham Hale and Seven Sisters. There are general reductions in actual flows across the network reflecting the lower car mode shares. However there is an increase in actual flows on some links around Tottenham Hale. This reflects the general reduction in delay, allowing traffic that was previously forced to divert away from the area back to the main roads around Tottenham Hale. In addition the reduction in background traffic increases junction capacity for some key movements, allowing an increase in traffic during the peak hours as they are no longer stuck in over capacity queues.

[24] TfL Travel in London, Supplementary Report: London Travel Demand Survey (LTDS), Chapter 5, p15, Table 5.1 Mode share of trips by London residents

Figure 4.21: Change in link delay (Do Something with Network and Parking mitigation and 3% reduction in car demand relative to Do Something scenario) – AM peak

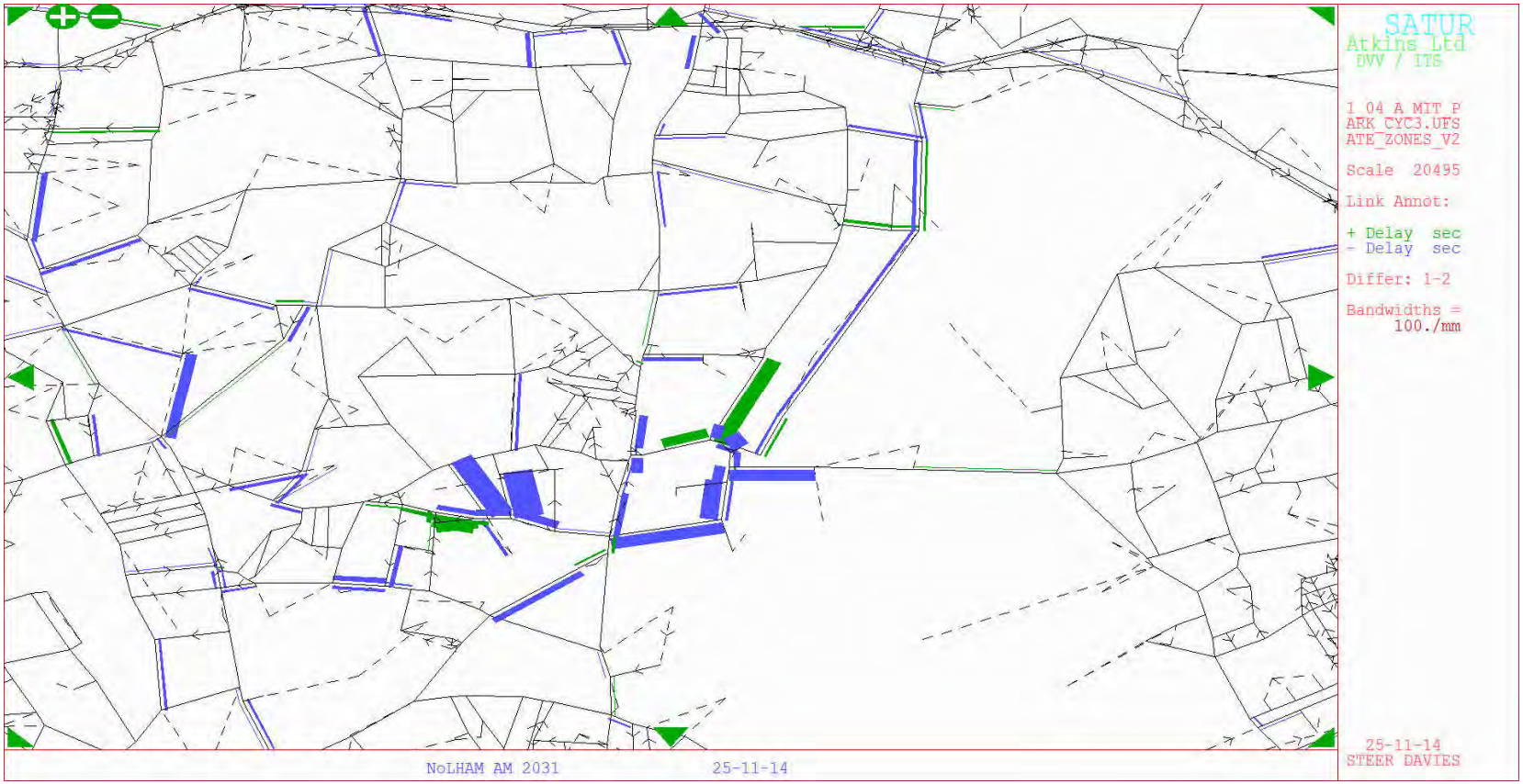


Figure 4.22: Change in junction delay (Do Something with Network and Parking mitigation and 3% reduction in car demand relative to Do Something scenario) – AM peak

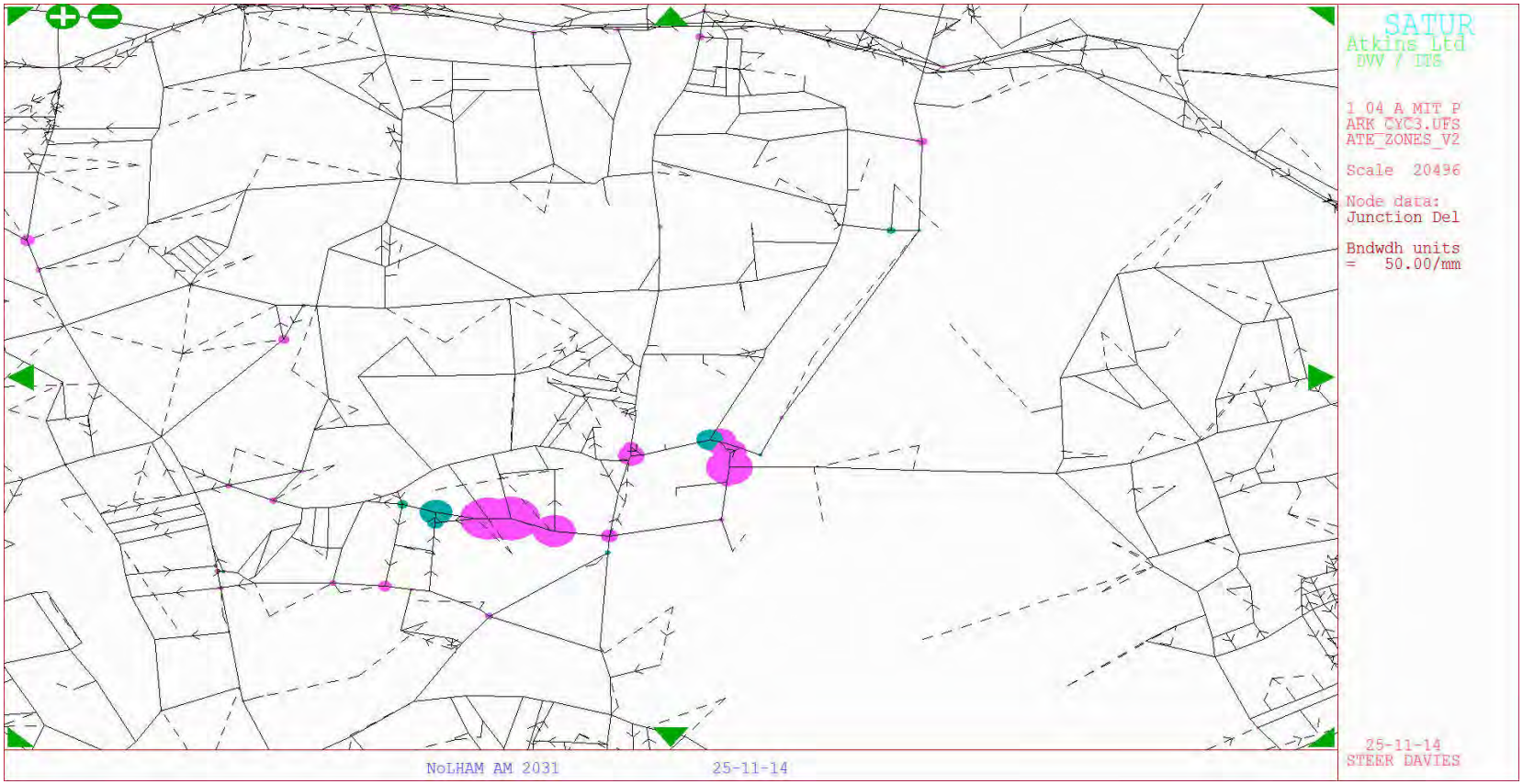


Figure 4.23: Change in Actual Flows (Do Something with Network and Parking mitigation and 3% reduction in car demand relative to Do Something scenario) – AM peak

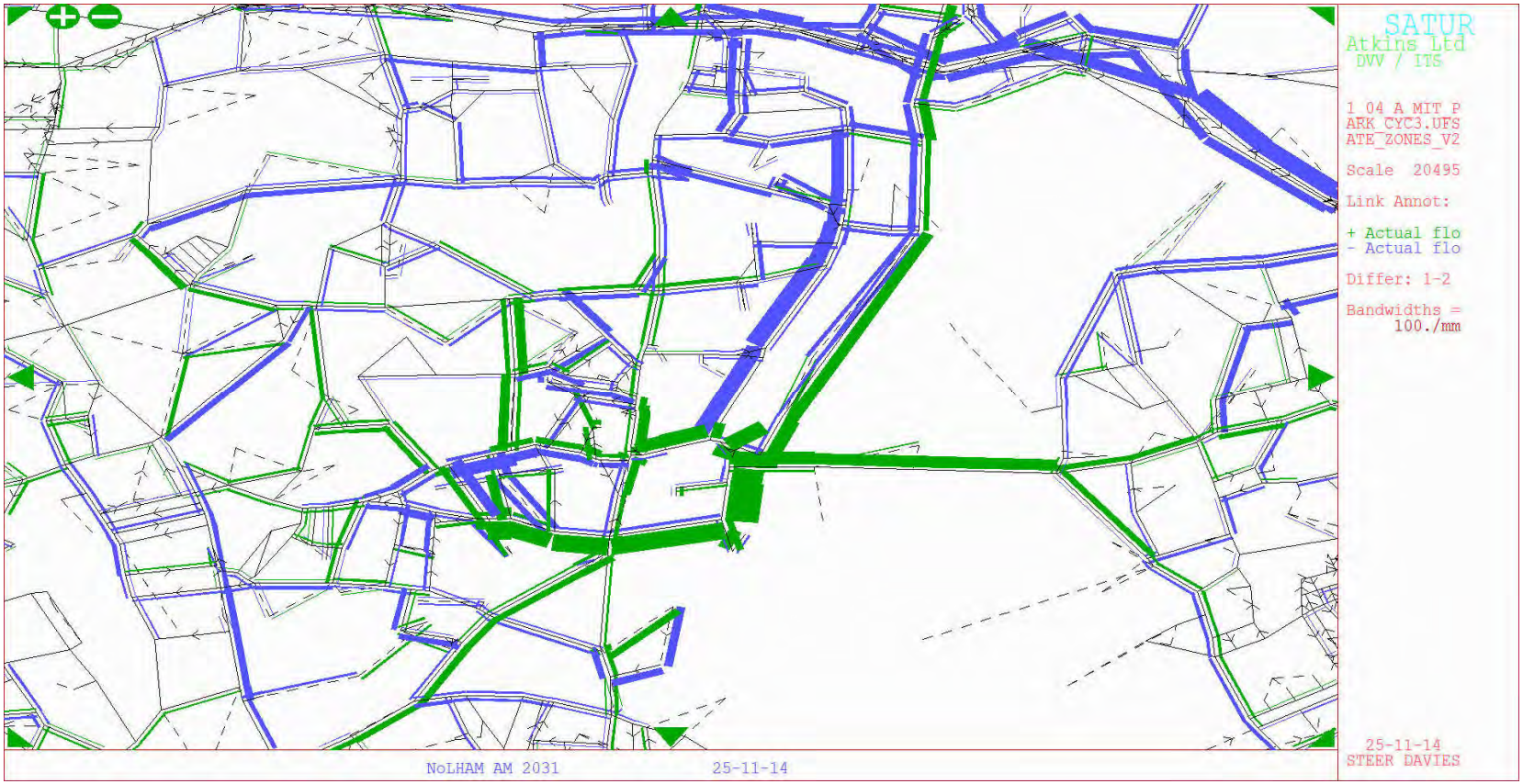


Figure 4.24: Change in link delay (Do Something with Network and Parking mitigation and 3% reduction in car demand relative to Do Something scenario) – PM peak

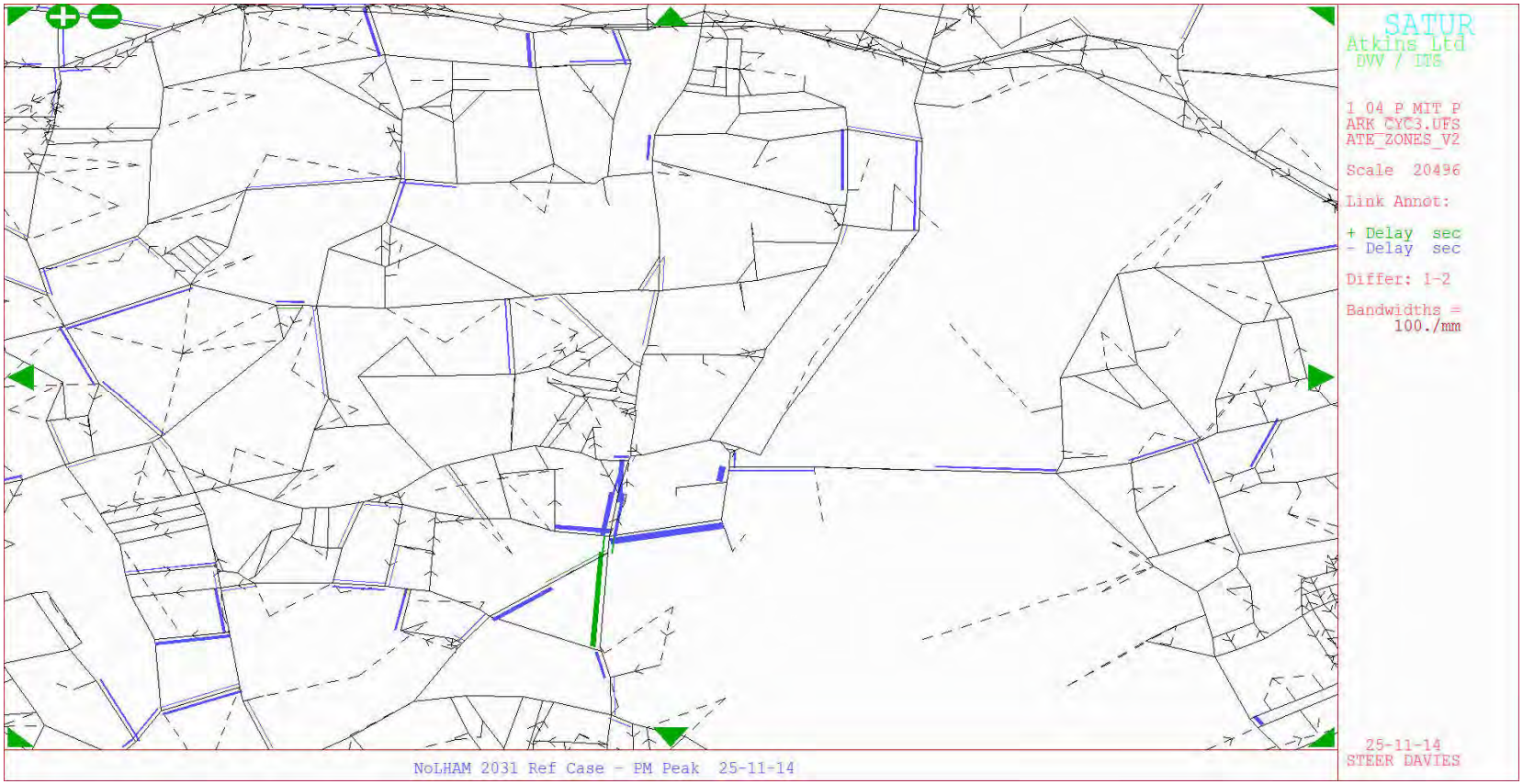


Figure 4.25: Change in Junction delay (Do Something with Network and Parking mitigation and 3% reduction in car demand relative to Do Something scenario) – PM peak

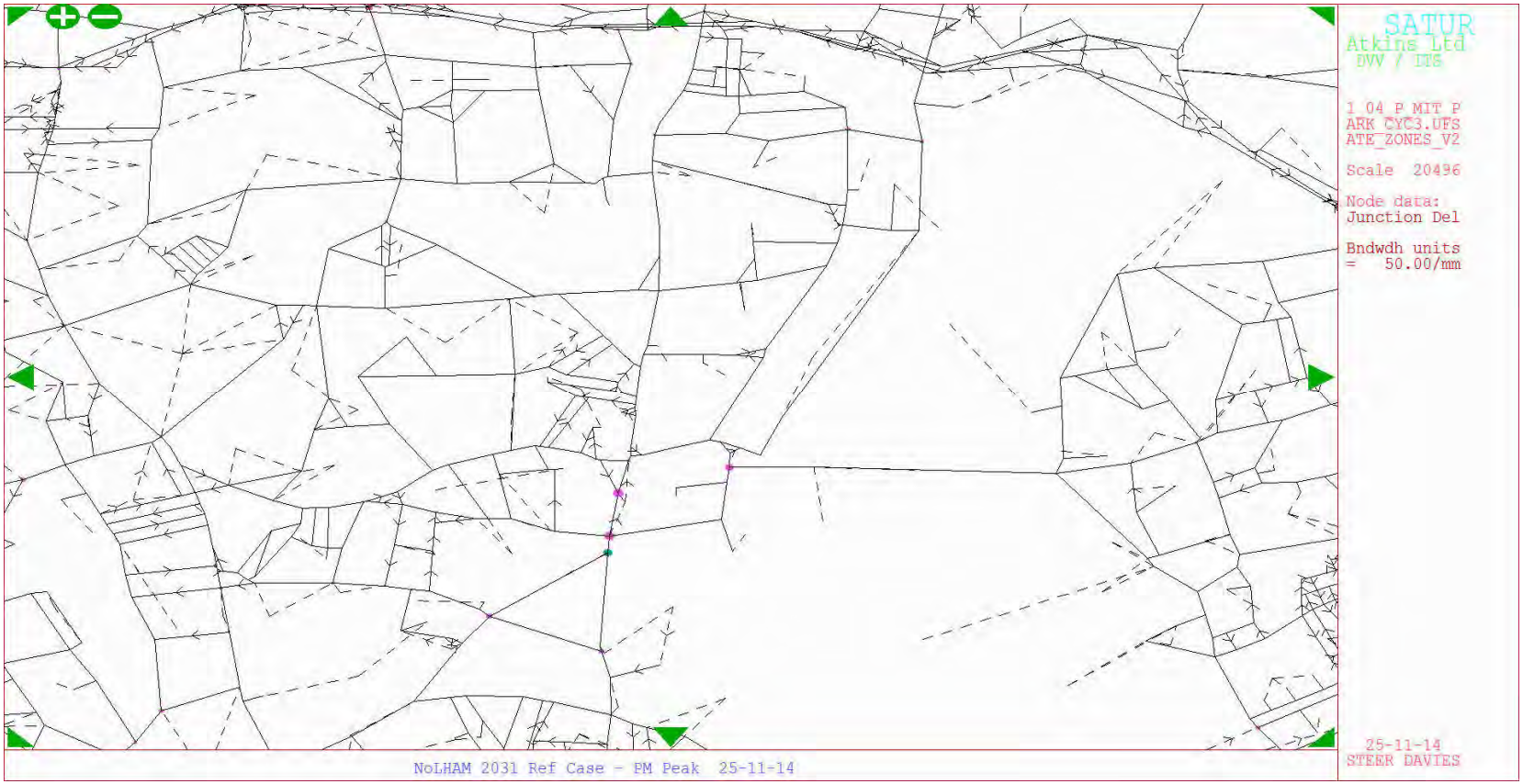


Figure 4.26: Change in Actual Flows (Do Something with Network and Parking mitigation and 3% reduction in car demand relative to Do Something scenario) – PM peak

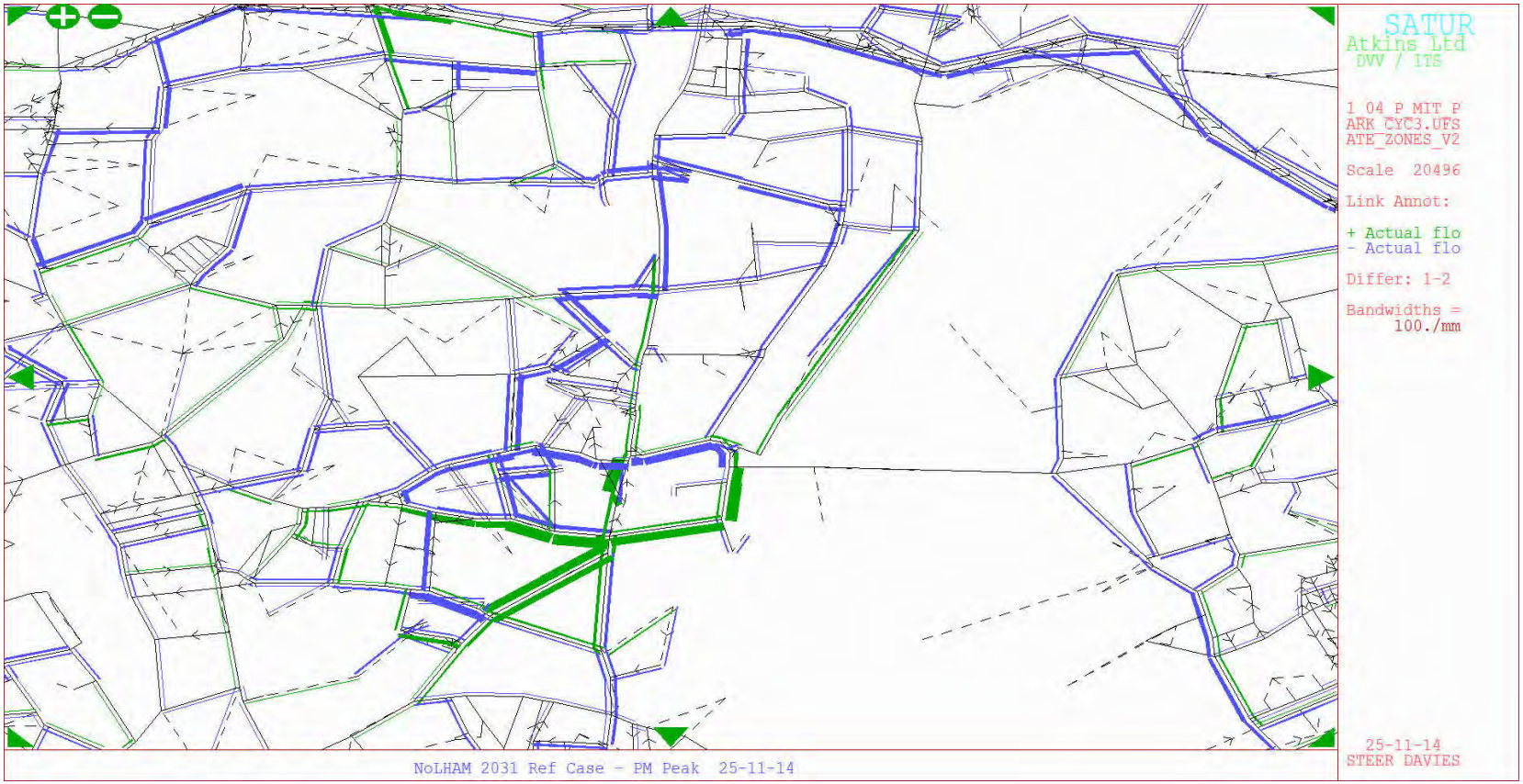


Figure 4.27: Change in link delay (Do Something with Network and Parking mitigation and 15.4% reduction in car demand relative to Do Something scenario) – AM peak

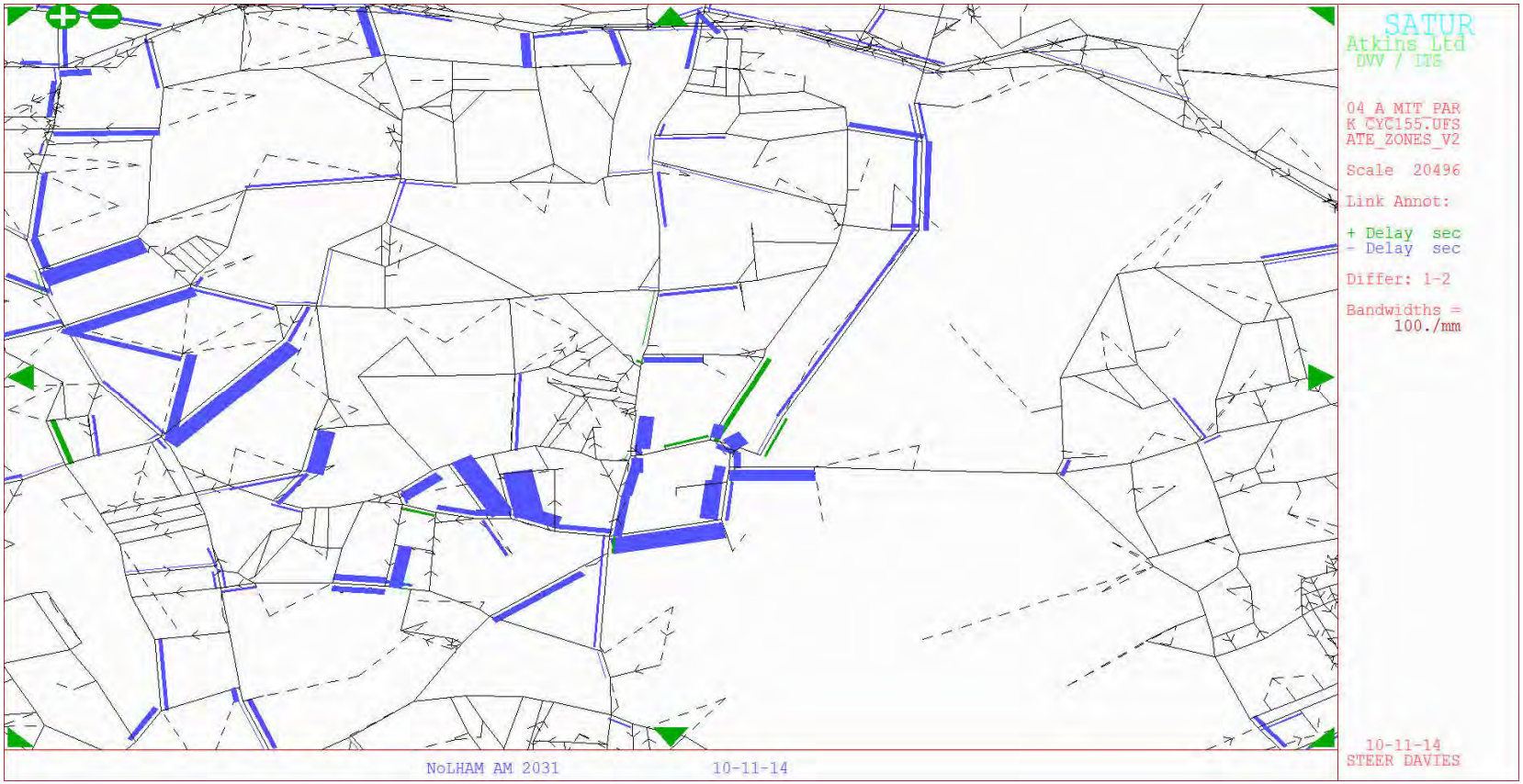


Figure 4.28: Change in junction delay (Do Something with Network and Parking mitigation and 15.4% reduction in car demand relative to Do Something scenario) – AM peak

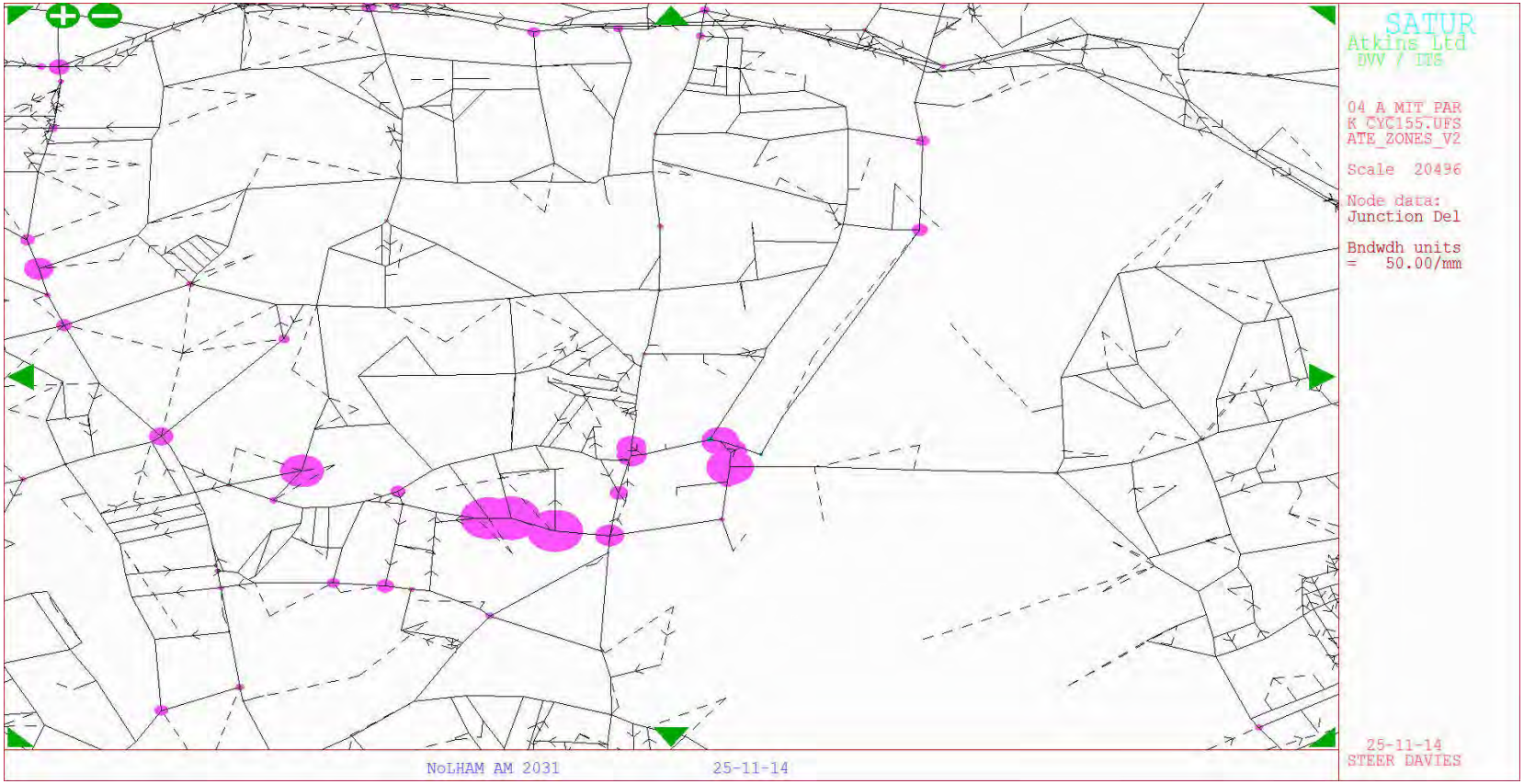


Figure 4.29: : Change in Actual Flows (Do Something with Network and Parking mitigation and 15.4% reduction in car demand relative to Do Something scenario) – AM peak

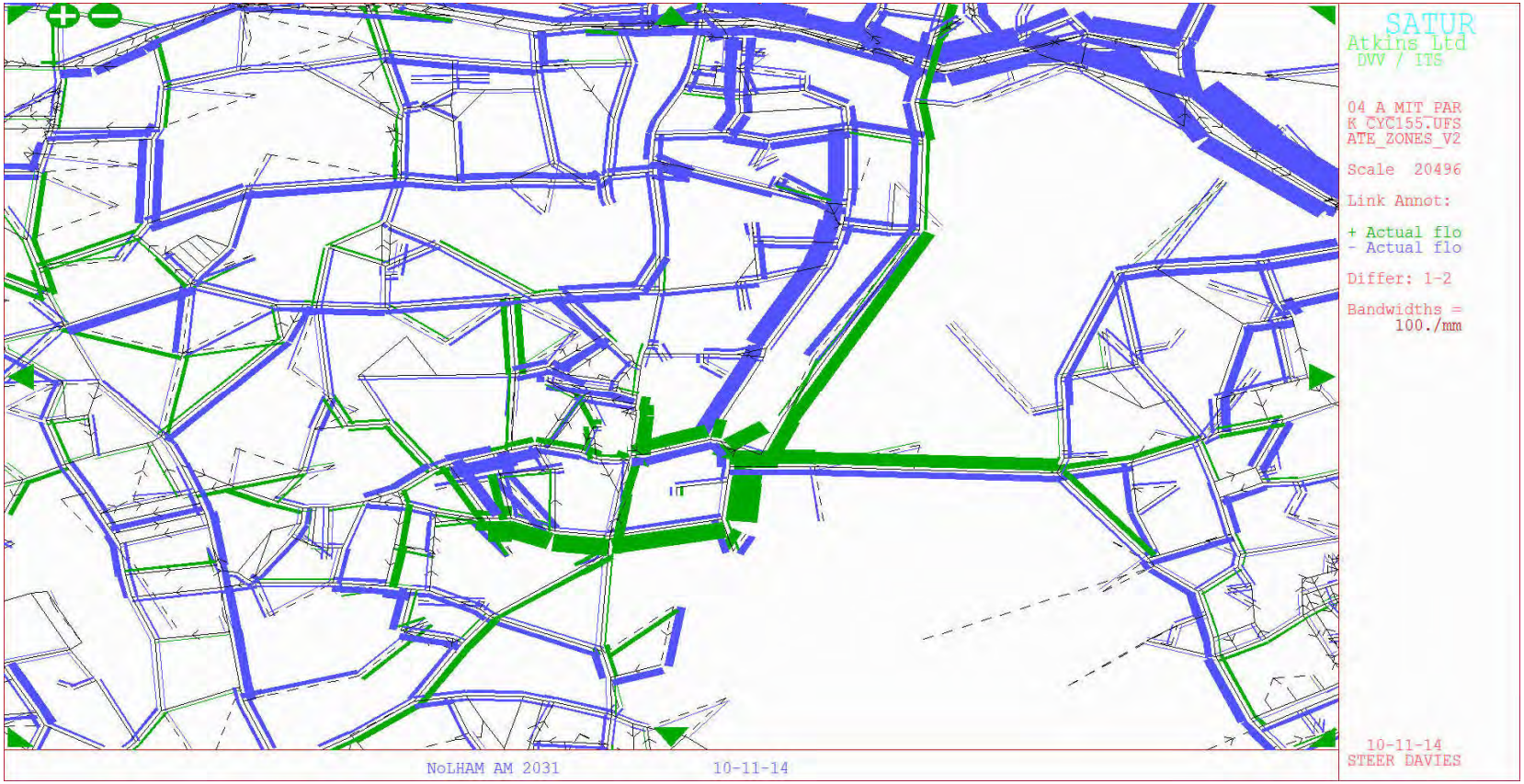


Figure 4.30: Change in link delay (Do Something with Network and Parking mitigation and 15.4% reduction in car demand relative to Do Something scenario) – PM peak

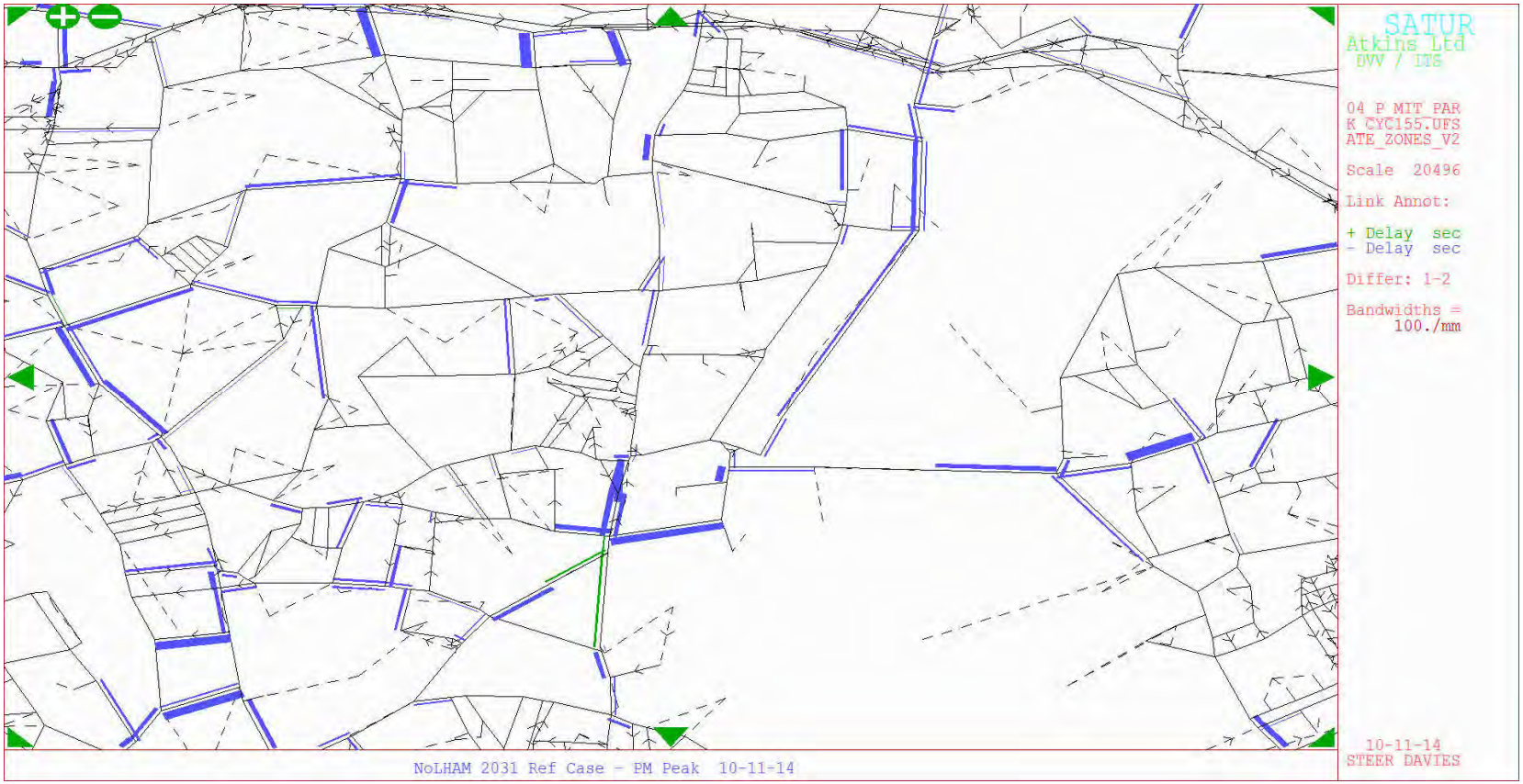


Figure 4.31: Change in Junction delay (Do Something with Network and Parking mitigation and 15.4% reduction in car demand relative to Do Something scenario) – PM peak

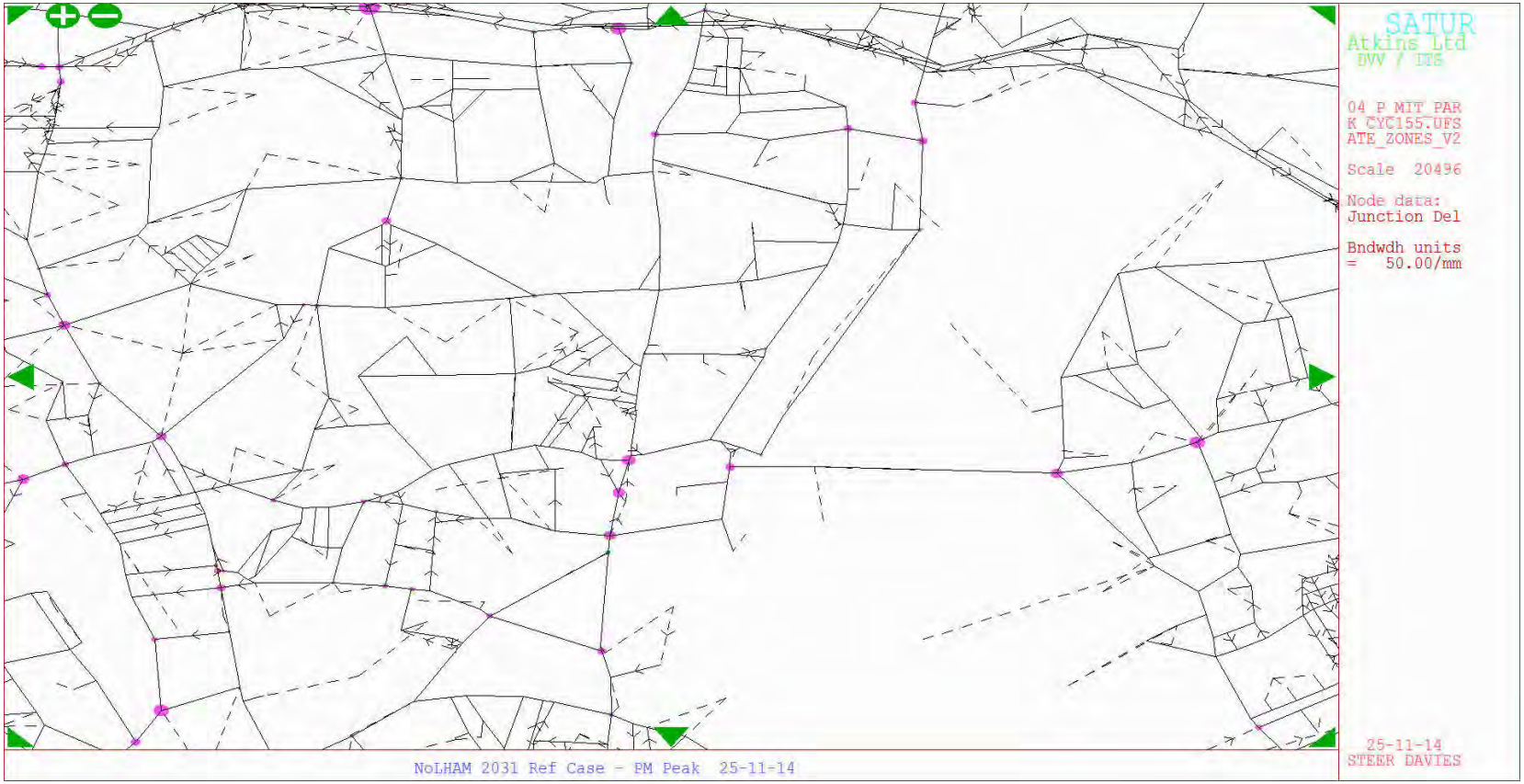
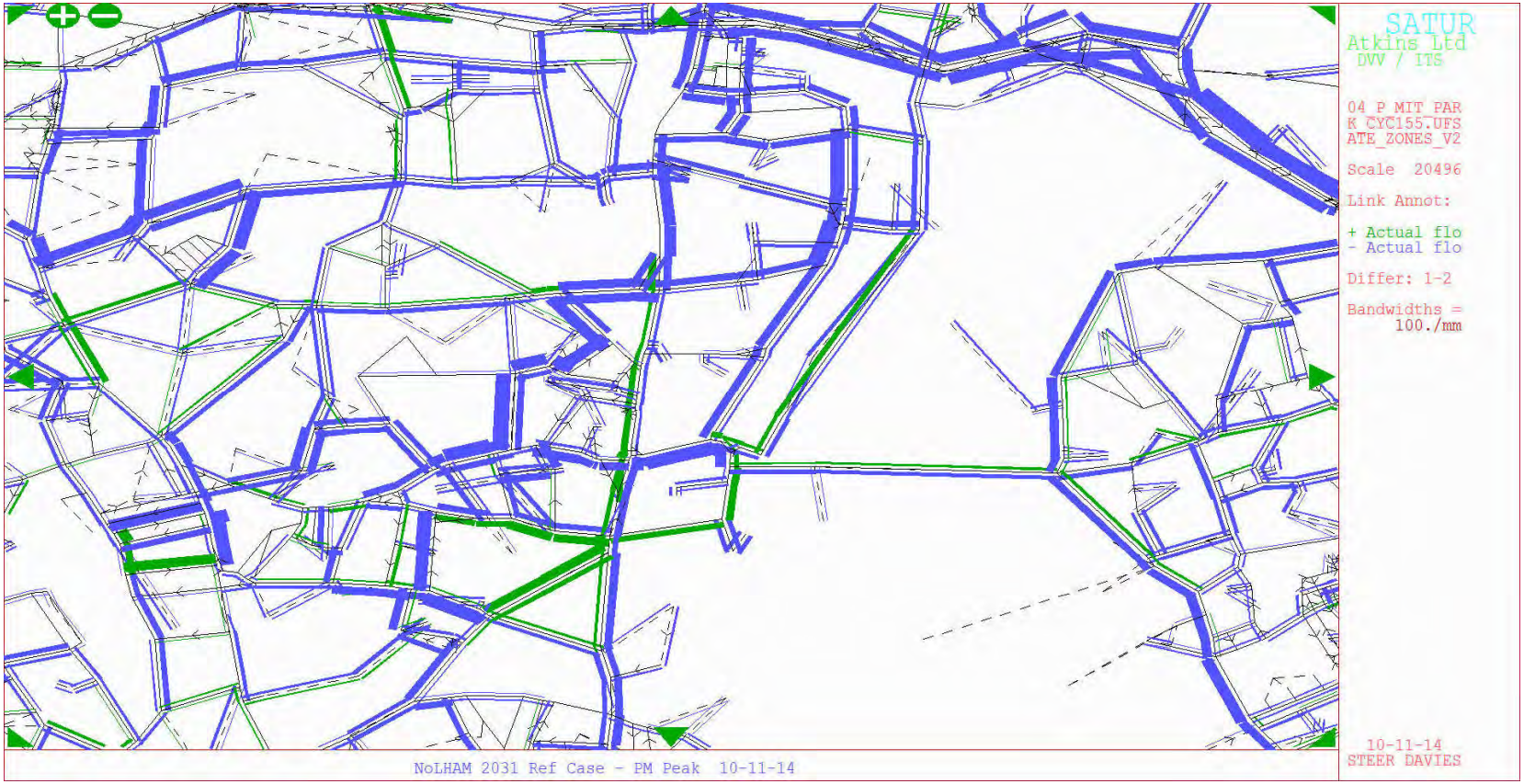


Figure 4.32: Change in Actual Flows (Do Something with Network and Parking mitigation and 15.4% reduction in car demand relative to Do Something scenario) – PM peak



Scenario Comparisons

4.22 This section compares the results across the scenarios at a more aggregate level to assess to what extent the various mitigation measures have offset the impacts of the AAPs and therefore what level of intervention will be required for the AAPs to be implemented successfully. We compare a set of journey times over the scenarios and finally the borough statistics to show how the network performs across the whole of Haringey.

Journey Time Analysis

4.23 Journey time analysis has been undertaken on the two routes (Tottenham High Road and former Tottenham Hale Gyratory) in the AAP area that were analysed for the Do Minimum and Do Something in Chapter 3. We have compared the forecast journey times for the following scenarios:

- Do Minimum (DM)
- Do Something without mitigation (DS)
- Do Something with network mitigation (DS+Mit)
- Do Something with network and parking mitigation (DS+Mit+Parking)
- Do Something with network and parking mitigation, and cycling mode shift with 3% reduction in car trips
- Do Something with network and parking mitigation, and cycling mode shift with 15.5% reduction in car trips

4.24 The main impact can be seen on the gyratory (former) with journey times showing significant reductions in delay at a number of junctions which showed very large “spikes” in delay without any intervention. As mentioned earlier much of this delay is caused by blocking back at the junctions on the gyratory which causes capacity reductions at downstream junctions producing a knock on effect across the gyratory. This demonstrates that as part of the implementation of the AAPs detailed and linked junction modelling should be undertaken particularly around Tottenham Hale and Seven Sisters.

4.25 For other mitigation measures the improvements in journey times are more moderate. Improvements can be seen for all the different measures, however only the 15.5% mode shift test restores the modelled journey times back to the levels seen in the Do Minimum.

Figure 4.33: Journey Time Analysis – High Road – AM Peak with Mitigation Northbound

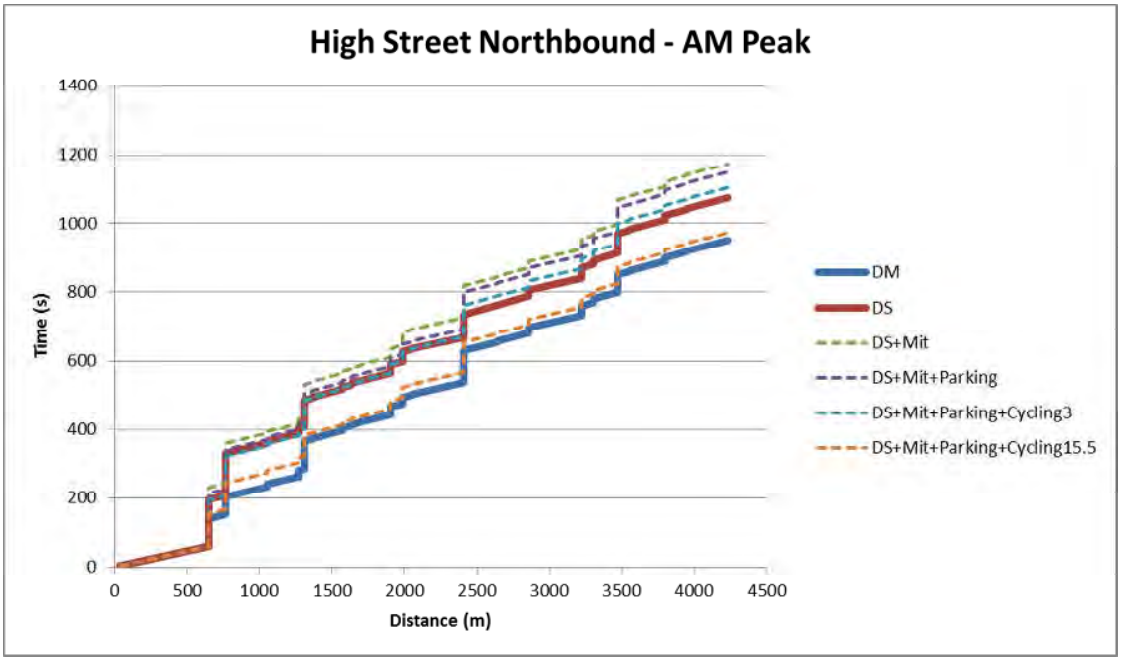


Figure 4.34: Journey Time Analysis – High Road – AM Peak with Mitigation Southbound

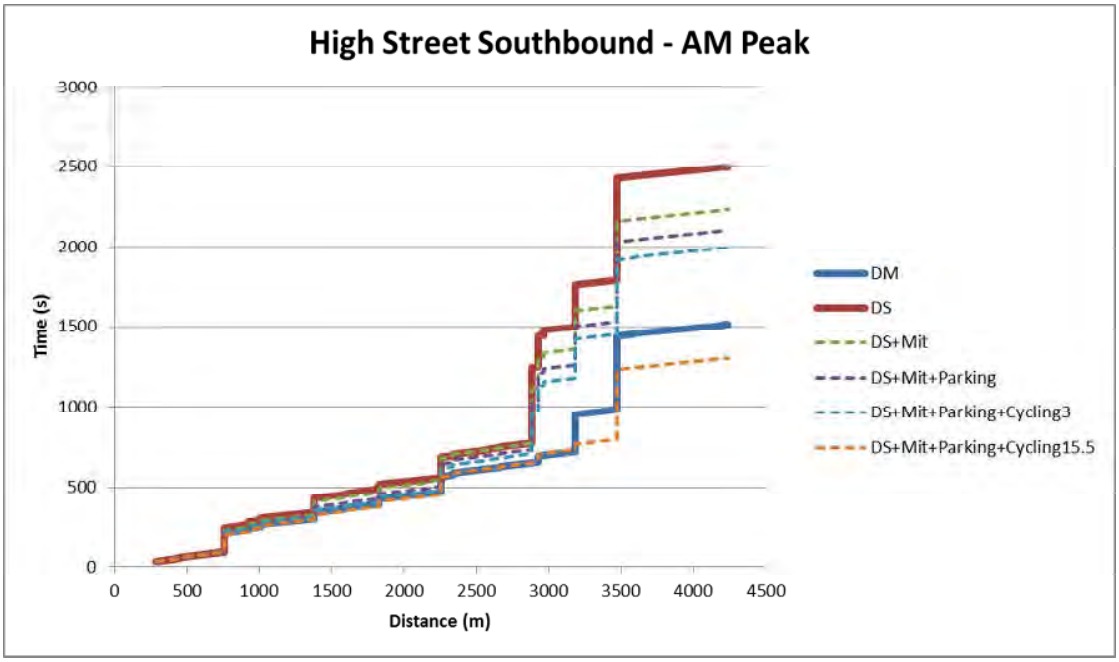


Figure 4.35: Journey Time Analysis – High Road – PM Peak with Mitigation Northbound

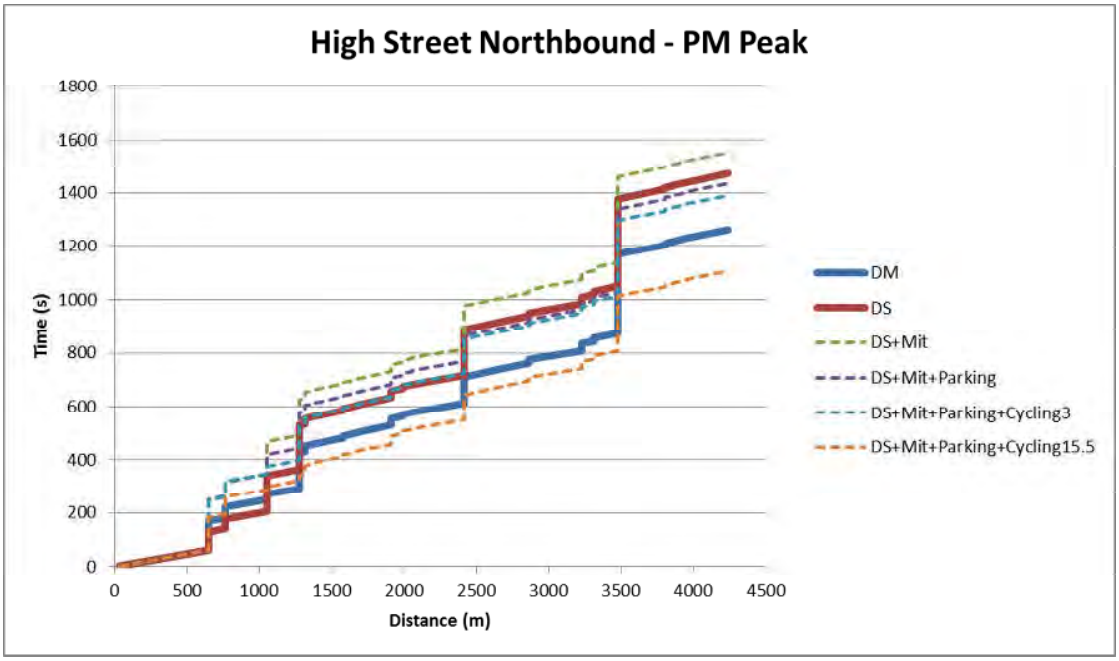


Figure 4.36: Journey Time Analysis – High Road – PM Peak with Mitigation Southbound

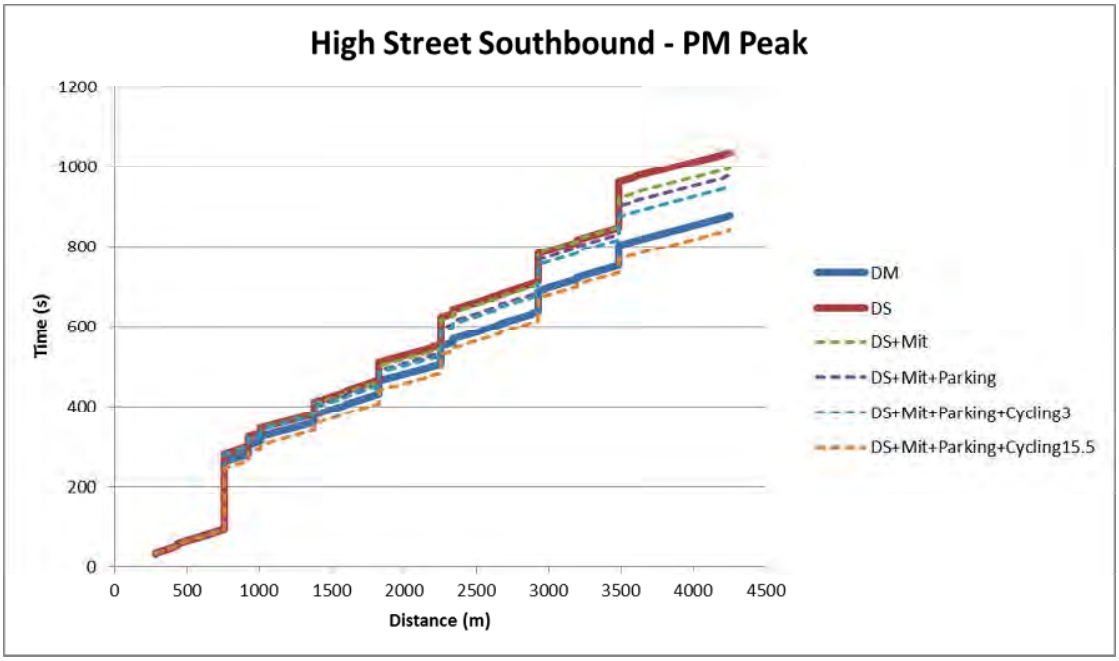


Figure 4.37: Journey Time Analysis – Tottenham Gyratory – AM Peak with Mitigation Clockwise

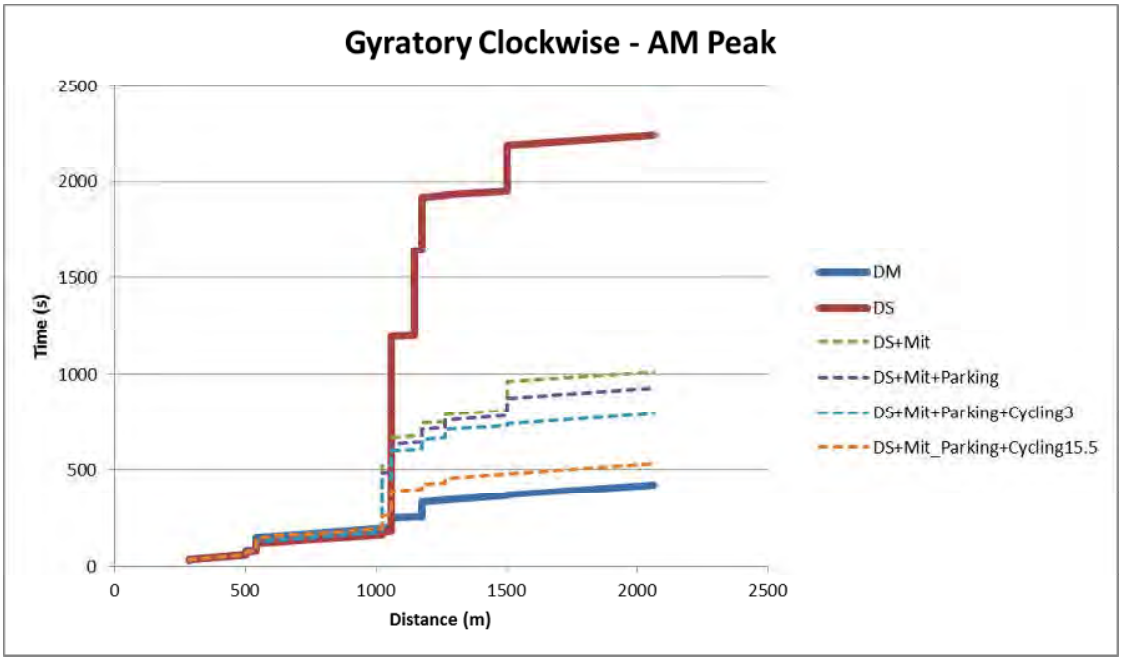


Figure 4.38: Journey Time Analysis – Tottenham Gyratory – AM Peak with Mitigation Anticlockwise

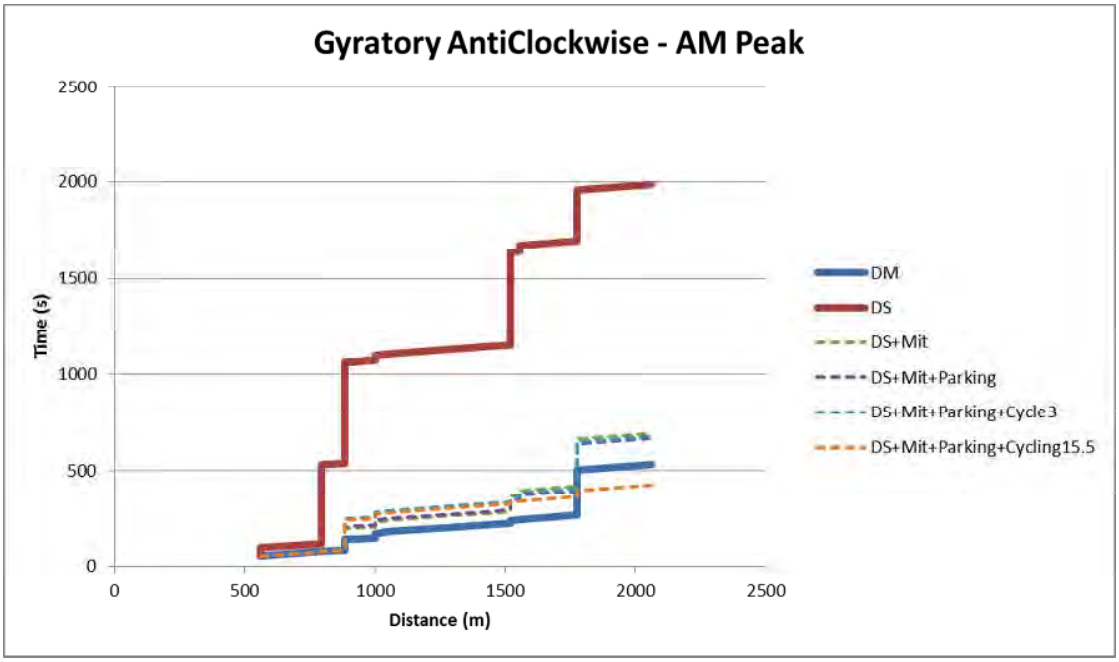


Figure 4.39: Journey Time Analysis – Tottenham Gyratory – PM Peak with Mitigation Clockwise

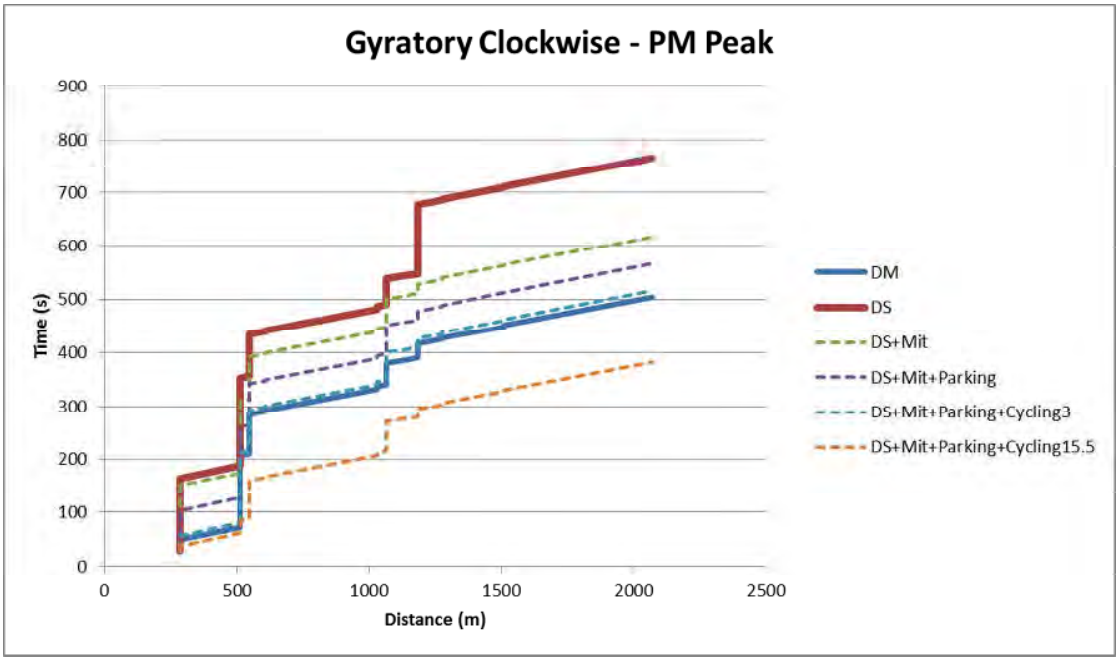
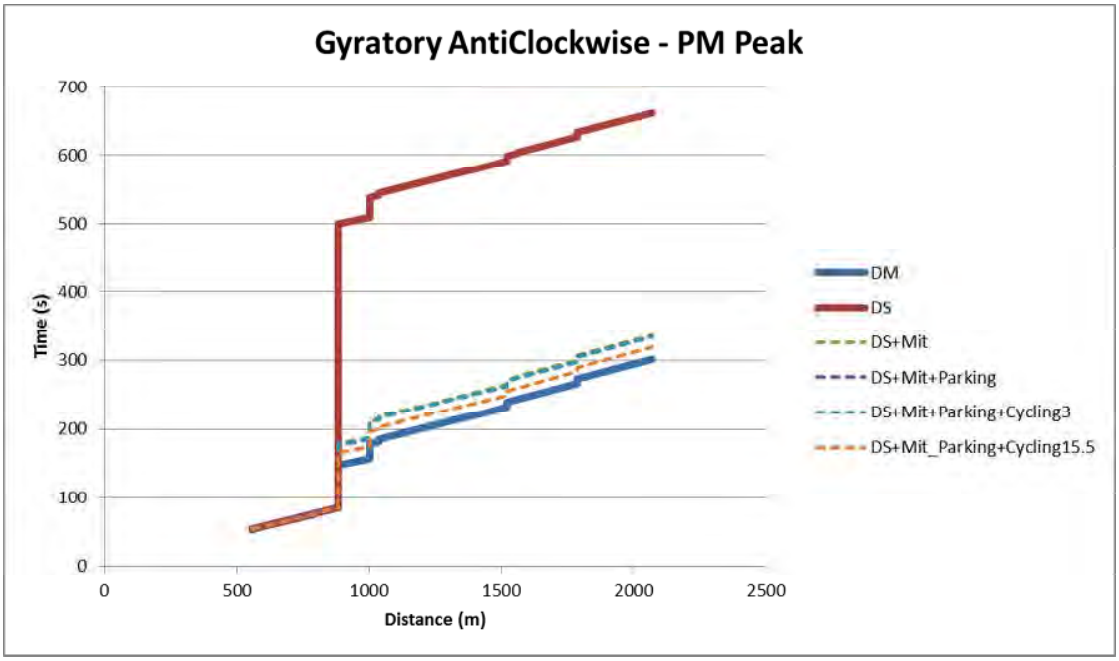


Figure 4.40: Journey Time Analysis – Tottenham Gyratory – PM Peak with Mitigation Anticlockwise



Borough Statistics

4.26 This section shows the impact of the mitigation measures on the highway network at a Borough level using the 'Borostats' tool, as described in Chapter 3. The borough statistics indicate that while local AAP mitigation efforts will have an important part to play in reducing delays in the network, to fully mitigate for the demand generated by the AAPs there needs to be a significant mode shift away from car to slower modes across the borough.

4.27 For both peaks the average speeds and levels of congestion only improve significantly when the cycling/ walking tests are introduced. The 15.5% test shows network conditions better than the Do Minimum which indicates that this ambitious target does not fully need to be met to offset the impact of the AAPs.

Table 4.4: 2031 AM Peak – Percentage change in Key Link Statistics from the Do Minimum for Haringey Borough

Measure	Do Something	Do Something (with Network Mitigation)	Do Something with network and parking mitigation	Do Something with network and parking mitigation, and 3% cycling mode shift	Do Something with network and parking mitigation, and 15.5% cycling mode shift
Total Travel Distance (PCU Kms)	4%	6%	5%	3%	-3%%
Total Travel Time (PCU Hrs)	34%	27%	24%	16%	-10%
Average Speed (Kph)	-22%	-17%	-15%	-11%	7%
Level of Congestion (PCU Hr Delay)	59%	46%	40%	27%	-15%

Table 4.5: 2031 AM Peak - Average Speeds (Kph)

Measure	Do Minimum	Do Something Change form Do Minimum	Do Something (with Network Mitigation)	Do Something with network and parking mitigation	Do Something with network and parking mitigation, and 3% cycling mode shift	Do Something with network and parking mitigation, and 15.5% cycling mode shift
Average Speed (Kph)	14.7	11.5	12.3	12.5	13.1	15.8

Table 4.6: 2031 PM Peak – Percentage change in Key Link Statistics from the Do Minimum for Haringey Borough

Measure	Do Something	Do Something (with Network Mitigation)	Do Something with network and parking mitigation	Do Something with network and parking mitigation, and 3% cycling mode shift	Do Something with network and parking mitigation, and 15.5% cycling mode shift
Total Travel Distance (PCU Kms)	4%	4%	3%	2%	-8%

Measure	Do Something	Do Something (with Network Mitigation)	Do Something with network and parking mitigation	Do Something with network and parking mitigation, and 3% cycling mode shift	Do Something with network and parking mitigation, and 15.5% cycling mode shift
Total Travel Time (PCU Hrs)	13%	12%	9%	3%	-17%
Average Speed (Kph)	-8%	-7%	-5%	-2%	11%
Level of Congestion (PCU Hr Delay)	23%	21%	16%	6%	-26%

Table 4.7: 2031 PM Peak - Average Speeds (Kph)

Measure	Do Minimum	Do Something Change form Do Minimum	Do Something (with Network Mitigation)	Do Something with network and parking mitigation	Do Something with network and parking mitigation, and 3% cycling mode shift	Do Something (with Network and Parking Mitigation) Change from Do Minimum
Average Speed (Kph)	16.9	15.6	15.8	16.1	16.6	18.8

4.28 A summary of the conclusions of the mitigation testing is as follows:

- Detailed junction analysis should be undertaken around Tottenham Hale and Seven Sisters and in particular how the junctions interact with each other to improve local network conditions.
- Reducing highway demand through smarter choices and parking restrictions could further improve the local road network
- To mitigate the impact of the AAPs fully, significant reductions in highway demand needs to occur beyond the AAP area, which will require a wide range of different policy initiatives. This includes the implementation of policy measures that are beyond the control of the London Borough of Haringey – most notably the Mayor of London's Vision for Cycling.

5 Conclusions and Recommendations

Highway

5.1 Without mitigation, the increase in traffic associated with Tottenham AAP development sites will result in a significant increase in journey times throughout the Tottenham area, with speeds and congestion worsening significantly, particularly around the gyratory.

5.2 Potential mitigation has been identified at 3 key junctions; Watermead Way/Marigold Road, Seven Sisters Road/Amhurst Park and High Road/Broad Lane. While these improvement can be shown to reduce the impact on journey times along the High Road and, particularly, around Tottenham Gyratory, further mitigation will be required to fully accommodate future demands for highway capacity in the Borough.

5.3 Encouraging future mode shift to cycling, and tightening of parking controls in the wider Tottenham area should form an element of any future mitigation proposals.

5.4 Substantial levels of delay mitigation are only achievable if a wide range of policy initiatives are implemented in combination.

Public Transport

5.5 In general, mitigation measures for the LUL, Rail, and Overground networks have already been devised and committed with capacity enhancements recently implemented on the Victoria Line and additional capacity to be implemented on the Piccadilly line and Overground services.

5.6 It may be possible to rebalance a modest amount of demand from the Victoria line to other less crowded services. One possibility is to improve bus service provision between the AAP area and Turnpike Line station on the Piccadilly Line. It is also possible that proposals to improve cycling provision in central London (e.g. the Central London Cycle grid) will improve the attractiveness of cycle journeys between Liverpool Street and other central London locations, whilst cycling improvements across the Tottenham area (the proposed Cycle Superhighway 1 and a series of Quietways) will improve the attractiveness of cycling to the various LUL and Rail stations in the

area. This may encourage some users to switch from the Victoria Line to less-crowded National Rail services.

5.7 Tottenham Hale station is expected to undergo a significant increase in entry, exit, and interchange demand in 2031, particularly if the AAP proposals are implemented in full. The ongoing improvement plans will provide significant additional capacity for all movements. Nevertheless, to ensure that the additional AAP movements can be accommodated, a test is recommended with the aid of TfL's LEGION model. The impact of the AAP proposals on Seven Sisters is expected to be relatively modest and hence, less likely to lead to capacity issues at the station. Consequently, a similar LEGION test may be worthwhile for completeness, though less of a priority.

Policy Based Measures

5.8 In addition to the network-based mitigation measures assessed with the aid of the models as outlined above, it is recommended that a series of additional policy-based measures are implemented, a selection is outlined here. These were assessed with the aid of the additional sensitivity tests described earlier.

5.9 It is recommended that consideration is given to enhanced parking controls in the Tottenham area, including the introduction of expanded Controlled Parking Zones and extended hours of operation. The sensitivity tests undertaken have shown that such measures could be effective, though this is dependent on the number of car trips that enhanced parking controls would remove in the first place – this is subject to considerable uncertainty. The AAP proposals will increase parking pressures on the wider Tottenham area, and additional controls could reduce the number of car trips in the overall area and hence, offset some of the additional car trips arising from the AAP proposals.

5.10 The work undertaken in this study assumes that strict limits are placed on car parking associated with the development. Again, this will help to restrain car demand in the local area. Furthermore, the PTAL analysis in chapter 3 demonstrated that the AAP proposals will have good access to the public transport network and so limited parking provision will not be a significant problem in terms of access to the transport system.

A Trip Generation Forecasts

Wider Haringey DPD Sites

DPD Site Name	Ref	Area Size ha	Timeframe	Residential Units	Town Centre m^2	Commercial/ Office m^2	Retail m^2	AM in Trips	AM out Trips	PM in Trips	PM out Trips
Haringey Heartlands											
Clarendon Square	HH3	4.55	2015-20	610	1020			93	103	65	23
Clarendon Square Gateway	HH4	0.95	2020-25	159		4000		25	23	14	12
Clarendon Road South	HH5	1.48	2025-30	274		29000		80	43	29	68
NW of Clarendon Square	HH6	0.30	2020-25	144				16	20	11	4
Land adjacent to Coronation Sidings	HH7	0.71	2020-30	281				32	40	22	7
Wood Green											
Civic Centre, Wood Green	WG1	1.18	2020-25	115				13	16	9	3
Arriva Bus Depot	WG2	0.84	2030+	260			6000	659	346	955	481
Station Road Sites	WG3	0.96	2020-25	188	9000			236	175	163	71
Wood Green Library	WG4	1.33	2020-25	166			6000	648	333	948	479
Highgate											
Wellington Rbt/Highgate Rail Depot	HG1	5.38	2020-30	981		48000		193	147	91	126
Highgate Magistrates Court	HG2	0.47	2015-20	72				8	10	6	2
Highgate Bowl	HG4	3.35	2015-30+	32				4	5	3	1
Summersby Road	HG5	0.50	2015-25	51		4000		13	8	5	10
Muswell Hill											
St Luke's Hospital	MH1	2.52	2015-20	354				40	50	28	9
56 Muswell Hill	MH2	0.50	2015-20	51				6	7	4	1
Hornsey											
Hornsey Depot	HO1	2.36	2015-20	462	21000			554	411	383	167

DPD Site Name	Ref	Area Size ha	Timeframe	Residential Units	Town Centre m^2	Commercial/ Office m^2	Retail m^2	AM in Trips	AM out Trips	PM in Trips	PM out Trips
Hornsey Water Treatment Works	HO2	0.66	2020-25	130				15	18	10	3
South of the Borough											
St Ann's Hospital	S1	11.50	2020-30	837				95	119	67	21
Greater Ashfield Road	S2	3.06	2015-30	267		52000		119	46	35	116
Vale Rd/Tewkesbury Rd Emp Areas	S3	7.15	2015-30	700		134000		308	121	91	300
Arena Retail Park	S4	5.74	2030+	960				109	136	76	24
Finsbury Park Bowling Alley	S5	0.37	2015-20	180				20	26	14	5
Finsbury Park & Stroud Green Road	S6	0.39	2020-30	50		4000	700	86	44	114	65

Tottenham/Northumberland Park AAP Sites

DPD Site Name	Ref	Area Size ha	Timeframe	Residential Units	Town Centre m^2	Commercial/ Office m^2	Retail m^2	AM in Trips	AM out Trips	PM in Trips	PM out Trips
Tottenham Hale											
Tottenham Retail Park	TH1	4.84	2020-30	1100	47000	47000		1175	815	799	378
Over Station Dev@Tottenham Hale	TH2	0.95	2015-20	190	1500			41	31	28	12
Station Square West	TH3	2.52	2015-25	675	24000			593	419	409	181
Ashley Road South	TH4	2.63	2015-25	665		60000		44	26	17	36
Ashley Road North	TH5	5.47	2015-30+	300		36000		24	12	8	21
Hale Village	TH6	0.18	2015-20	220				6	8	4	1
Hale Wharf	TH7	1.93	2015-25	450		5000	5000	146	80	204	104
S Tottenham Employment Area	TH8	10.18	2020-30+	800		227000		119	37	31	124
Welbourne Centre	TH9	0.97	2015-20	200	1800			49	37	34	15
Northumberland Park											
500 White Hart Lane	NT1	1.00	2020-25	101	2000			59	47	41	17
Tottenham Stadium Development	NT2	9.99	2015-20	285		36500		94	46	32	84
High Road West	NT3	10.90	2015-30	1200				196	179	95	91
Estate Renewal in N Tottenham	NT4			2000				226	283	159	51
Tottenham High Road											
The Roundway at Bruce Grove	THR1	0.70	2015-20					0	0	0	0
Tottenham Delivery Office	THR2	0.63	2015-25	163				18	23	13	4
Bruce Grove Snooker Hall	THR3	0.50	2015-25	80	1300			40	33	28	12
Tottenham Green Bus Garage	THR4	1.43	2020-25	264	3000	11000		120	89	73	52
Kwik Fit n of Saltram Close Estate	THR5	0.30	2015-20	45				5	6	4	1
Lawrence Road	THR6	3.34	2015-20	360				41	51	29	9
Seven Sisters Regeneration	THR7	1.37	2015-20	266	16000			413	301	285	125
Seven Sisters Station	THR8	19.60	2015-25					0	0	0	0

DPD Site Name	Ref	Area Size ha	Timeframe	Residential Units	Town Centre m^2	Commercial/ Office m^2	Retail m^2	AM in Trips	AM out Trips	PM in Trips	PM out Trips
Gourlay Place & Wicks site	THR9	2.49	2015-25	112		2200		50	19	15	49

Control Sheet

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Review

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