Transport for London

Transport Innovation Fund

Managing transport demand – investigation and demonstration of a range of measures in London

Bid from Transport for London, August 2006

MAYOR OF LONDON

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Executive summary

Road traffic congestion

Road traffic congestion is a serious and growing problem across the UK. As the UK's population and economy increase, demands for travel and car ownership are increasing. This puts all aspects of the transport system – including the road network – under ever-greater pressure.

Traffic congestion is not only a transport issue: it degrades quality of life and creates delays that affect UK productivity. Private road transport vehicles are the most significant contributor to CO_2 emissions from transport, and traffic congestion only increases road transport emissions. However, managing congestion is particularly challenging in an urban environment such as London, where there are competing claims on and aspirations for space on the road network: for example, to improve pedestrian facilities, promote cycling and public transport, and to accommodate kerbside parking and deliveries.

Recognising the seriousness of the challenge, the Government has increasingly focused on what measures can be taken to address traffic congestion. A key focus of Government transport policy is now in managing demand for road transport – indeed, it was the first specific challenge mentioned in the Prime Minister's recent letter appointing Douglas Alexander as Secretary of State for Transport.

The creation of the Transport Innovation Fund recognises that successful development of effective, acceptable, local schemes is a key first step in tackling this challenge. London brings substantial experience to this area given its successful introduction of congestion charging and its work on smart travel demand measures. The Mayor and Transport for London are keen to build on these initial successes through a combination of supporting the Government's road user charging strategy and deploying the first large-scale trials of smart travel demand management.

Both policies, if successfully implemented, would contribute towards dealing with London's long-term transport challenges as summarised in TfL's recently published discussion document *Transport 2025*. The policy options identified in the document are consistent with – and supportive of – TfL's other policy interventions and with national transport policy objectives. The *Transport 2025* work will contribute to the revision of the Mayor's Transport Strategy projected for consultation in 2007.

This submission for support from the Transport Innovation Fund focuses on road user charging and smart demand management measures. However, these measures must be implemented in conjunction with associated public transport and traffic management interventions. This includes measures to optimise allocation of limited available road, and parking, space, including adequate provision for travel alternatives such as public transport and walking and cycling. This bid focuses on funding for the demand management measures but does not cover these associated interventions.

Road user charging

'...developing new ways of paying for road use...'

The Government is exploring new ways of paying for road use. It is working to address the issues identified in the *Feasibility Study of Road Pricing in the UK*, published in July 2004, recognising that road pricing needs to be demonstrated though local 'pathfinder' schemes supported by the Transport Innovation Fund.

The challenges facing the Government nationally are comparable to the challenges facing London. In this part of the submission TfL sets out three linked proposals or packages to explore and implement different types of road user charging in different types of location across London.

The packages set out here deal with many of the technical, operational and public acceptability issues identified in the *Feasibility Study*. They make use of TfL's established knowledge and expertise in designing, evaluating, implementing, operating, trialling and monitoring road user charging infrastructure and schemes and investigate how this knowledge might contribute to the wider development of road user charging. By covering a variety of conditions and locations the proposals provide a firm basis for further development both within London and nationally.

The demonstration role of road user charging in London

The Government is looking at the role of a national road user charging scheme and within this framework, TfL is looking at the role of road user charging as part of the development of the Mayor's Transport Strategy. There are numerous parallels: town centres, suburban areas, strategic routes; and the underlying issue of organising payments from drivers who move between charging zones.

London offers the early introduction of the development of technology to vary charges by location, time of day and vehicle type – to reflect marginal social and environmental costs.

Given the intensity of traffic congestion in London and the strategic and proven ability of TfL to provide complementary public transport there is a strong case for Greater London helping to lead the development of a national road user charging scheme. There is also a strong case for demonstrating the combined impact of charging and non-fiscal or smart travel demand management measures. Furthermore, TfL's network management duty under the 2004 Traffic Management Act and ownership of a range of public transport modes means that it is well-placed to test new, holistic approaches to road traffic congestion.

Studies have demonstrated the potential for a national road user charging scheme to reduce traffic congestion across London. TfL's initial analysis indicates that a national road user charging scheme could reduce congestion in Greater London by 30 to 40% with potential annual benefits of perhaps £1 billion, and potential gross annual revenues of perhaps £2.5 billion.

While the results of consultation and the Mayor's decisions on the form of the revised Transport Strategy cannot be anticipated, the proposals set out here have been designed to fit into the timetable for the development of the Transport Strategy. Hence, the initial road user charging feasibility studies set out in this submission are planned to inform both the development of the Strategy and the decisions on the implementation of each of the specific packages of proposals.

The road user charging proposals in summary

Three road user charging packages are being submitted by TfL for support from the Transport Innovation Fund.

Package RUC-A: Towards more flexible charging mechanisms
Implementation £40m, including £2m for feasibility studies

This proposal would test the merits of automatic vehicle detection and account-based charges. These would make charges easier to pay, avoid penalty charges due to forgetting to register, and open up the possibility for more flexible charges varying, for example, by time of day.

The extended central London congestion charging scheme, with its western extension, becomes operational in February 2007. This proposal would involve further feasibility assessments and – subject to public consultation and a Mayoral decision on a variation to the Scheme Order – the implementation of dedicated short-range communications equipment to allow vehicles to be automatically detected and classified. This would be a voluntary mechanism for drivers as the existing payment systems would also be retained.

The feasibility study and the public consultation would provide detailed information and public reactions to electronically-enabled charging, with lessons for such schemes elsewhere.

The enhanced scheme could be operational in 2010 and would allow automatic payments for registered vehicles as well as the scope to vary payments by time of day, by direction of travel at the zone boundary, and allow more subtle variation by type of vehicle – for example to reflect emissions and concerns about air quality and climate change. It would also enable automatic charge payments for drivers in more than one London charging zone – thus providing a direct 'inter-operability' with the second proposal for charging outside central London, set out below.

The implementation and operation of the new automatic, more flexible, arrangements would offer valuable experience for national developments and local schemes elsewhere. It would also demonstrate an infrastructure developed specifically for British urban conditions, but designed to be applicable on a national basis and available from third party service providers.

Package RUC-B: Understanding road user charging beyond central London
Implementation: £60m to £100m depending on complementary measures, including £2m for feasibility studies

Transport for London recognises that central London is unique. To understand the effects of a national road user charging scheme elsewhere in Greater London there needs to be experience of a scheme operating away from the central area in the context of more typical conditions.

This proposal would test the use of charging in an area outside central London. Initial studies will focus on the feasibility of a charging scheme in the area around Greenwich – both in and around the town centre and on adjacent strategic routes – in the context of a series of complementary traffic, transport and smart travel demand management measures. Understanding public acceptability would be a key feature of this proposal.

This package would be integrated with a package of smart demand management measures to demonstrate how the two forms of demand management would complement and support each other. In parallel, TfL would review management of the road network and key corridors in the area to identify necessary and desirable interventions in road space management and allocation. These will be crucial to both capture mode shift away from car (to bus, walking, etc) and to ensure best use is made of all available road space. Enhancing and improving the availability of public transport would form an important part of any package, as it did for the central London congestion charging scheme, where a 'virtuous circle' of improvements delivered a mode shift of 4% from car public transport.

The feasibility and attitudinal studies focused on Greenwich would report during 2007. If the outcomes are promising and there is political support from the Mayor and the Borough, a package of measures would be developed – including road user charging and smart travel demand management – that could be implemented and operational in late 2010 or 2011, depending on the scale of measures and extent of charging adopted. Implementation would be dependent on revisions to the Mayor's Transport Strategy and consultation on the selected proposals.

Package RUC-C: Towards distance based charging
Implementation: £25m, including £2m for behavioural and modelling studies

The Department's *Feasibility Study* suggested that marginal social cost charging – where charges reflected the intensity of local traffic congestion – would bring substantial traffic benefits, particularly in urban areas. This proposal would involve trials of distance-based charges and the scope to adjust these to reflect local variations in traffic congestion. It would provide fundamental data on driver responses and public acceptability, as well as providing an operational demonstration of the necessary technology.

Transport for London is already undertaking trials to prove the technology and the basic concept with a few hundred drivers. This proposal could eventually involve perhaps 5,000 drivers being provided with 'on-board units' for a simulated London-wide trial, but with the intention of moving to a fully operational scheme around 2010 as part of the extended central London scheme, in the first instance for those with units of sufficient accuracy. As for Package A, the distance based charging designs would be applicable on a national basis, take account of DfT's future business architecture for national road pricing, and be capable of being sourced from third party service providers.

Overall costs of the three road user charging packages

The estimated spend profile of the three packages is summarised in the table below, in £ millions:

	06/07	07/08	08/09	09/10	10/11	Total
RUC-A : Flexible charging in central London	-	7	28	5	-	40
RUC-B: Charging beyond central London	1	1	10-21	37-61	11-16	60-100
RUC-C: Distance based charging	3	3	4	8	7	25
Total	4	11	42-53	50-74	18-22	125-165

At this stage the cost estimates for Package A are relatively well developed. Benefits would be evaluated in the feasibility study in accordance with the Department's guidance, though early estimates are available.

The cost estimates for Package B are more uncertain and would be refined in the feasibility study, along with an evaluation of the benefits in accordance with the Department's guidance.

Initial estimates of the costs of Package C are available, though these will be refined. The feasibility study will seek to develop estimates of the benefits of different types and applications of distance-based charging, in due course making use of the behavioural evidence from any demonstrations.

The availability of £15m of funding for financial years 2006/07 and 2007/08 would allow TfL to make early progress towards the development of the proposals in time to inform the expected consultations and decisions on a revised Transport Strategy in 2007/2008, as well as providing early support for the DfT's development of wider processes for national road pricing.

Smart travel demand management

'... new techniques for influencing people's travel behaviour...'

TfL believes that the challenge of traffic congestion can only be addressed through a range of policy interventions. This includes the combined implementation of road user charging and complementary smart travel demand measures, supported by attractive public transport and non-motorised alternatives as well as by ongoing review and management of road space allocation in line with TfL's statutory traffic management duty.

The impact of smart measures, such as those set out in this proposal, would be greatly enhanced by road user charging. Similarly, the public acceptability and impact of road user charging can be increased by the use of supportive smart measures. As the Government has itself acknowledged: *During the period when pricing is awaited, interim tools including both 'soft' measures and 'hard' ones.....should be implemented widely and without delay* (Government response to Select Committee Report: Road Pricing - The Next Steps, 2005).

TfL is already working with the boroughs, London's businesses, local communities and individuals, to address the demand side of the transport equation through smart measures. This does not necessarily require large-scale changes in behaviour, as relatively small or marginal behavioural changes can have a significant local impact. The Department for Transport's own research has shown that smart measures such as travel planning, proper cycle facilities, improved performance and marketing of public transport, and teleworking can have a significant impact on travel behaviour and hence on traffic congestion.

The demonstration role of smart travel demand management measures in London

Since TfL was established there has been a significant increase in smart travel demand activity year-on-year. TfL is now at the forefront of work in this field with a well-established implementation programme for school travel planning, workplace travel planning, personalised travel planning and travel awareness, with positive results. In London, there are now over 1,000 school travel plans in place; there are examples of workplaces with travel plans achieving a 20% reduction in staff car use; travel planning with individuals is indicating a 6% reduction in car kilometres amongst those involved. In addition, TfL is implementing a co-ordinated pilot in one area which will allow the measurement of the impact of a full programme of concentrated smart travel demand management activity. This will be launched in partnership with the London Borough of Sutton in September 2006.

Rigorous and sustained monitoring is key to TfL's travel demand management programme. In addition to using bespoke vehicle tracking and GIS mapping technology to measure and report mode shifts linked to individual travel plans for schools and workplaces, TfL also undertakes attitudinal and behavioural research surveys. These, along with travel volume and congestion surveys, will inform the success of the programme in delivering change.

The three smart travel demand packages within this bid will allow TfL to build on experience to date and test new approaches to smart travel demand management. These will be able to inform both TfL and national policy in defining the scale and nature of the impact from these initiatives.

The smart travel demand management proposals in summary

Three packages are described in turn, together with their estimated impacts. An important aspect of the monitoring of these packages will be to distinguish 'first order' impacts on directly affected individuals from the wider 'second order' effects on all road users and traffic conditions more generally.

Package STDM-A: A comprehensive town centre approach
Implementation £21m

This package would be introduced as an integral part of the road user charging package B set out above. It will use TfL's existing experience in managing a range of smart travel demand programmes, in order to complement the introduction of a town centre road user charging scheme outside central London (as defined in RUC-B). The programme will include a full range of activity incorporating travel planning with schools, workplaces and individuals, plus widespread travel awareness and the development of alternative transport options such as car clubs.

This will be the first opportunity to test the joint effect of smart travel demand management and road user charging in a comprehensive approach to travel demand management. This would include 40,000 individuals involved in personalised travel planning and 5,000 employees covered by workplace travel plans. All schools in the chosen area would have travel plans and there would be high-level awareness campaign and the provision of a car club.

These measures and their monitoring would be integrated with package RUC-B and its monitoring. By 2014 the smart demand measures could be delivering some 20% of the overall traffic reduction in the study area.

Package STDM-B: Workplace Travel Plans – the next phase
Implementation £24m (Outer London) + £18m (Central London)

This package would build on TfL's existing Workplace Travel Planning programme with the aim of demonstrating the effects of a radically improved workplace travel planning programme, including high-quality materials focused on the most high-impact workplaces.

This more intensive approach would be fully flexible to the needs of different businesses and would be subject to comprehensive monitoring. In terms of expected benefits, as an example TfL would be expecting a first order 5 to 10% mode shift by car drivers at individual workplaces in Outer London with travel plans by 2014, though the monitoring would look also at the wider second order impacts.

There are two elements:

B.1 (£24m) would focus on outer London where car use for commuting is relatively high. 40,000 new employees would be covered by travel plans each year. The focus of this element is on high-car-mode-share workplaces and therefore on moving car trips to alternatives.

B.2 (£18m) will concentrate on central London with the objectives of a reduction in short trips on public transport and support for shift workers to utilise sustainable travel options. 30,000 new employees would be covered by travel plans each year. The focus of this element is to free up capacity on the public transport network by moving employees to alternatives such as walking for some or all of their trip to work.

Package STDM-C: Managing demand on major transport corridors
Implementation £45m

This package would build on experience from the existing smart travel demand pilot scheme being launched in Sutton town centre; it would aim to test the effects of a similar concentrated approach to major transport corridors rather than to a centre. As with the town centre pilot, travel habits would be influenced through a concentrated programme of travel planning activity via workplaces, schools and a personalised travel plan programme. The funding would support five individual pilots each of three years duration.

This will be the first project to test the management of urban traffic by integrating the management of corridors via traditional transport means, with the management of demand via smart measures. Road space management and allocation would be systematically reviewed along the corridor, taking all road users' needs into account (in line with the Corridor Plans work under TfL's Network Management Duty) – the management and allocation of space would be reviewed in order to optimise movement across the full range of road users, including pedestrians. In parallel, the most appropriate smart measures interventions would be defined and implemented. This package would therefore seek to test the impact of a more active management of road space in combination with smart measures. It is important to note that the bid only covers funding for the TDM component and does not include funding for the systematic review of road space allocation along the corridor.

Around 5,000 employees and 40,000 individuals would be covered by each three year pilot. The monitoring would look at both the first and second order impacts.

Overall costs of smart travel demand management packages

The proposed timescales and expenditure profiles of the three smart travel demand management packages, in £ millions, is shown in the table below.

Package	Annual Budget	Time period	Total Budget
STDM-A: Town centre approach	3.5	2008/09 - 2013/14	21
STDM-B1: Workplace travel plans **STDM-B2:** Workplace travel plans	4 3	2008/09 - 2013/14 2008/09 - 2013/14	24 18
STDM-C: Transport corridors	6-9	2008/09- 2013/14	45
Total	16.5-19.5		108

The details of each of these six packages are described in the remainder of this document.

It may be worth reiterating that all six of the packages described assume a level of investment and ongoing activity in London's public transport and road networks. As such, the demand management measures described cannot be considered in isolation and require ongoing investment in a full range of complementary measures. This includes:

- ongoing, effective, real-time management of the road network through streetworks permitting, traffic signals optimisation, the traffic control centre, traffic policing and enforcement, etc, to make the best use of limited road space;
- reviews of current corridors and road space across the network to consider the optimum allocation between competing needs – between movement space and 'exchange' space, between non-motorised and motorised travel, between public transport and private movement;
- ensuring attractive public transport alternatives, both in terms of capacity and service quality.

These measures all support the demand management interventions described. Although the funding for these measures (except those described in the town centre package under RUC-B) is not included in the bid, they are crucial to supporting movement across London.

1. Introduction and context

1.1 Road traffic congestion in London

London's population has been growing steadily since 1989, reaching an estimated 7.2 million people in 2002. This has been accompanied by a growth in economic activity and employment. The result of this growth has been an increased demand for travel. At the same time, there are continuing pressures to utilise road space for a whole range of purposes: to improve safety, provide adequate space for non-car movements such as pedestrians, cyclists and buses, and to provide space for non-movement purposes such as parking and loading. In this environment there is little opportunity for freeing up road space.

Unlike some other areas of the country, there is virtually no opportunity for publicly acceptable road widening schemes. Significant additional road space is therefore not possible, and would in any case be limited to only specific strategic locations such as junctions. While useful, these would not contribute significantly to addressing rising pressures on London's road network. More broadly, increasing road capacity can in some cases induce further demand and thus fuel the traffic congestion problem further.

However, despite recent increases in capacity on public transport, largely enabled by growth in the bus sector, traffic congestion has continued to increase across most of London – partly as a result of other interventions on the road network to increase priority for public transport, walking and cycling. The exception is in central London where growing traffic congestion has been stemmed by the introduction of the central London congestion charging scheme in February 2003.

While London's congestion charging scheme has been effective at reducing traffic and congestion in the zone, central London is unique and its impact may not aid the full understanding of the impacts of a national road user charging scheme or other measures on the rest of London.

There are several factors which exacerbate the road traffic congestion challenge in London.

- Some journeys are of particularly high value (such as business travel and certain commercial vehicle movements) and often occur in peak period and in congested locations. Pricing provides a mechanism for increasing the efficiency of high value journeys by mode or time shifting or suppressing lower value journeys.

- The scope to influence road traffic patterns, without the use of road user charging, within London is reducing. That is, there is less opportunity to route traffic away from congested areas or to shift movements to less congested times of day. This is for two primary reasons. Firstly, traffic congestion has been spreading across the day and into the weekend. In many critical locations, the morning and evening peaks of 20 years ago have spread into an 'all-day peak.' Secondly, traffic congestion is not restricted to certain areas – it is endemic across the network at many junctions and links, and spreading from major roads to minor roads. These factors limit drivers' ability to choose to avoid traffic congestion, such as travelling an hour earlier or later, or taking a different route.

- There is a strong reliance on cars for private travel, particularly in areas less well-served by public transport. In Outer London, for example, lower residential densities and car-based land use patterns make it more difficult to offer effective alternatives.

1.2 Current activities to manage London's road network

A significant programme of work is underway at TfL in partnership with London's boroughs to manage the existing network as well as possible. On a day-to-day basis, TfL seeks to manage congestion and disruption on the road network through measures such as:

- Improved real-time traffic management through the creation of the London Traffic Control Centre;
- Improved management of disruptions and violations through increased deployment of police to clear disruptions, camera enforcement of yellow boxes and bus lanes, etc;
- Improved management of London's street and roadworks through *LondonWorks* (in partnership with London's boroughs).
- Identification and implementation of solutions for existing pinch-points or traffic congestion hotspots;

These measures are critical for making the most of the existing road network and minimising the effects of traffic congestion and disruption. However, these interventions can only manage existing levels of traffic, improve congestion at the margins and/or in particular locations and improve management of disruption. They will not and cannot have any wider impact on improving London's traffic congestion problems.

Over the medium term, TfL is seeking to make further improvements through initiatives such as:

- Implementation of TfL's Network Management Duty under the recent Traffic Management Act, including the development of Network Management Plans and corridor plans;
- Strategic review and improved ongoing maintenance of London's traffic signals.

These measures will more fundamentally review existing management and allocation of road space, and enable informed assessment of how this allocation could be optimised. As an example, this could include increased provisions for bus priority as a 'carrot' to attract trips from the car, or improved provisions for pedestrians to make walking a realistic and attractive alternative for the one third of trips in London which are under one mile. However, against a background of growing demand for motorised movement including car travel in particular, these measures will optimise the existing network but will not alone 'solve' the traffic congestion problem.

1.3 London's future growth and implications for traffic congestion

London's population and employment are predicted to continue growing over the next 20 years. Projections in the Mayor's London Plan, based on long-run trends of natural growth and continued net in-migration, forecast that London's population could reach 8.07 million by 2016 and 8.3 million by 2026.

It is crucial to the UK that London not only accommodates this growth, but that the city continues to flourish. This is the only way London will be able to maintain its position in the global economy: both as a location for world-wide headquarters and international financial services, and as a city people want to live in and visit.

Without the right road network management policies and public transport investments, traffic levels could increase by up to 15% over the next 20 to 30 years. This would lead to an increase in traffic congestion of around 20-25%. Average bus excess wait time could increase by 15% as a result of traffic congestion. An increase in delay of this scale could cost road users an extra £200-300m per year in lost time, further constraining London's economic growth and productivity. The Capital's townscape and urban environment would be eroded by higher levels of traffic and congestion in town centres.

If London is to accommodate this level of growth in travel demand there will need to be a sustained investment in effective capacity to maximise the efficient use of the existing network and to increase overall public transport capacity. Managing demand for travel is fundamental both in responding to potential growth and in facilitating a shift to sustainable transport patterns for future generations. Actions will have to be taken across all modes in the short, medium and long term to manage demand and supply effectively.

On the road network, demand management is a particularly critical tool. As the Secretary of State for Transport recognises in his recent letter to the Prime Minister, "*we cannot simply build our way out of congestion, which is a key threat to economic growth, particularly in our towns and cities.*"

Only a package of complementary measures will be truly effective in tackling road traffic congestion and crowding, including hard and soft incentives to reduce travel demand, information about alternatives and availability of attractive alternatives including public transport and sustainable alternatives (e.g. walking). These are considered in broad terms below.

2. Policy options

2.1 Outcomes that will reduce road traffic congestion

Theoretically, TfL can seek to manage demand in four ways:

Reducing the congestion effects of vehicle movements

- Better management of road network movements
- Better management of kerbside parking and loading
- Better information to drivers, from street names to real-time information to enable route optimisation

Reducing the need to travel so far

- Encouraging substitution of trips to more local destinations
- Ensuring an appropriately strategic approach to parking
- Improving access to services locally, including through mixed-use developments, attractive public spaces, and other land use planning mechanisms

Reducing the number of car driver trips

- Promoting the use of alternative modes (e.g. public transport for work trips and walking for short trips)
- Car sharing or pooling (e.g., through work and/or school travel plans)
- Improving the attractiveness of public transport and the urban environment for alternatives such as walking and cycling

Reducing the number of overall trips

- Reducing the need to travel for certain trip types while maintaining the underlying activity (e.g., home shopping, teleworking)
- Combining trips (e.g., one trip/week into Central London for errands rather than three separate trips)

Which of these approaches works will:

- *Vary by trip type:* Obviously not all trips are equally susceptible to these kinds of changes, nor should they be. Asking car drivers to bring a large, heavy shopping load home on the bus is less likely to work than shifting a short car trip to the local corner store to get the newspaper, which can easily be done by foot. Similarly, changing destination for a work or school trip is usually not possible, but it is for some retail trips.

- *Vary by person:* Certain segments of the population will be far more open to behaviour change than others – whether that change is driven by pricing, persuasion, or availability of attractive alternatives. In many cases, changing demand behaviour will make people either no worse off or better off. This was substantiated by recent TfL customer research: nearly 5,000 interviews were conducted which identified seven behavioural/attitudinal segments in relation to car usage. Four of those segments were identified as being susceptible to some change in their car usage – each for very different reasons. The findings illustrated clear distinctions between the groups' preparedness to change behaviour and the factors which would influence their decisions.

Because of this range in trip and customer types, we must consider what combination of policy measures we can use to achieve the various decongestion outcomes.

2.2. Policy tools to deliver the decongestion outcomes

London's experience with congestion charging has already shown that a suite of complementary measures, road space management considerations and public information are required to manage traffic congestion effectively. These measures are not alternatives – they are all necessary if traffic congestion is to be tackled successfully. Four broad elements are required.

Clear, fact-based communications. In the first instance, clear exposition and analysis of the issues and interventions is critical to get public support. This must be effectively communicated, as must alternatives to the car if people are being asked to consider changes to their current behaviours.

Road user charges. These require individual drivers to assess the value of their trip. They can be used to influence mode shift, time of travel, frequency of travel, and destination selection. Critically, they inhibit newly-freed-up road space filling up again with induced traffic.

Attractive alternatives to those 'priced off', including public transport and walking and cycling. Sufficiently attractive alternatives to the car must be offered both to provide alternatives and to gain public acceptance. Alternatives will vary depending on the situation: in Central London congestion charging bus provision was critical, whereas in suburban areas making walking an attractive option for short trips will also be a key element. Providing the right alternatives – and the right balance between different road space uses – requires a holistic review of existing road space and alternatives for allocating that space.

Smart travel demand management. Information and marketing to inform people about car alternatives and to encourage people to use those alternatives. These measures will be particularly important in areas where there are lower levels of awareness and use of public transport, and to encourage walking and cycling.

2.3 Relationship between policy tools: Need for package of measures

It is clear that attractive alternatives to the car are critical for demand management to work. Without such alternatives, a limited number of the traffic management outcomes listed in 2.1 would still be possible – shifting time of car travel, combining car trips, and replacing trips with alternatives such as teleworking and online shopping. But the bulk of the traffic decongestion opportunity would be lost. This is because demand management – whether 'smart' or pricing-based – must offer attractive, viable alternatives created through measures such as public transport investment and road space management, if significant shift from car driver is to be delivered. Such a virtuous circle, delivering mode shift of 4%, was crucial to the success of the central London congestion charging scheme.

In terms of the demand management measures themselves, smart measures and road user charging also support and reinforce each other in a number of ways.

Timing. National road user charging may still perhaps ten years away. In the meantime, given existing traffic congestion levels, smart measures can and must be ramped up to influence demand. DfT research has shown that smart measures activity can be effective when implemented in appropriate locations where 'hard' measures are not in place.

This phasing has an additional benefit. Smart measures and messages accustom car users to the idea of changing their travel behaviour and familiarising them with alternatives, even for those who do not respond. When charging is introduced, therefore, negative reactions may well be mitigated as the concept of demand management has been introduced and – perhaps more

importantly – they have been exposed to information regarding alternatives to the car. This makes the shift to alternative modes and trip patterns easier when charging is introduced.

Geographic scope. Road user charging provides critical wider traffic decongestion by covering a strategic area, routes, or major centres. Smart measures can be focused very narrowly on specific trips in particularly-congested areas (for example, targeting the shortest-distance school-run car trips in highly congested areas with a concentration of schools). The two therefore can be very effective when applied together.

Customer segments. Numerous market research studies show clear distinctions between different groups of car users. Typical breakdowns tend to indicate a 'willing' 30% interested in driving less but often not aware of alternatives; a large group of about 50% who are reasonably apathetic, know they should drive less but don't feel they have the time to do so, and a 'harder core' 20% who are not keen to give up driving.

While smart travel demand measures are very likely to be effective with the willing 30%, it will only be somewhat effective with the apathetic 50% and very ineffective with the harder core 20%. Road user charging influences lower value trips and may be useful in targeting less-willing segments of the population where information and positive messages don't work, but fiscal measures do.

Empirical evidence on the relative impact of these measures applied collectively is not yet available since the application and monitoring of smart measures has not yet been attempted on a large scale. TfL's pilot schemes and trials proposed in this bid will seek to provide part of this fact base, as will ongoing monitoring of congestion charging, the western extension and monitoring of the smart travel demand initiatives already planned such as the Sutton town centre pilot.

Road user charging and smart travel demand measures are discussed in turn in the following sections of this document. The need for the kinds of supporting measures discussed earlier is assumed throughout, although it is highlighted a few times in relation to a few specific aspects of the programme. The full package of desirable supporting measures – including a broad-based review of road space allocation – is not fully funded. TfL will be seeking funding for these additional measures in the context of SR2007.

3. Road user charging

3.1 Road User Charging Strategy

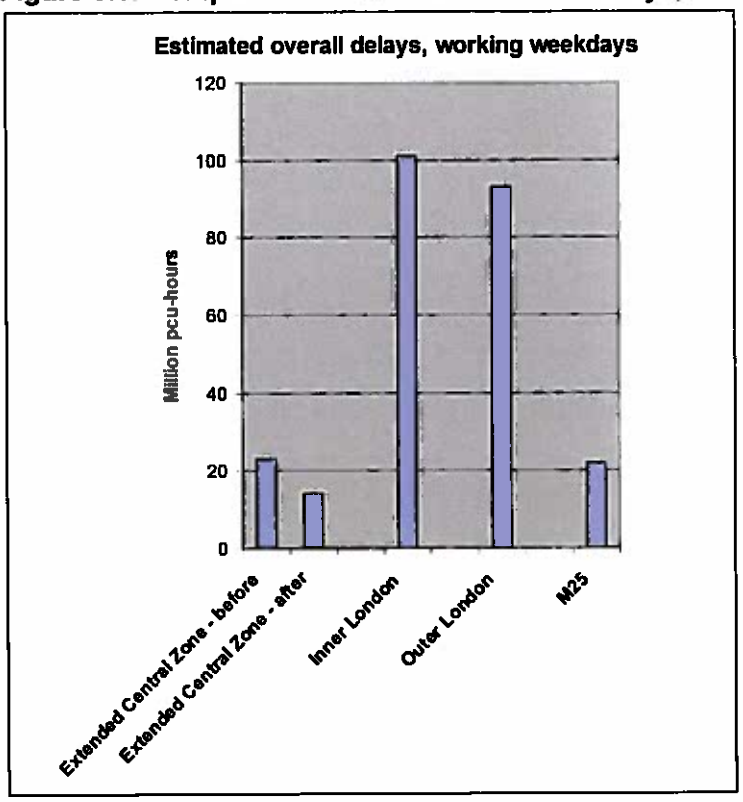
3.1.1 London's transport context

As discussed, London's projected growth and associated transport demand growth represent a significant challenge. Road traffic congestion is a serious problem throughout London and is likely to intensify if nothing is done. The UK Government is also facing the challenge of growing congestion on the inter-urban transport network. Traffic congestion reduction targets have been set for major conurbations, however, studies have indicated that some 40% of all congestion in England occurs in Greater London and so tackling rising traffic congestion in the capital will be key to tackling problems caused by traffic congestion nationally.

Ministers believe road user charging can form an important part of a solution to traffic congestion and hope to use the Transport Innovation Fund both to tackle some of England's worst congestion hotspots and to progress the theory and practice of road user charging in a way that will contribute towards establishing a 'road map' towards a nationwide solution. Transport for London is keen to understand the benefits which a national road user charging scheme could bring to Greater London.

One of the Mayor's key transport priorities is to reduce traffic congestion. The scale of the problem is illustrated in Figure 3.1, which shows estimated overall traffic delays on London's road network, in terms of passenger car unit (pcu) hours per year for the area of the existing charging zone plus its proposed extension with and without congestion charging, together with delays across Inner London, across Outer London and, for comparison, on the M25 orbital motorway

Figure 3.1: Comparison of estimated overall delays, working weekdays



The figure shows that charging has the potential to reduce delays substantially – a combination of reducing traffic intensity to more manageable levels and improving traffic speeds to more efficient levels. The figure also shows the scale of traffic congestion in Inner and Outer London and allows a comparison with an estimate of conditions on the M25.

3.1.2 National context

The precise form of a potential 'national' road user charging scheme has yet to be defined, but there are three ways in which it might be conceived:

- A series of local schemes covering the most congested areas, joined by a common back office;
- A network wide scheme, employing distance based charging;
- A combination of the above; with local charging schemes operating in conjunction with a national distance based scheme.

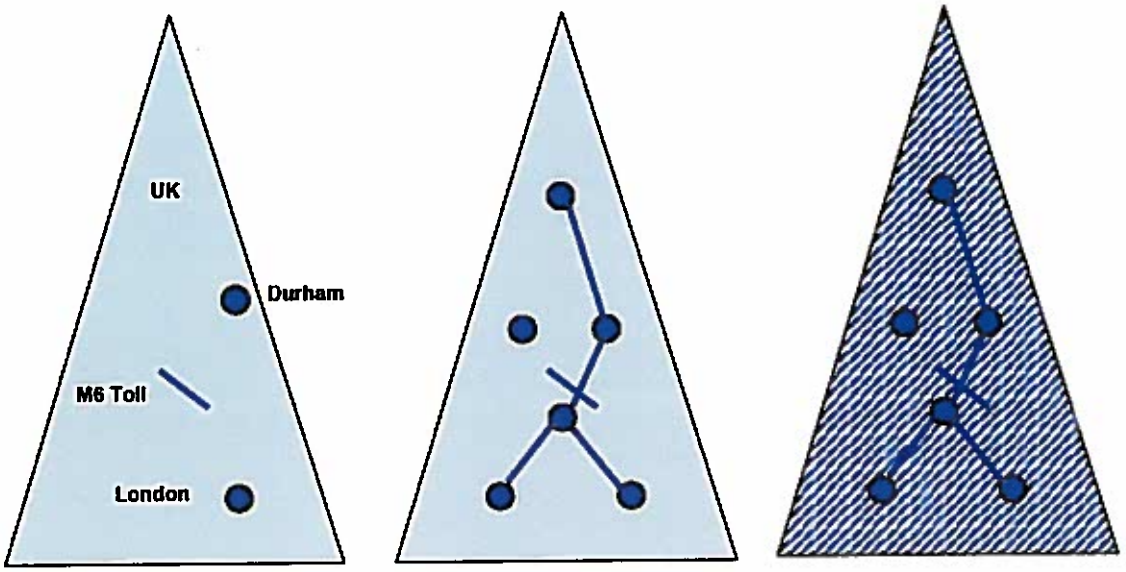
One possibility would be that a national charging scheme might emerge as a migration from the current system of charges (Durham, central London, M6 Toll, the tolled estuarial crossings) and taxes (fuel duty and VED), to a series of local traffic congestion reduction schemes in congested towns and cities and on key sections of the strategic network.

Those initial pilot schemes funded by the first tranche of TIF support might be joined by other congested locations, both within towns and cities and on the strategic road network around the country. As more schemes are implemented and a national structure for supporting charging emerges, charging itself would become increasingly cost effective and potentially more acceptable to the public, and the locations where it might form part of the solution could become more widespread.

At some point, a 'critical mass', or 'tipping point', may be reached where a sufficient proportion of the vehicle population is equipped with a suitable detection unit and more sophisticated and widespread charging might become possible. Eventually, a mandated nationwide charge could begin to emerge, overlaid by continued charging in those locations where charging has become a part of the solution to local or regional traffic congestion problems. A national road user charging scheme might then be developed from, or superimposed upon, these 'pathfinder' implementations sometime after 2015 (see Figure 3.2).

Public acceptability would be critical to the shape and timing of any national scheme, alongside issues such as control of the substantial funds that would be collected. However, the critical first step is to secure adequate 'pathfinder' schemes.

Figure 3.2: A possible way forward for the UK



3.1.4 A possible strategy for London

The first step is complete – congestion charging in central London

The central London congestion charging scheme began operating in 2003, based on a simple, flat-rate, daily, area charge, enforced using cameras and automated number plate recognition (ANPR) technology. The volume of traffic in the charging zone was reduced by 15%, with a consequent 30% reduction in traffic congestion. In early 2007, the charging area will be extended, to cover more of the central London road network where congestion is a significant problem.

Step 2 – flexible charging in central London

In 2010, when the contract for the operation of the extended congestion charging zone is due to be re-procured, TfL is investigating the possibilities of also using dedicated short range communications (DSRC) technology for charge payment. Also known as 'tag and beacon', this technology involves a small electronic device (a 'tag') carried inside the vehicles, that is identified by a roadside 'beacon'. Over the last two years, TfL has been carrying out a series of trials to investigate the feasibility of using tag and beacon in an urban context and is currently operating a full scale demonstration charging zone, with 20 charging points, inside the existing central London congestion charging zone, testing the robustness of tag and beacon in London traffic conditions.

Step 3 – understanding road user charging in other parts of London

TfL believes the development of a national road user charging scheme could have an important role in tackling congestion in other parts of Greater London where traffic conditions are more comparable similar to those in the UK as whole. It has been shown that, despite improvements in central London as a result of congestion charging, and ongoing measures to effectively manage road space for all road users, traffic congestion is still a significant problem in other parts of Greater London, and that traffic congestion in London as a whole accounts for a significant proportion of congestion nationally. TfL is working with a number of London boroughs to identify areas where road user charging might form an integral part of the solution to local traffic congestion problems. It is hoped to identify one or more areas in which a demonstration charging scheme, with an associated package of complementary transport improvements, could be

implemented in order to contribute to an understanding of the role charging could play outside central London.

Step 4 - Distance based charging

Area or cordon based road user charging is unlikely to be suitable or viable for all parts of the road network, either in London or nationally. In the longer term, mobile positioning technologies, principally those enabled by global navigation satellite systems (GNSS), could offer flexibility in charging for road use, with charges levied according to local conditions. Whilst the problems of retrofitting the vehicle fleet with the technology to enable such charging mean that widespread introduction of such charging is unlikely in the short term, TfL believes that simple distance based charging could be offered as a payment method in the central London congestion charging zone for voluntary 'early adopter' vehicles within a few years. This would provide a basis for research into what is known as 'marginal social cost' pricing – with charges varying to take account of traffic congestion and environmental conditions.

Step 5 – Further development of local road user charging schemes

Once a suitable location for the demonstration road user charging scheme described under Step 3 above is confirmed, TfL would continue to work closely with other London boroughs and other local authorities across the UK to identify locations where similar schemes could be implemented, should there be interest from those boroughs or authorities.

With a series of schemes in London, and further schemes developed outside London, the number of equipped vehicles would begin to increase. It is possible to foresee a point at which enough vehicles are equipped with some form of on board unit that their use, perhaps initially in London, might be mandated, or at least given favourable treatment in moving from scheme to scheme. All of this, of course, would be subject to the findings of the relevant feasibility studies, the necessary public consultation and Mayoral approval.

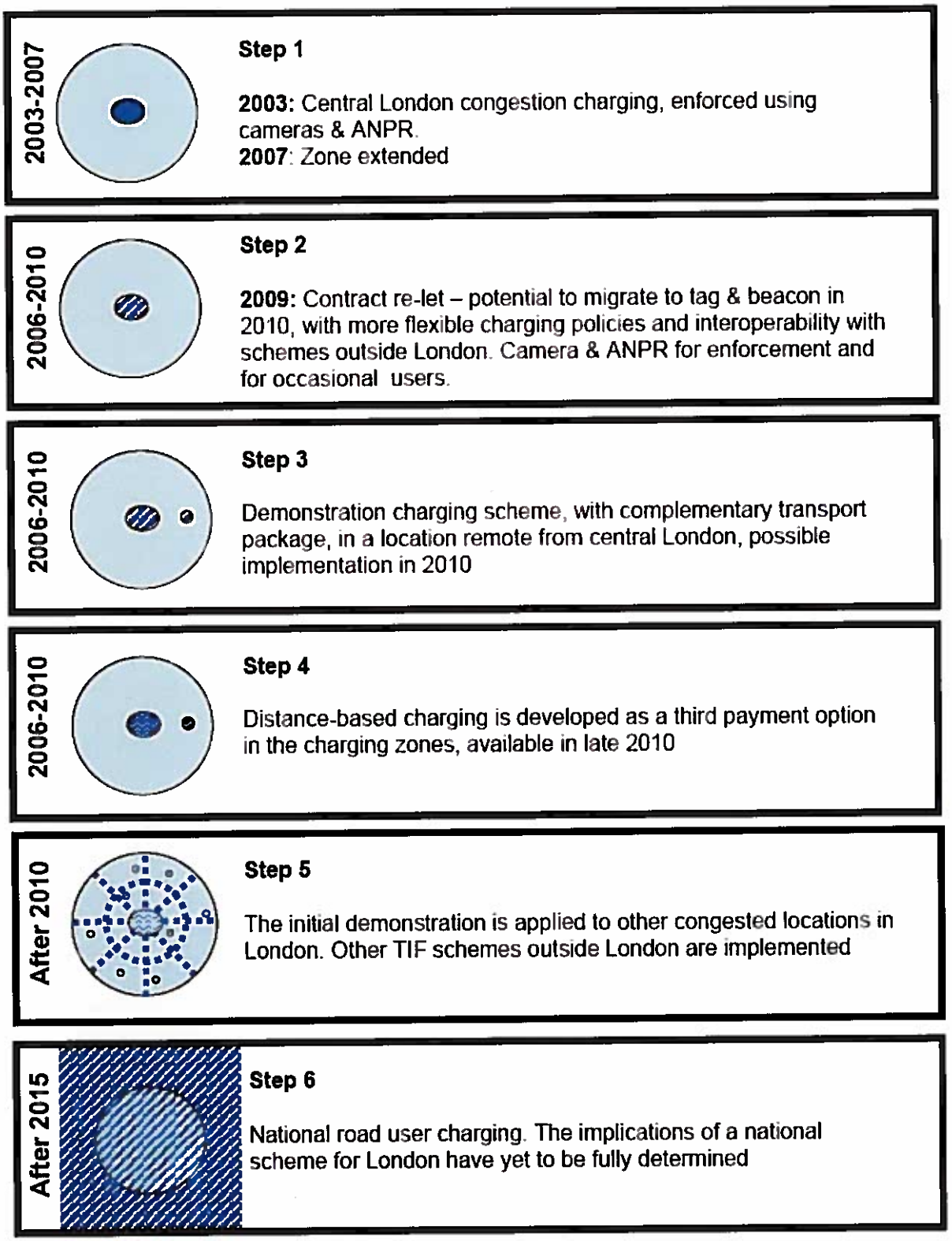
Step 6 – National road user charging

All these steps:

- the successful implementation of charging in central London;
- the availability of a flexible, interoperable charging mechanism;
- an understanding of the impacts and acceptability of charging outside central London;
- the development of affordable, accurate distance based charging; and
- increasing experience of the operation of different road user charging schemes in different locations and traffic conditions, and an increasing understanding of public attitudes and acceptability,

could enable the development of a national road user charging scheme.

Figure 3.3: A possible road user charging strategy



3.2 TfL's Congestion TIF proposition

TfL has identified three packages of work which would build on the work already carried out in achieving Step 1, a successful congestion charging scheme in central London, and our ongoing work to explore new technologies. TfL is seeking TIF funding for these three packages which could enable London to take some of the steps towards achieving a national and London-wide road user charging scheme.

Package A: Towards a more flexible charging mechanism

TfL is in the process of re-procuring the operating contracts for the extended central London congestion charging scheme, with the new contracts due to begin operating in 2010. These contracts will initially replicate the existing charging scheme, requiring user declaration enforced with cameras and ANPR. Over the past three years, a series of trials of road user charging technologies have taken place, studying, amongst other things, the possibility of using DSRC tag and beacon technologies to enable more flexible charging policies through automated payments. TfL is now seeking support from the TIF to implement DSRC tag and beacon charging infrastructures within the core IT, at the roadside and in participating vehicles, as well as demonstrating an interoperable 'model office' for charging that could be developed into the core for a 'national' scheme and be delivered by third party service providers. With DfT funding, and subject to public consultation and Mayoral approval, DSRC could be offered as a payment option in central London by 2010, alongside the existing area charge and with the possibility of interoperable charging with, for example, M6 Toll or Dartford-Thurrock Crossing and other 'remote' schemes;

Package B: Towards an understanding of charging outside central London

Having established the principle, in central London, of a combined camera enforced area charge and a DSRC enabled cordon charge, with flexible charging, interoperability with other schemes and the possibility to set up accounts, it would become possible to introduce road user charging in a zone remote from central London, covering a congested centre or 'strategic' link.

TfL is looking for TIF funding initially to build on its ongoing feasibility studies of charging in a town centre or strategic route. Assuming a positive outcome from this research, political support from the Mayor and the partner borough, and subject to public consultation, funding would be sought for such a scheme to be implemented. This would be part of a package, also including improvements to public transport, walking, cycling, accessibility, and environment, along with smart demand management measures and road network management improvements. TfL and the affected boroughs would review management of the road network and key corridors in and around a charging area to identify necessary and desirable interventions in road space allocation. These would be crucial to both capture mode shift away from car driver and to ensure best use is made of all available road space. The London Borough of Greenwich has expressed a willingness to work with TfL to examine the feasibility of such a road user charging scheme. With DfT funding a remote charging zone could be operational by late 2010;

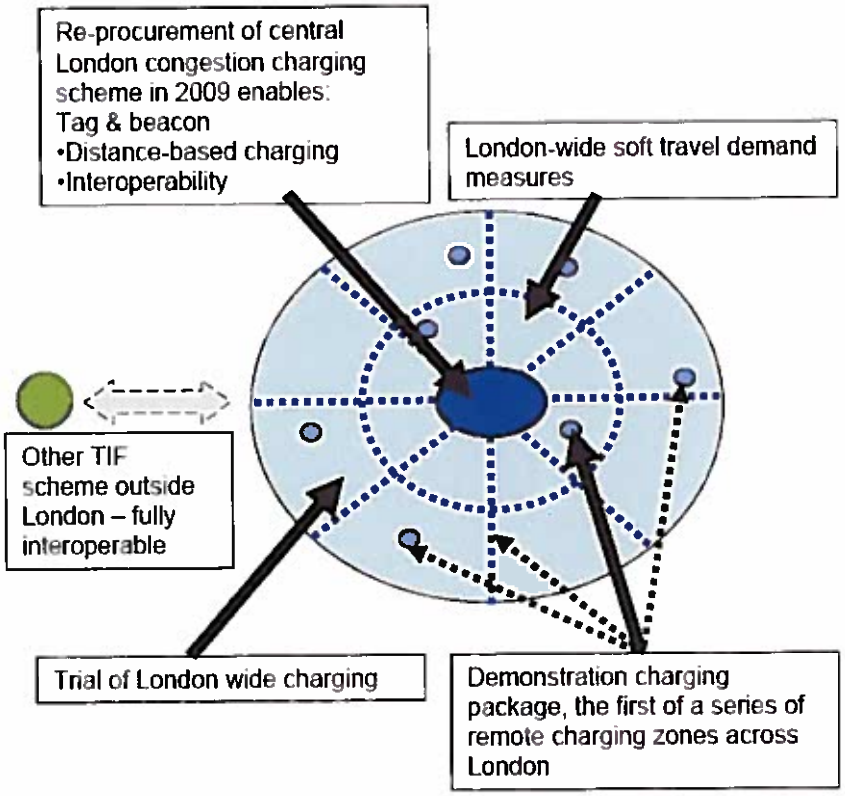
Package C: Towards a distance based charge for road use

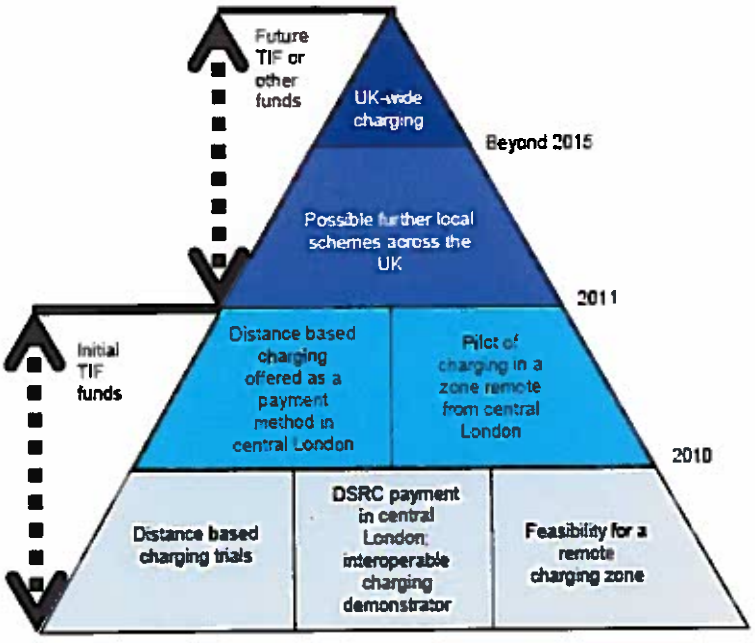
The Government's *Feasibility Study* suggests that some form of charge that might be varied by distance, time and location would deliver considerable traffic and other benefits. TfL's own initial studies show that in London, such benefits could be particularly significant, especially if revenues could be retained in London and reinvested in transport.

TfL has already carried out some initial trials of satellite tracking in London and is seeking TIF funding to pilot distance based charging as a payment option in the extended central London charging scheme, some 50 sq km, as well as pursuing a large scale trial of satellite positioning

technology to understand operational and behavioural issues across Greater London's 1,580 sq km. With DfT funding mobile positioning could be offered as a payment mechanism in the central London zone, and any eventual remote zones, in late 2010. This would provide a demonstration of charging, potentially varying by time, distance and place, in a 'live' charging environment, with broader lessons for the acceptability and behavioral impacts of such a charge.

Figure 3.4: The Congestion TIF packages in the context of the strategy





Work package A: Towards a more flexible charging mechanism – DSRC in the central London congestion charging zone

Summary

Proposed TIF-funded activities:

- Completion of ongoing analysis of charging options enabled by flexible charging, and their implications for central London;
- Consultation on amendments to the Scheme Order;
- Implement core IT, roadside and in-vehicle infrastructure to enable DSRC tag and beacon charging in central London;
  Test scenarios for interoperability between DSRC-enabled charging schemes.

Outputs:

- Detailed feasibility study of the potential impacts of flexible charging in central London, with broader lessons for other implementations outside London;
- An understanding of the acceptability of flexible charging, through consultation and attitudinal research, with broader lessons for other implementations outside London;
- Designs for a DSRC charging infrastructure which is both robust and acceptable in an urban environment, but designed to be applicable on a national basis and available from third party service providers;
- A combined area and cordon scheme with tag-enabled "scheme detection" payments, "personal user declaration" payments and camera enforcement;
- Contributions to the development of interoperable charging, enabling significant progress towards a national 'back office';
- Interoperability with other major tag-enabled charging implementations outside London (e.g. M6 Toll, Dartford-Thurrock Crossing.

Outcomes:

- A potential benefit-cost ratio of 1.5.
- Depending on the precise charging option pursued, tag and beacon has the potential to deliver an increase in the perceived 'fairness' and ease of use of charging in central London and improved incentives for the use of less polluting vehicles, with implications for broader acceptance of the use of charging within and outside London;
- An understanding of the traffic, and other, impacts of flexible charging policies in central London, with broader lessons for other implementations outside London;
- The availability of an interoperability demonstrator enables the introduction of charging in other parts of London and nationally.

Costs:

- The estimated cost of the package is £40 million (this represents the difference in cost between a simple re-let of the existing scheme operation as is and a more flexible charging scheme, using DSRC tag and beacon.

Timescales:

- Results of feasibility studies (mid 2007) and potential public consultation on a revised Scheme Order – late 2008;
- Lessons from the testing of scenarios for interoperability – 2009;
- Tag and beacon charging operational in central London, interoperable with other tag-enabled charging implementations – 2010.

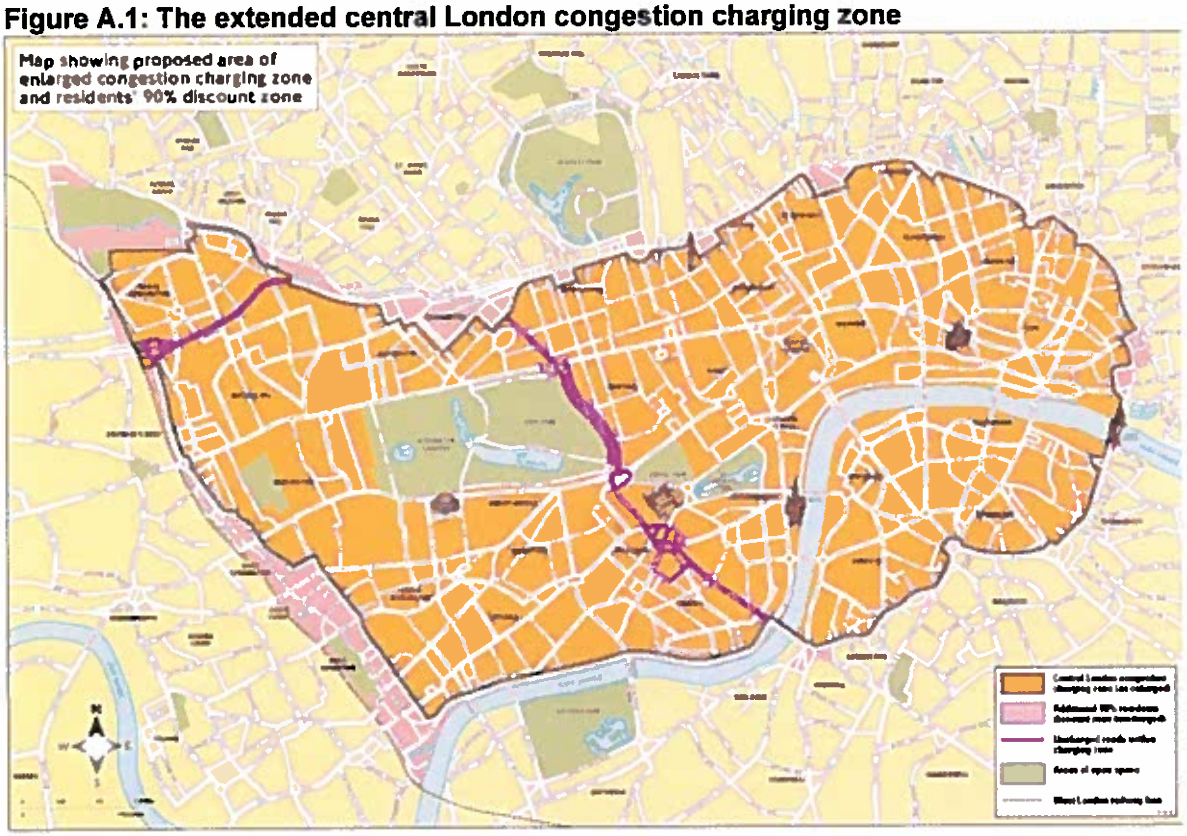
A.1 The extended central London congestion charging scheme

The central London congestion charge, a flat rate charge for using roads within a 22 sq km area of central London, was introduced in February 2003, with the aim of combating traffic congestion. Payment is possible by a range of methods and is enforced through a network of cameras at all entry and exit points, as well as at key locations within the charging area.

Following a series of consultations, work is now underway to implement an extension to the charging area, to double the size of the zone to some 50 sq km. When charging begins in this extended area in early 2007, it will operate in broadly the same way as today.

By 2010 the contracts for the operation of the scheme will have to be re-procured. TfL is currently working towards a re-procurement of the scheme operation as it currently exists, but is also proposing to build into both the core IT and the contracts the flexibility to allow other forms of charging during the proposed lifetime of these new contracts 2009-2014, with a potential extension to 2019.

Figure A.1: The extended central London congestion charging zone



A.2 The possible benefits of more flexible charging mechanisms

Benefits for the central London congestion charging scheme

There are numerous advantages to the basic area charge that is currently in operation. It is relatively simple and straightforward to operate and is a known quantity to chargepayers. Moreover, an area charge is both effective and robust – the system can continue to function if a camera fails because vehicles typically pass several other cameras on their journeys into, through, and out of the zone, and because camera detection is used for enforcement rather than payment. However, this robust scheme does not allow for much flexibility, leading to a perceived

inequity for some: for example, multiple movements into and out of the zone incur the same charge as single movements.

The higher capture rate experienced in TfL's trials of tag and beacon technology means that some of these problems could be overcome for vehicles equipped with the appropriate technology. Charging on the basis of an event, rather than as a flat rate for an area, could allow, for example, payments based on the number of entries made to the zone, the direction of travel at the boundary of the zone, the time of day or vehicle characteristics. This might, for example, enable shift workers (e.g. nurses, bus drivers, wholesale market workers) leaving the charging zone during the morning, or entering in the evening, to pay a lower charge than vehicles which are present within the zone all day. It could also allow a charging regime which encourages the cleanest vehicles and discourages those which are less fuel efficient or more polluting. These options are to be extended in detail in a feasibility study.

Under present arrangements the charge payer is required to take some action in order to ensure that payment is made, leading to a certain number of penalty charges being generated by people forgetting to pay, rather than deliberately attempting to evade payment. This in turn has had some adverse impact on public acceptability of the scheme. The greater accuracy of the detection could enable charge payers to set up accounts which debit payments (or allow for some form of post-payment) rather than having to remember to pay every time they enter the charging zone. This would cut the number of 'accidental' penalty charge notices being issued, as well as cutting the 'compliance costs' incurred by those responsible for paying the charge. On the other hand, it is likely that these more flexible arrangements could reduce the congestion effect of the current arrangements. Again the feasibility study will examine this in detail.

Benefits for road user charging in London and the UK

TfL believes that, with the addition of other charging zones in locations remote from central London, the ability of the current charging and enforcement mechanisms to cope with the different charges incurred by individual vehicles could become cumbersome, for all but occasional users. For anyone regularly driving through more than one charging zone, perhaps with differing charge levels and hours of operation, the current payment mechanisms are likely to be complex, increasing the possibility of accidentally incurring a penalty charge as well as increasing the costs of compliance for individuals and businesses.

TfL thus considers the implementation of charge payer accounts and an automatic vehicle detection to be a prerequisite for the piloting of charging in any zone beyond central London, if this were to become a feature of the Transport Strategy.

There is still some development work needed to ensure that tag and beacon technology can meet the needs of charging in an urban environment, particularly its ability to cope with urban traffic conditions and to be visually acceptable in urban streets.

At the moment, London, with some 350 sites in the extended central London congestion charging zone, offers the only realistic chance of persuading manufacturers to make the necessary investments in research and development to achieve a suitable product. This could provide an urban charging arrangement that would be easily adopted by other highway authorities.

Crucially, an early implementation of tag and beacon technology in London would be able to develop the structures and processes necessary to achieve interoperability between different schemes, both within London and nationally. This would provide lessons for the migration path to any coordinated national implementation of road user charging.

A.3 More flexible charging technologies

TfL has conducted a substantial trial of tag and beacon technology to prove that it can work technically within an urban environment. Stage 2 of the trials was completed in June 2006 and demonstrated that microwave tags using the DSRC protocol could be used for an area or cordon-based scheme using roadside mounted beacons and number-plate reading cameras. The trial has involved a zone with 20 beacon sites being implemented in Southwark, where all vehicles entering or leaving the zone are detected. The trial involved TfL test vehicles as well as some 500 volunteer vehicles.

The key findings of Stage 2 are that:

- Tag and beacon could be used to charge vehicles based on direction of travel, time of day or class of vehicle (where a tag type is issued to a vehicle class);
- The tag transaction can be used to charge an account, but cameras and number-plate reading systems are still needed to accommodate unequipped vehicles, assist in resolving transaction anomalies and to provide supporting evidence should a charge payer dispute the charges applied;
- Detection performance of the tag and beacon system depends substantially on road site geometry and how the equipment is mounted, but that detection rates in excess of 99.5% are feasible with cantilever mounted beacons at the roadside;
- Tags from other schemes can be detected and images of those vehicles can be captured in order to enable interoperability between schemes and the potential for single customer accounts. TfL have specifically detected tags from Dartford, M6 Toll, France, Austria, Spain, Portugal and Australia. Interoperable working between different tag and beacon suppliers has also been proven.

There are some areas where the trialled arrangements are not fully mature:

- Where beacon sites have parking close by, tags in the parked vehicles can suffer from excessive battery drain shortening their life: a solution is needed for this;
- A few types of vehicle have no opening in their windscreen metallization to accommodate a tag's radio communication with a beacon (there is usually an opening behind the drivers rear view mirror) they represent less than 1% of vehicles on the road;
- The design of the pole or cantilever on which to mount beacons and cameras needs to be acceptable for use in a wide range of 'streetscapes', both modern and historic.

Stage 3 of the trials programme is now under way. This is focusing on the operational aspects of using tag and beacon, covering charge payer usability and fitting, aesthetics of roadside installations, front and back-office processes and systems, outstanding technical issues and working with the supplier market to ensure that an urban tag and beacon system meeting our requirements is procurable. Stage 3 is continuing to make use of the installed zone in Southwark.

Figure A.2: Photomontages showing tag & beacon equipment in Borough High Street

Photomontage of 'traditional' tag & beacon equipment

Photomontage of prototype 1: "urban" tag and beacon equipment

Photomontage of prototype 2: "urban" tag and beacon equipment

A.4 Indicative timetable, subject to Mayoral approval

July 2006 – Issue of OJEU for Re-let contract;

November 2006– Issue of OJEU for DSRC equipment;

Mid 2007 – results of feasibility studies of flexible charging options;

Late 2007 – consultation on revision to the Mayor's Transport Strategy;

November 2007 – Selection of preferred bidders for core IT and operations provision;

February 2008 – Selection of preferred bidder for supply and installation of DSRC equipment;

Late 2008 – consultation on variation order for chosen charging option;

Mid 2009 – Completion of installation and testing of upgraded camera and integrated DSRC infrastructure for the extended central London congestion charging zone;

November 2009 – Go-live of Re-let contract;

Early 2010 – Complete integration testing of camera/DSRC infrastructure for potential combined area and cordon charging scheme;

May 2010 – Earliest Go-live of potential combined area and cordon charging scheme using DSRC detection.

A.6 Towards an interoperable charging mechanism

The experience of the central London congestion charging scheme is that approximately 10% of the system set up costs were for on-street infrastructure, with the majority of the costs being for the setting up of the central systems and processing functions, customer-facing channels and enforcement.

London is different from most local authorities. With the volume of chargepayers and the then £5 (now £8) charge the scheme can more than cover the costs of the central facilities and generate 'net' revenues. In other parts of London, or other towns and cities, it may be more appropriate to apply a lower charge, or charge over a wider area, meaning that such schemes may not be able to easily cover the costs of central services as a stand-alone solution.

Buying services from centralised resources at or near marginal cost could improve economic viability and could enable schemes that were otherwise not economically viable. There are then two potential benefits of a common back office for road user charging, both within London and more widely across the UK:

- Economies of scale;
- Interoperability with other schemes or a national scheme.

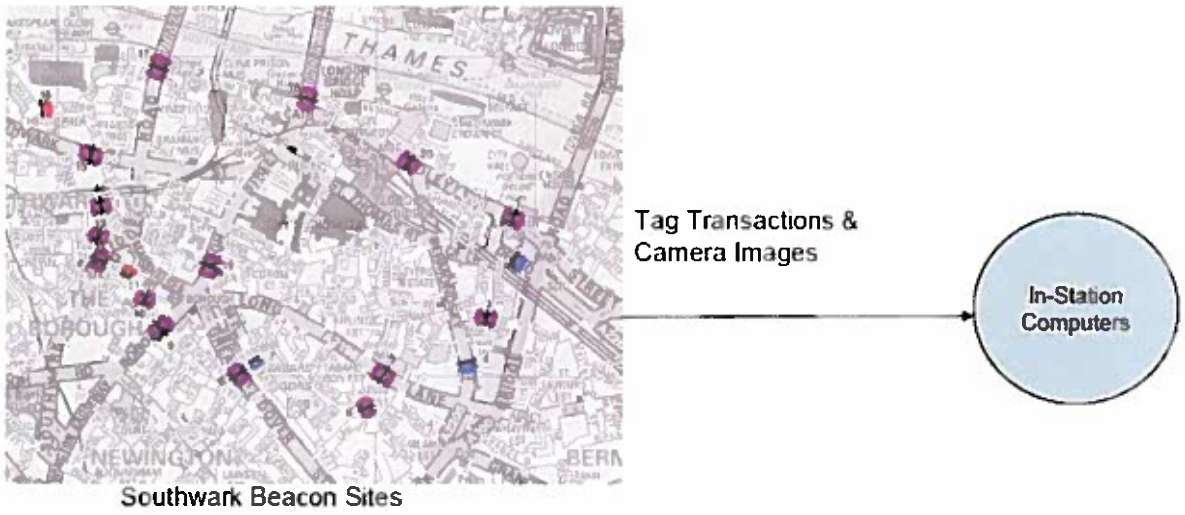
The *Feasibility Study of Road Pricing in the UK* briefly considered the case for a national back office and proposed that one of the next steps might be to: *"consider whether a national back-office and management function would be worthwhile and value for money".*

TfL would thus like to take the opportunity, in procuring a charging infrastructure to enable flexible charging using tag and beacon in central London, to carry out some further development work to demonstrate how such infrastructure might interface with other charging schemes outside London. This could contribute to the development of a model for how such a national 'back office' could support a network of local charging schemes.

Scope of the work

Figure A.3 indicates the scope of TfL's existing Southwark tag and beacon trial. The trial uses an "in-station" to gather transaction data from roadside beacon sites. These transactions are generated from TfL's test vehicles and tag-equipped volunteer vehicles. The trial has also observed tag equipped vehicles from other schemes.

Figure A.3: Geographical scope of existing tag and beacon trial



At present the trial does not involve any 'accounts' being debited or credited. During Stage 3 of the technology trials it is intended to implement some example functionality to permit such accounts and also simulate front-office processes. In particular it is intended to explore how interoperability with other schemes can be achieved through front and back office processes.

The tag and beacon trial in Southwark indicates that 2% of vehicles on the road have tags relating to the Dartford-Thurrock River Crossing or M6 Toll road. Typically, some 10% of vehicles using Dartford or M6 Toll have tags, so the actual community of central London congestion charging zone users who are also Dartford or M6 toll users may be as high as 15-20%.

TfL has already held discussions with the M6 Toll concessionaire Midland Expressway Ltd and the operators of the Dartford-Thurrock River Crossing, Le Crossing, on the potential for demonstrating interoperable accounts. At a technical level interoperability appears feasible. There are however commercial and business process issues which at this stage are not simple to address. The Stage 3 trial will define how technical interoperability could be achieved and also how processing could operate subject to commercial agreement being reached. The intention is that, with TIF funding and the sponsorship of DfT, it should be possible to reach such agreement and implement a demonstration of interoperable working with M6 Toll and Dartford-Thurrock.

There is also a series of other schemes with which interoperability could be demonstrated. Figure A.4 identifies such interfaces. For each, we would wish to define the technical interoperability possible and then implement a demonstration using TIF funding and DfT support.

The extent of the demonstrators possible would depend on co-operation and maturity of the other schemes and operators.

Figure A.4: Schematic illustrating potential scope of front and back-office and interoperability demonstrator

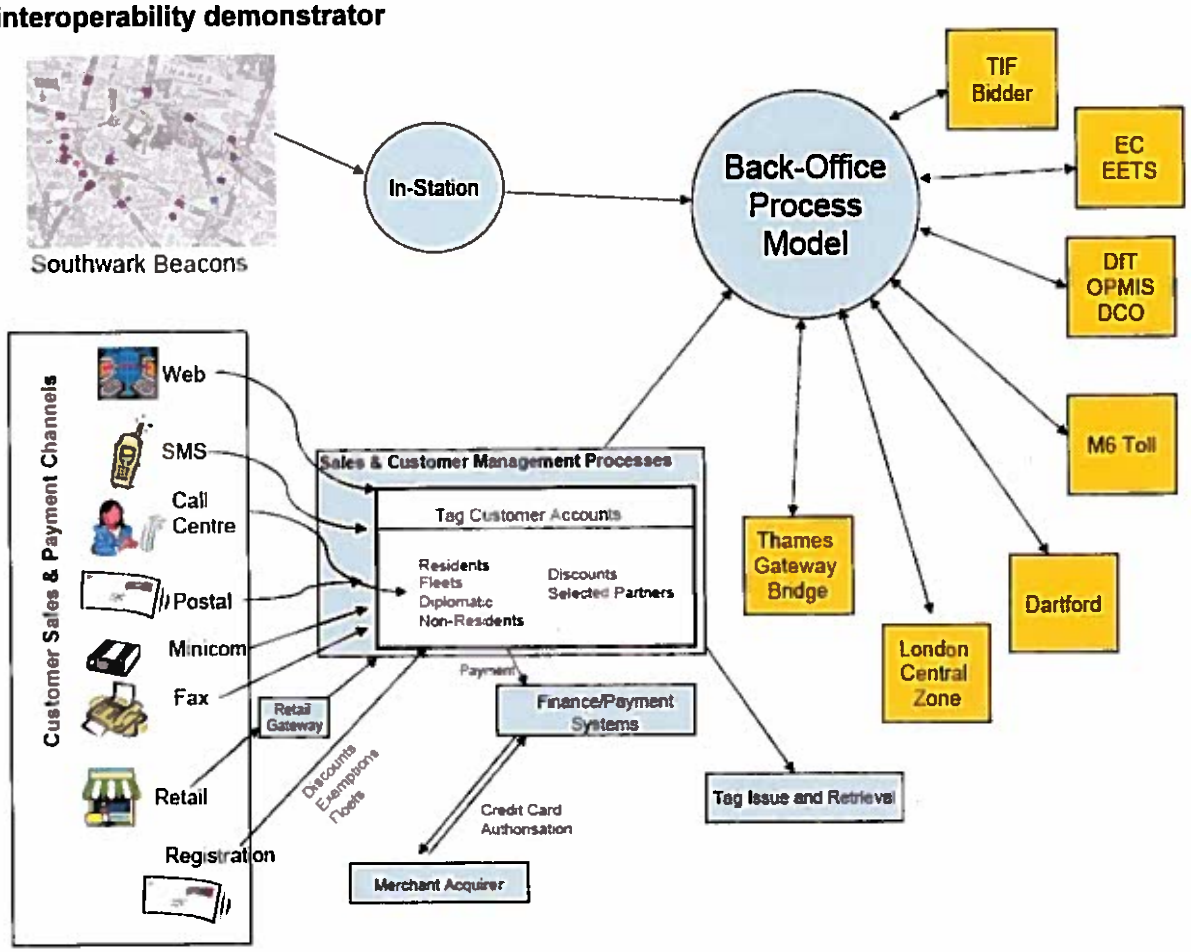


Figure A.4 illustrates a conceptual design; each part of the scope could be delivered by one or more third party service providers either for London or on behalf of DfT. The scope intended for each interface is as follows:

TIF Bidder: as already identified above, it would seem unnecessary for each local scheme to build and setup its own front and back office – consolidation of such facilities would seem to offer better value. TfL would hope to work with other bidders to identify how a shared services facility could be realised, how requirements could be met and what the business benefits might be. Subject to the co-operation of other bidders a demonstrator could be defined and implemented. The investment needed would depend on the other TIF bidders involved and their requirements; at this stage an outline budget for this activity has been identified.

EC European Electronic Toll Service: the draft decision defining the European Electronic Toll Service (EETS) is currently under review. It is expected that it might become a mandatory service between 2010 and 2013. TfL proposes to work with DfT to identify how an EETS service could be provided for DSRC-equipped vehicles and then design and build a demonstrator. This would prove a format for interoperability. Section C.3 proposes a similar demonstrator for the Galileo related elements of EETS.

OPMIS: the DfT has developed an Open Preliminary Minimum Interoperability Specification (OPMIS) for road user charging. TfL has commented substantially on early OPMIS draft specifications in 2005-2006 and a new draft is expected to be issued for comment in summer 2006. TfL propose to define how interoperability for London tag-based operation could be achieved with the proposed OPMIS 'PSP', 'ORSP' and 'DCO' structure.

Thames Gateway Bridge: the bridge is expected to open in 2013, using tag and beacon technology for free-flow payment. TfL is currently defining the tolling mechanisms and how interoperability with the central London congestion charge would operate. It is proposed to design and implement a demonstrator for this interface through the TIF package. The demonstrator could potentially be applied to other crossings with free-flow tolling. The current programme indicates that a concession to build and operate the bridge will be awarded through a procurement between 2006 and 2009 – use of a congestion charging back office will not be mandatory for the successful concessionaire.

The central London congestion charging scheme will be re-procured between 2009 and 2010. It is expected that the present single charge for driving in the zone, using ANPR detection, will continue to apply to many customers; interoperability for customers with and without tags is expected to be required. It is proposed to define and build a demonstrator for this interface.

In addition we plan to explore how interoperability for customer accounts could be achieved with existing and emerging ticketing systems for bus, tube and rail, such as Oyster and those defined by the Interoperable Fare Management standard and the Integrated Transport Smartcard Organisation (ITSO). This work would take place in the context of on-going discussions between TfL and the Department for Transport regarding possible links between Oyster and ITSO.

Work package B: Towards an understanding of road user charging outside central London - a 'remote' demonstration charging scheme

Summary

Proposed TIF-funded activities:

- The completion of feasibility studies for charging around a town centre. An initial study has examined the potential for charging in some five centres. The London Borough of Greenwich has agreed to participate in a more detailed feasibility study;
- The completion of feasibility studies for charging on part of the strategic road network, including parts of the network around Greenwich, as well as elsewhere in London;
- Assuming a positive outcome from feasibility studies, as well as political support, the development of a scheme, including consultation, design of a complementary transport package and implementation of charging in a location outside central London.

Outputs:

- A detailed feasibility study, including attitudinal research, for a charging scheme remote from central London, with broader lessons for other implementations;
- A detailed feasibility study of scenarios for charging on part of the strategic route network, with broader lessons for charging on the UK strategic road network;
- Assuming a positive outcome from the feasibility studies, as well as political support, the implementation of a charging scheme as part of a package of traffic, transport and travel demand management measures in a location outside central London.

Outcomes:

- Potential traffic congestion reductions in the chosen location of 15-30% with a benefit-cost ratio of the order of 1.5. A series of schemes across London would deliver comparable or greater benefits with less cost.
- A demonstration of the potential for charging in locations outside central London, part of a strategy towards the broader use of charging to tackle traffic congestion both inside and outside Greater London.

Costs:

- The total cost of the package is dependent on the location chosen and the scope of the package of complementary measures, but is estimated to be between £60m-£100m, including £2m for feasibility and consultation.

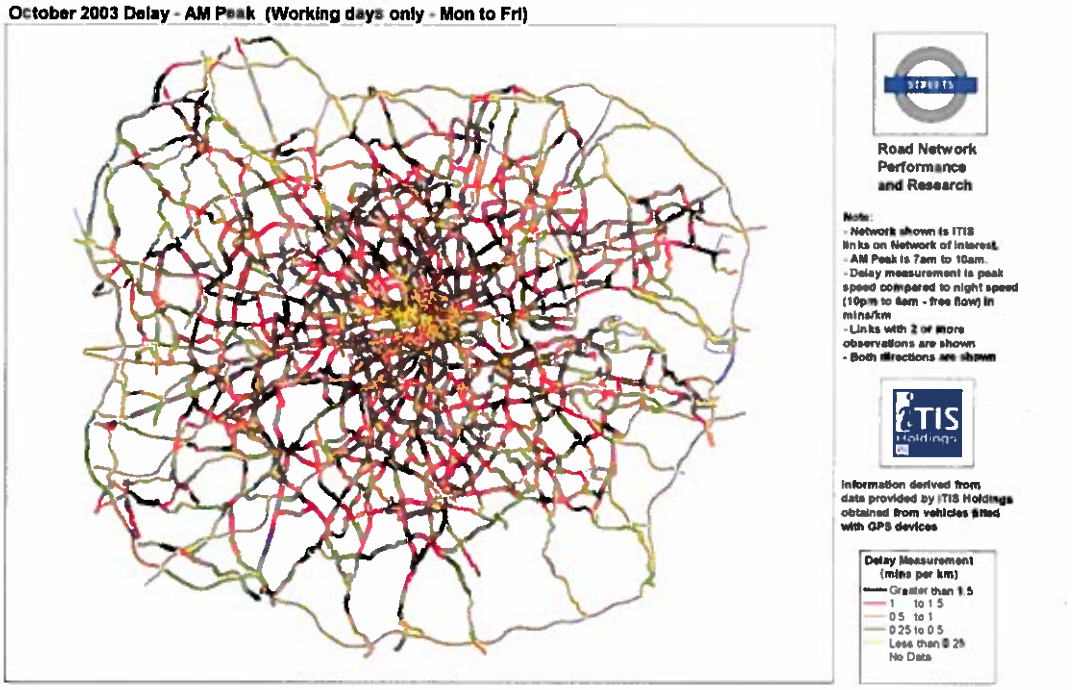
Timescales:

- Results of detailed feasibility studies – mid 2007
- Assuming a positive outcome from the feasibility studies, and political support, a charging scheme outside central London could be operational in late 2010.

B.1 The role of charging outside central London

In developing future strategies for traffic demand management across Greater London, TfL has been investigating the incidence of congestion on the road network in an effort to identify those links or locations where traffic congestion is causing a significant problem for local accessibility, the efficient operation of bus services and the sub-regional and local economy. These studies have shown that the main road network across Greater London is running at capacity in specific locations and at specific times, and that, in particular, congestion is causing a problem along strategic routes and in outer London's town centres and traffic nodes. In the short term, road traffic congestion is being addressed through optimisation of the efficient operation of the network through measures such as real time control and co-ordination of road works, but longer term measures are likely to include a cohesive approach to corridor management, reviews of the current management and allocation of road space to ensure the needs of all road users are taken into account, the use of smarter measures, and, where appropriate, road user charging.

Figure B.1: Traffic congestion – weekday AM peak



B.2 Outline solution

TfL is investigating a number of locations in London where road user charging could form part of the solution to local traffic congestion problems, and is considering a number of scenarios that might be developed further. The precise charging scenario or configuration would depend on the nature of the local traffic congestion problem.

TfL anticipates that charging in a 'remote zone' would initially use the tag and beacon technology currently being considered as an option for the central London zone, along with cameras and ANPR used for enforcement purposes and to cater for those vehicles without the necessary on-board equipment. The scheme would be supported by the infrastructure developed for the central London scheme, using a shared back office to reduce the set up and operation costs and allow for integrated payment and discount registration. Those technology pathfinder vehicles which are equipped with appropriately accurate GNSS technology could choose to pay all applicable charges on the basis of distance travelled.

Some possible scenarios are discussed in more detail in Annex 1.

B.3 The development of a complementary package

Any location being considered for a possible remote zone would need further complementary measures to maximize the benefits of charging and minimize any potential adverse impacts. An integrated package of measures would be required to support the implementation of charging. TIF funding would be needed to develop such a package to respond to local needs, likely to consist of:

- Smart travel demand management measures;
- Public transport enhancements;
- Road network management, ensuring a balanced allocation of road space amongst all users;
- Environmental traffic management;
- Local environmental, urban design and streetscape improvements.

B.6 describes a proposed feasibility study to be undertaken in partnership with the London Borough of Greenwich, and explores some of the schemes that could be included in a complementary package based on Greenwich Town Centre.

B.4 Outcomes

The successful introduction and operation of the central London congestion charging scheme has shown that this method of demand management can achieve a measurable reduction in traffic congestion in the core of a large urban area with good alternative transport links. Whilst this success has been widely admired, its ability to act as a model for charging elsewhere in the UK is limited – central London is unique.

A road user charging scheme in another part of London, perhaps on a different charging basis, would take the principle of congestion charging and apply it to a location more representative of congested areas in other parts of London and the rest of the UK. It could act as a demonstration for the categories of urban areas declared to be of particular interest in the TIF Guidance:

- Strategic routes within larger conurbations;
- Individual towns and smaller cities, and other generators of traffic; and
- Groups of towns and cities in an area or region.

The scheme would test:

- Feasibility, impacts and acceptability of charging outside central London;
- Feasibility of charging on a smaller scale than central London;
- Feasibility of charging traffic using strategic routes, rather than purely local routes;
- The scale of an associated package of increases in public transport capacity, smart travel demand management measures, traffic management and environmental and streetscape improvements;
- Interoperability of charging between two geographically remote schemes.

B.5 Indicative timetable

2006/7 – Feasibility studies and business case development;

Summer 2007 – Consultation on revision to Mayor's Transport Strategy to policies and proposals on road user charging;

Summer 2008 – Mayor's Transport Strategy submitted for confirmation;

Mid 2008 – Scheme order consultation;

Early 2009 – Scheme order submitted for Mayoral confirmation;

2009-10 – Implementation;

Late 2010 – Earliest go-live.

B.6 Greenwich – a feasibility study

To progress a detailed study into the options for and potential impacts of road user charging in an urban centre outside central London, TfL is working in partnership with the Council of the London Borough of Greenwich to design an exemplar road user charging scheme – including a package of complementary measures – in order to test its feasibility, acceptability and effectiveness.

Greenwich town centre contains a World Heritage Site and the most popular visitor destination in Greater London outside the City and the West End. Traffic intrusion has, however, long been an oppressive aspect of the town centre, damaging its environment, creating severance and restraining further development of tourist amenities. Resolving these issues by conventional traffic management solutions has proven to be unsuccessful, largely because of infrastructure constraints.

On 12 June 2006, the Council agreed to be a partner in the TfL TIF bid to investigate and survey options for local travel demand management. Council Members were advised that road user charging would be a key part of any TIF funded demand management initiative. The London Borough of Greenwich has already expressed its aspiration to investigate the opportunities for local road user charging in a bid for TIF pump-priming funding in October 2005. In feedback from the DfT, the fact that TfL was not involved in the production of the bid was referred to as a "weaker aspect". The feedback also mentioned the lack of a strategy for dealing with high traffic levels at peak times – a reference to the fact that the original proposal described only an off-peak charging scheme – and suggested that the proposal would not offer great benefits in terms of lessons for other authorities, or for national government.

In this cooperative bid, it is proposed that the study area is wide enough to include a larger area beyond Greenwich town centre. Surveys would be carried out on a corridor basis to include at least the town centre, A2, A20 and the A205. The possibility of linking a prospective Greenwich charging scheme with charging on a longer section of the A2 would also be investigated.

As well as the acceptance of road pricing as the likely solution to the problems caused by high traffic levels in Greenwich, an element of the original Greenwich pump-priming funding bid that was praised by the DfT was the thought that had been given to "creating a step change in public transport provision and changing perception of public transport".

The London Borough of Greenwich and Transport for London would wish to see a number of improvements packaged with road user charging in order to deliver maximum complementary benefits to the area, including:

Smart travel demand management

TfL is already working on the development of strategies for the area-wide implementation of smart travel demand measures in order to tackle traffic congestion and to better utilise existing transport capacity, and is seeking TIF funding for a broader package of measures across Greater London (see Chapter 3).

Smart travel demand management measures use information and positive incentives to influence a 'voluntary' change in behaviour. In combination with a charging scheme, the implementation of measures such as workplace, school and personalised travel plans, and schemes to raise general awareness of alternatives to making trips by car could encourage people to develop lifestyles that are less dependent on car use and make more use of sustainable alternatives.

- In and around Greenwich town centre there are areas of high density employment where the application of such smart travel demand measures might be particularly effective. There are a number of large trip attractors and centres of employment, including the University of Greenwich, National Maritime Museum and the Observatory. Away from the town centre, employment is concentrated on the Greenwich Peninsula and west of Woolwich. The Borough's 67 primary schools and 13 secondary schools could be assisted in developing their green travel plans.

- Greenwich has a good record of considering travel demand and green travel in major new developments, including Convoy's Wharf, the old Greenwich Hospital site and for the 13,000 new homes and 325,000 square metres of commercial development planned for the Peninsula. Sustainable travel plans are also being developed for the 93,000 square metre entertainment development around the former Millennium Dome site, including the possibility of event-day river transport.

Public transport enhancements

Improvements to the quality and availability of bus services were crucial to the success of the central London congestion charging scheme and there is scope for local bus improvements to support mode shift in all of the remote zone candidate locations being studied. As well as improvements to the local bus service, this would include end-to-end bus priority of key routes to and through the remote zone, improvements to real-time bus information, through the i-Bus projects currently being piloted, and improved rail-to-bus interchange to enable seamless travel.

- Additional bus services – in order to accommodate increased demand for bus services alongside the introduction of a road user charging scheme, enhancements to the frequency and capacity of local bus services would be required in and around Greenwich. The Borough is particularly keen to improve bus services to North Greenwich station in order to provide an alternative to 'park and ride' and 'kiss and ride' trips as well as securing general improvements to the local bus network.

- Bus priority interventions – in order that increased bus capacity is used most effectively, bus priority measures would be considered alongside the improved bus services that accompany a road user charging scheme. Three routes passing through the feasibility study area form part of TfL's programme of third Generation Bus Priority: Route 177, from Peckham to Thamesmead, via Greenwich Town Centre; Route 486, from North Greenwich to Bexleyheath, and; Route 54 from Elmers End and Lewisham to Woolwich. Elements of these three proposals which would be complementary to a possible road user charging scheme could be included in a package.

- Greenwich Waterfront Transit – is a high quality public transport system using buses with high levels of priority over other traffic. The route is to be developed in a number of phases with the first phase, from Abbey Wood to North Greenwich, via Thamesmead and Woolwich, due for implementation by 2010. Feasibility studies for the section between North Greenwich and Greenwich station are currently underway, but initial findings suggest that current levels of traffic in Greenwich town centre might be an obstacle to the effective operation of the scheme. Implementation of this phase is not anticipated before

2015, but early work could form part of an overall package of transport improvements in Greenwich.

- Additional river bus services – the Borough sees the Thames as an under-utilised transport facility and suggests that increased use of the river as part of the public transport network would have particular benefits for Greenwich.

Road network management, ensuring a balanced allocation of road space amongst all users

There is scope to improve the way in which the road network is managed to ensure optimum balance between the needs of different road users, not just within the given area or corridor, but on parallel, perpendicular or through routes.

- TfL is currently developing a 'Network Management Plan' (NMP) for a section of the A2 which bypasses Greenwich town centre from Borough to its junction with the A102. The first stage of this project involves characterising the current operation of the route in terms of an inventory of provision for competing demands (the various modes, freight, parking, frontages etc), corridor performance by section (based on performance indicators) and the identification of local issues and traffic congestion hotspots.

  Stage 2 is intended to define the required operation of the route in order that it can contribute fully towards the delivery of London-wide and local objectives. Later stages involve detailed design of appropriate measures to deliver the route's required operation followed by consultation and potential implementation.

  In the short term, data gathered for Stage 1 of the A2 NMP project should prove useful as inputs to a Greenwich road user charging feasibility study. As both studies progress it will be important to ensure that the options for charging on or near the A2 are incorporated into the analysis for and design of the A2 NMP, since a reduction in the level of car traffic could be useful in attempts to introduce enhanced facilities for buses, pedestrians and cyclists. Additionally, depending on the timing of implementation of schemes associated with the NMP, it may be possible to include some elements into a package of complementary measures to accompany a charging scheme.

  A similar approach could be taken on the A102, and other sections of the Transport for London Road Network (TLRN) in the vicinity of the study area.

- A206 Trafalgar Road is part of the Strategic Road Network and provides access to Greenwich town centre. Currently, there are a number of schemes programmed for the A206 corridor to address issues at specific junction and link locations. Also, initial discussions have been held between TfL the borough regarding the feasibility of introducing an Urban Traffic Control system. If a charging scheme is progressed at Greenwich, it might be beneficial to delay these schemes and incorporate them into a package of complementary measures. A corridor approach similar to that employed on the TLRN could be applied to this, and other key routes in and around the study area.

- Improved Traffic Control – implementation of an improved urban traffic control system in and around the charging zone that balances the movement of pedestrians, cyclists, buses, cars and freight in the zone and on the adjacent road network. There will be a need to consider further traffic signal control infrastructure and to develop alternative management strategies.

- Streetworks coordination – the planning and installation of a road user charging scheme would offer the opportunity to coordinate streetworks that would otherwise be completed

on an ad-hoc basis. Previously, a collaborative approach between boroughs, utility companies and TfL has demonstrated significant savings (both financial and in terms of adverse impacts to the travelling public) arising through reducing overheads and fewer interventions on the network.

- Cycling facilities – measures to improve and expand safe cycling facilities and so reduce car dependency for local trips.

Environmental traffic management

TfL would need to work with any affected boroughs to produce plans for a package of complementary measures on the local road network. This could include area-wide traffic management measures to deter diversion of traffic onto local roads outside the charged area (e.g. 20 mph zones, traffic calming measures, road closures) as well as a review of local residents' and public parking arrangements to ensure that policies, periods of operation and charges are compatible with the proposed charging scheme. The discouragement of local diversions onto less suitable alternative roads within the same corridor would be of particular relevance in the event of charging on part of the strategic route network.

- More effective parking controls – a review of CPZs and other parking facilities to reduce car use and 'rail heading' in Greenwich town centre.

Local environmental, urban design and streetscape improvements

TfL has already worked with the architect Jan Gehl to consider the scope for environmental and streetscape improvements to enhance the urban realm around the strategic road network. The Mayor's Office has developed a programme of 100 Open Spaces to be rolled out across Greater London to support exemplar public realm improvements.

The development of a remote zone scheme allows the possibility to integrate these and other local borough aspirations to make environmental and streetscape improvements that would fully take advantage of the possibility to re-distribute road space towards pedestrians and cyclists.

- The Borough has developed proposals for a series of 'Public Zones' – the introduction of areas within which some parts of the street may be completely pedestrianised or where traffic reduction would facilitate the introduction of shared surfaces.

There are also several transport schemes that are identified in the London Plan in the Greenwich area:

Funded and committed

- Jubilee line upgrade – TfL
- DLR Woolwich extension – TfL
- DLR Phase 1 capacity enhancement (Bank-Lewisham) – TfL
- Greenwich Waterfront Transit Phase 1 (North Greenwich-Abbey Wood) – TfL
- improvements to walking and cycling – TfL
- bus capacity increases – TfL

Not yet defined or evaluated

- Silvertown Link – TfL
- longer term Underground line improvements and extensions – TfL
- longer term DLR extensions – TfL

- development led schemes, e.g. A13 – TfL/boroughs/developers

The suitability, design and costs of these individual schemes and measures as potential elements of a package of complementary traffic and public transport measures would be addressed as part of a study into the feasibility of a Greenwich charging scheme.

2012 Olympic Games

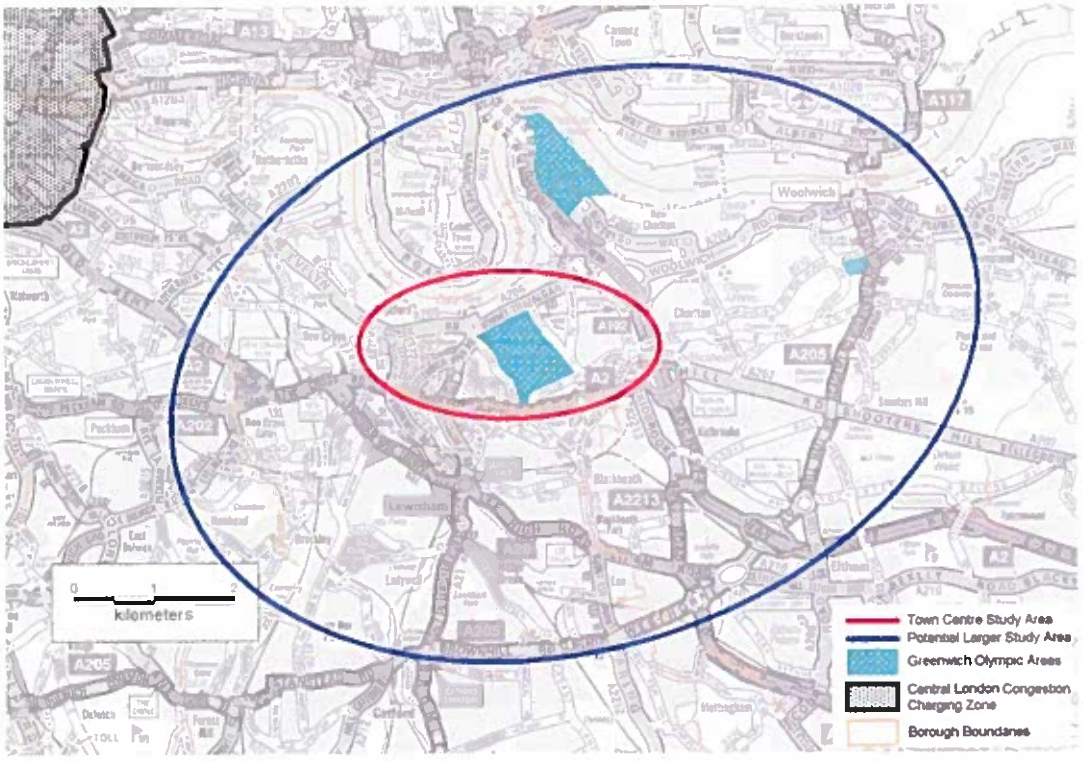
Greenwich, together with four other boroughs, will be the location for the 2012 Olympic Games and Paralympic Games and up to a third of all the Olympic events will take place in three separate areas across the Borough of Greenwich. Equestrian events will take place at Greenwich Park; gymnastics, the basketball finals and the badminton competition will take place at two venues on Greenwich Peninsula; and the shooting events will take place at the Royal Artillery Barracks at Woolwich.

The Borough hopes that the Games will bring many opportunities to the area and that its experience of other major regeneration projects will help to maximise local benefits and ensure that they last well beyond 2012.

Study

A study is required to assess the feasibility, acceptability and effectiveness of a range of charging options in the Greenwich area. Options would range from a small scheme protecting and enhancing Greenwich town centre, the World Heritage Site and its environs, through a series of larger schemes, up to and including nearby strategic routes, including the merits of charging for use of the Blackwall Tunnel, particularly in the context of Olympic transport provision. Various charging configurations would also be investigated, including flat-rate area charging, cordon-based charging and distance-based charging, and the possibility of also charging at weekends would be explored.

Figure B.2: Potential Greenwich study areas



Changes to traffic patterns, public transport enhancements and the cost of paying a charge could have significant impacts to those living in and travelling to the Greenwich area. These would include improved journey times for road users, improved amenity and safety, as well as impacts to the local economy as a result of changes to the quality of access by road vehicles. There might also be secondary benefits, to the environment and human health, from reduced emissions and increased physical activity.

The scale of these impacts would be assessed as they relate to individuals and households and businesses. Particular attention would be paid to the impact to those in the mayor's equalities target groups and the distributional impact to those with different household incomes.

Specifically, the impacts of various charging scheme options would be investigated with respect to the following:

- *traffic and congestion levels* on potentially charged roads and diversionary routes;
- *public transport usage* in and around the areas being examined;
- *environment* including emissions, local air quality and noise, and human health;
- *safety* mainly comprising road traffic accidents;
- *economy* including assessing the efficiency of the transport system for users and in terms of wider economic impacts;
- *accessibility* including impacts to severance;
- *local and national objectives* including conformity to mayoral strategies;
- *individuals and households* including impacts, such as those to health, for the wider population and for equalities target groups and an assessment of the distribution of impacts across income brackets; and,
- *financial impacts on businesses and households.*

Assessments would also be made of the following in relation to a range of Greenwich charging schemes:

- *benefits* where these can be monetised from the impacts listed above;
- *costs* including those to set-up and operate such a scheme and the potential compliance costs;
- *revenues* including those generated through charge payments and penalty charge notices;
- *practicality* including issues relating to charging powers, the *Mayor's Transport Strategy* and formulating a Scheme Order, and other practical hurdles such as signage; and
- *public acceptability* including ease of understanding, perceptions of fairness, stakeholder interests, perception of operation, potential complementary measures to improve

acceptability, the scale of the problem and the suitability of the proposed scheme in dealing with the problem.

A detailed business case would be developed.

The study would also include the detailed design and infrastructure requirements of such a charging scheme, as well as the likely components of a package of complementary measures and a detailed timetable for possible implementation.

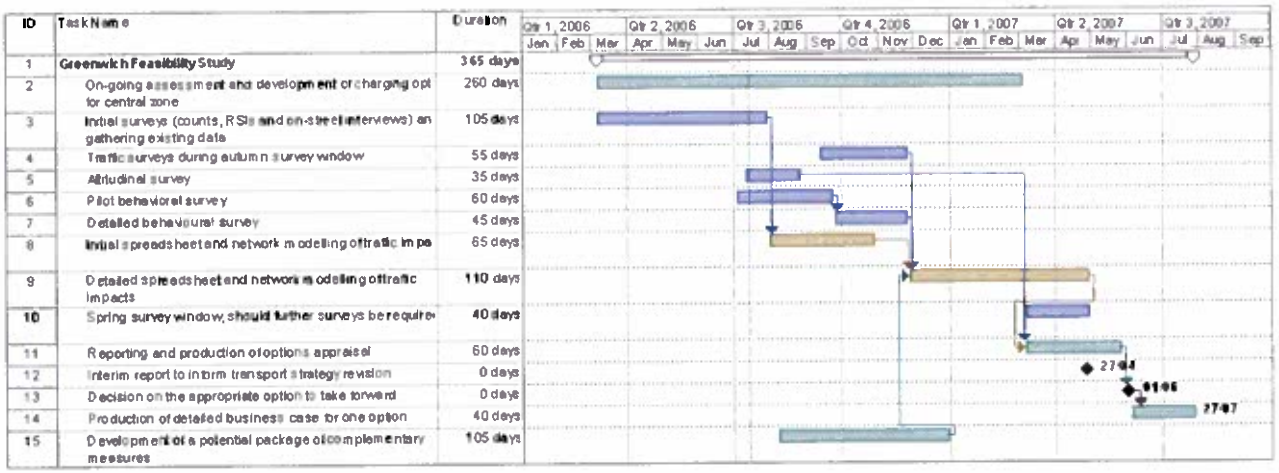
Timetable

The feasibility study would consist of surveys (traffic, travel, behavioural and attitudinal), traffic modelling and analysis of potential traffic impacts, analysis of other impacts and the production of a detailed business case.

The Borough and TfL have already undertaken a limited programme of counts, roadside interviews and on-street surveys. A small scale pilot behavioural survey (stated intentions with elements of stated preferences) is currently scheduled for summer 2006. In order to ensure the earliest possible production of a full business case, it is important that the majority of the remaining traffic and travel surveys are undertaken during the autumn 2006 survey window, while attitudinal and further behavioural surveys would take place over a longer period.

It is anticipated that this study could produce an appraisal of the options by April 2007, with a full business case for the more promising options by July 2007.

Figure B.3: Potential timetable for a Greenwich road user charging scheme feasibility study



B.7 Strategic routes – a feasibility study

In order to explore the issue of road user charging on strategic routes as part the development of a national road user charging policy, it is proposed that a detailed study is undertaken into potential scheme options and impacts on a selection of such routes. Routes selected for inclusion in this study should have relatively few junctions in order that the implementation of any future charging scheme would be relatively simple in terms of infrastructure requirements. Additionally, to enhance the possibility of a satisfactory level of benefits as a result of road user charging in these circumstances, the selected routes should experience relatively high levels of traffic flow and congestion. Preliminary investigations have suggested that it would be appropriate to take the A10, A3 and A40, as well as the A2 previously referred to, forward for further study.

The initial stage of the strategic route charging feasibility study would consist of assessing traffic and congestion conditions on the chosen study routes. This data would be used as the basis for initial consideration of a range of charging configurations, such as a flat rate charge, quasi-distance based charging for those with tags and distance-based charging for those with mobile positioning equipment. The adequacy of distance-based charging as a proxy for the actual marginal social cost of trips would be considered.

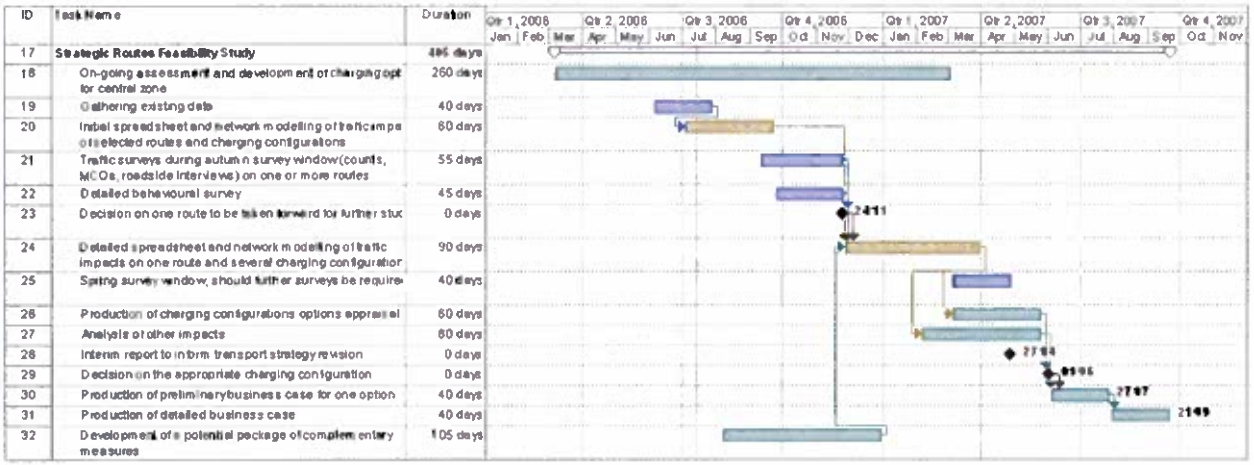
The study should also provide useful information on the potential impacts of an actual scheme to charge on strategic routes within London. It would lead to a business case for a pilot scheme, including some element of marginal social cost pricing.

Roadside interviews to obtain origin, destination and journey purpose information and stated preference surveys to understand driver behaviour would be carried out during autumn 2006 on one or more routes that appear the more promising according to the initial assessment. Detailed modelling would then be undertaken and traffic impacts quantified.

Analysis of other impacts, such as to the environment and the economy, would also be undertaken in the same way as for the Greenwich feasibility study, and with an appraisal of the options from a traffic perspective would lead to a report on the merits of a pilot charging scheme on a strategic route.

A preliminary business case for a pilot charging scheme on a strategic route as part of the development of a national road user charging policy could be produced by July 2007 and a detailed version could be available by September 2007.

Figure B.4: potential timetable for a study into the feasibility of road pricing on strategic routes



Work package C: Towards enabling distance based charging

Summary:

Proposed TIF-funded activities:

- An initial trial, with 50 volunteers paying for their use of the extended central London congestion charging zone based on the actual distance they travel within the zone;
- A possible expanded trial with 500 vehicles paying according to the distance travelled;
- A larger scale trial (up to 5,000 participants) testing the end-to-end processes and behavioural impacts of distance based charging across Greater London;
- Testing scenarios for interoperability in circumstances where rate based distance charging is an option alongside cameras and DSRC tag and beacon event based charging.

Outputs:

- An understanding of the practicalities and implications of distance based and marginal social cost charging in central London, with lessons for the feasibility of marginal social cost charging more widely;
- An understanding of the end-to-end processes and possible behavioural implications of a large scale implementation of marginal social cost road user charging;
- A model for distance based charging that could be developed into the core design for a national scheme and be delivered by third party service providers.

Outcomes:

- A successful trial could enable distance based charging to be offered as a payment option in central London, with real results and lessons for a more widespread application in London and beyond;
- Increased understanding of the practicalities and possible impacts of charging could aid moves towards a London-wide distance based or marginal social cost charge (probably in the context of a national road user charge). Modelling suggests that a London-wide implementation of charging could deliver benefits annually of perhaps £1 billion.

Costs:

- The estimated cost of the package is £25m.

Timetable:

- A trialled system design – late 2007;
- Distance based charging trial in central London – 2009/10;
- Distance based charging trial across Greater London – 2009/2010;
- Possible availability of distance based charging as an option for all appropriately equipped vehicles in central London – late 2010.

C.1 The case for distance based charging

In the longer term, charging based on local conditions may be the most effective way to tackle congestion on the road network. It is likely that this would be most effectively implemented using satellite-based positioning technologies. The Government's *Feasibility Study* concluded that such technologies were unlikely to be sufficiently mature and readily affordable before 2015.

The results of TfL's trials in central London have highlighted particular problems with the use of satellite positioning in dense urban areas, which could limit the scope of their application in the short term.

Nevertheless, TfL believes that the advantages that could be enabled by satellite positioning and the rapid development of this technology, mean that these problems could be overcome. During late 2005 and early 2006, TfL has been challenging leading suppliers of satellite positioning technology to demonstrate the performance of their solutions in the dense urban environment around Borough and the City of London.

C.2 The position in London for satellite-based road charging

During Stage 2 of the road user charging technology trials TfL has challenged industry to demonstrate accurate distance based charging within central London. Following a notice in the Official Journal of the European Union to identify solutions, 18 on-board units from 14 suppliers have been trialled to test three criteria: locational accuracy; map-matching ability, and end to end billing for routes.

The principal conclusions of the trials to date are:

- There has been a general and significant improvement in performance of on-board units at the location level compared with Stage 1 trials in spring 2004;
- Nevertheless there are still wide variations in performance of units in similar satellite and physical conditions even though specifications of the units may be very similar;
- Map matching can both improve and degrade accuracy at the road segment level and help poorer performing units to give good end-to-end results;
- **Suppliers that used the more accurate TfL mapping data obtained better results at the segment and hence journey level with not less than 60% of the shortest segments being detected;**
- Sample rate of the on-board unit was an important factor in performing well at this level;
- At the journey level, results were widely spread between suppliers, few would meet a sufficiently high level of billing accuracy for confidence in the overall system.

With the best system providing an error rate of less than 1%, it would be possible to conduct a London-wide distance based charging trial using equipment and services available in 2008. Data would need to be assessed as to whether or not it meets agreed levels of confidence and quality. The back office would determine the suitability of the data for charging purposes and adjust the billing data appropriately. One unit produced an integrity reading that indicated an error ellipse

that enclosed the reading to a confidence of 1 in 100,000. Such devices can greatly assist in reducing cases that might produce billing errors.

C.3 Steps towards a distance based charge

TfL proposes to introduce a pilot for distance based charging within the extended central London charging zone. The charge would be capped at the area charge (currently £8) for distance driven within the zone within charging hours. TfL would recruit regular chargepayers to act as volunteers for the pilot. Subject to the necessary procedures, the pilot would involve:

- volunteers having distance based charging accounts set up;
- the existing scheme order being amended to allow distance based charging;
- on-board units being provided to the volunteers and professionally installed in their vehicles;
- distance data from the units being transmitted to a central computer system;
- statement of distance driven being prepared on a daily basis for each account;
- charges being deducted from an account; with both pre- and post-pay procedures being assessed.

The current distance driven by an average charge paying vehicle within the zone each day is approximately 6 kilometres. We propose initially to set a distance charge rate at perhaps £1.50 per kilometre. There would be benefits for those who drove less than the average.

The pilot would assess how drivers responded to distance-based charges. For example, would it encourage driving around the zone to minimise travel within the zone.

Outline Timetable

The timetable for the pilot would be approximately as follows:

- Months 1-3 complete pilot design;
- Months 4-6 implement systems and process design;
- Months 7-8 prove on-board unit;
- Months 8-10 recruit initial batch of 50 volunteers;
- Months 11-18 initial 6 month trial;
- Month 18 – decision point on whether to extend the pilot to more chargepayers.

The systems and on-board unites for the pilot would need to be procured. This procurement would take up 6 months, with the proving of the units in the following months.

Preparation for the Pilot and TfL's Stage 3 Trials Programme

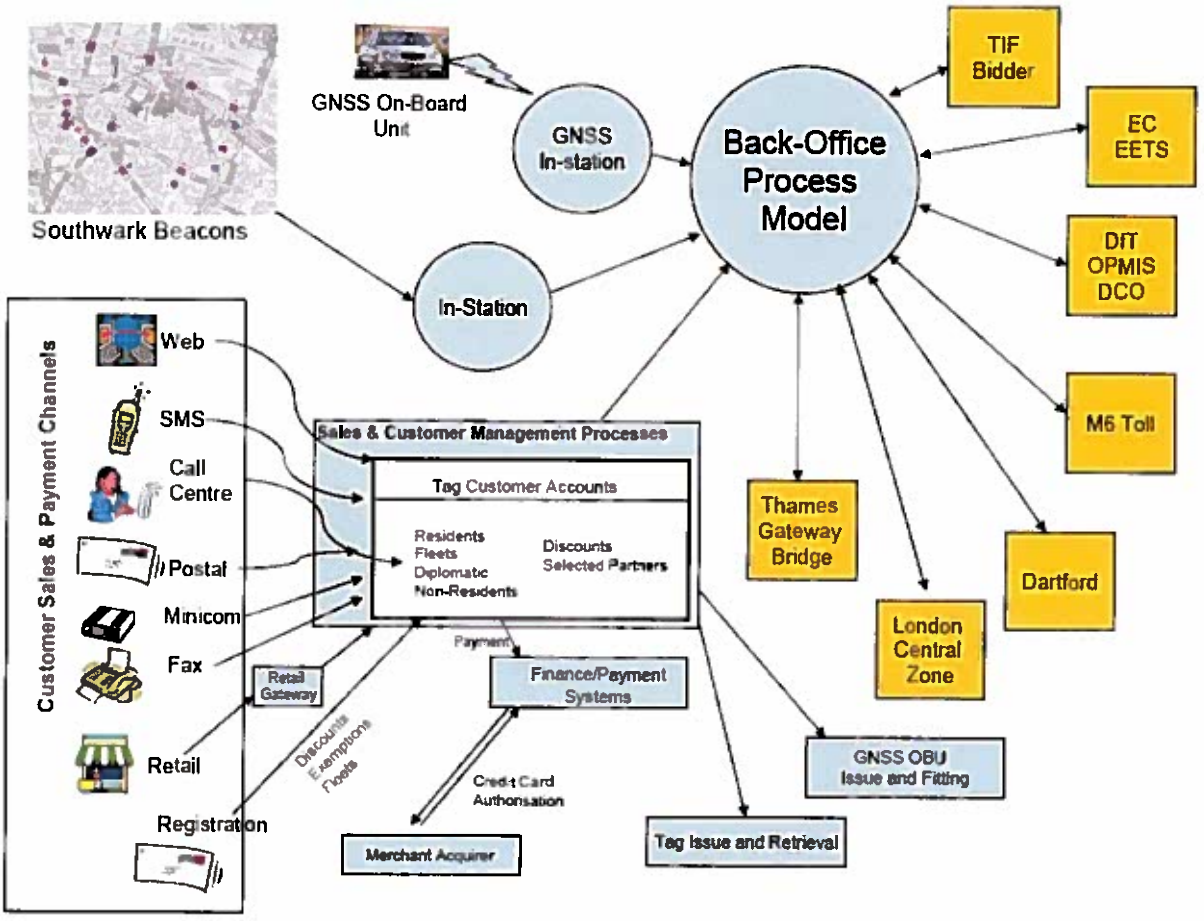
The distance-based pilot would follow as part of the Stage 3 Technology Trials and so could commence in July 2007. This timetable would be dependent on the TIF funding and approval process.

Back-Office for GPS Pilot

TfL plan to build on the back-office model designed and built for the tag and beacon pilot in Package A, to provide for the possibility of distance based charging accounts and data processing capability for the pilot.

The back-office capability would therefore evolve from that described in A.4, to that shown in Figure C.1 with the addition of the GPS OBU related elements.

Figure C.1: Evolution of the back office



C3.1 A first step – proving the technology and the methodology

Under the third stage of TfL's ongoing series of technology trials, it is proposed to carry out some initial work to prepare for the larger trial to be described here. As mentioned above, these initial steps would include:

- Merging the current Value Added Services and GPS Trial platforms to provide the major elements of congestion charging and distance charging customer registration and billing system;
- Running a trial to test the efficacy of a dual congestion charge and distance charging system in the central London congestion charging zone;

- Specifying and procuring a pilot distance based system to test procedures and organisation prior to the major trial;

- Specifying and procuring the full distance based trial including the recruitment of 500-5,000 volunteers.

The objectives of the trial would include:

- To establish the accuracy and integrity of a road user charging system based upon on-board units using GNSS and other sensors augmented by an overlay of route or zone charges for identified traffic "hotspots" where demand management is required;

- To review how TfL can ensure that any national road user charging scheme can meet TfL's needs in London;

- To explore the logistics of operating a charging scheme based on mobile positioning, the usability of on board equipment, user reactions and acceptability;

- To study the behaviour of drivers before and after the establishment of a road user charging scheme.

TfL is currently formulating the precise details of the trial, but the essential elements would include:

- A significant population of volunteer vehicles, up to 5,000, over a period of at least 18 months and covering all roads within the Greater London area;

- A flexible charging scheme with tariffs based on location, distance travelled, direction and/or time of day, that would act as an incentive or deterrent for drivers to use certain routes or change travel mode and which could supplement or replace local road user charging, vehicle excise duty and fuel duty;

- A full study of drivers' behaviour prior to and after the application of the charging scenarios, to aid the development of more accurate models of user responses to a real implementation;

- Research to explore usability and customer understanding of the charging policies and methods, with feedback from our volunteers on the effectiveness of the measures. A behavioural trial would use some kind of incentive or payment to give revealed preference data to inform future modelling;

- Testing of system performance and data integrity measures for enforcement and charging confidence. The trial would also demonstrate how non-payment or enforcement events would be handled;

- Trials of a range of on-board units and back office configuration to trial simple or complex units and/or central office systems;

- Investigation of the enhancements to performance provided by the increasing number of Galileo GNSS satellites;

- Mapping the trial elements to the EC's Electronic Fee Collection Directive, demonstrating what can be delivered in an urban environment;

- An exploration of issues associated with installation and maintenance of complex OBUs.

C.4 Outcomes

TfL has already begun work to assess the feasibility of satellite positioning for the purposes of road user charging in London. The urban topography of London presents some particular challenges for the use of satellite positioning - for example, the impacts of the dense urban 'canyons' found in parts of the City of London - which are not replicated to the same extent elsewhere in the UK, even in the largest cities. A charging system which relies on satellite positioning will thus need to be appropriate for use in London, and be capable of delivering the kind of charging policies that London might need.

London also offers the opportunity to test some of the key questions regarding the possible migration paths between local remote charging zones and an area-wide marginal social cost charging scheme. By ensuring that a proportion of the volunteers included in the London trial are regular users of the central London congestion charging zone, it would be possible to demonstrate a real integration between different charging schemes, as well as the possibility to use satellite positioning in a live charging environment.

As briefly mentioned in the previous section, the trial would also provide an opportunity for TfL to investigate how much travel behaviour could be changed by the introduction of a distance based charge. The implementation of measures such as the issuing of an Oyster card to record the amount of public transport usage and the introduction of Journey Planner to the system to provide alternative routes, could help to promote a behavioural response.

There might also be an opportunity to link trials of mobile positioning for the purposes of road user charging with some of TfL's planned and ongoing investigations of other applications of this technology in urban traffic. A recent study of the application of Intelligent Speed Adaptation has suggested some potentially very positive benefits for safety, including a possible 10% reduction in casualties for an 'advisory' system in all vehicles. A mandatory system in all vehicles could halve road traffic fatalities. The possible links between a trial of road user charging systems and a trial of ISA will be investigated during the ongoing feasibility stages.

C.5 Indicative timetable

It is envisaged that the trial would fall into four phases, with the first two phases forming part of TfL's ongoing series of technology trials:

2006 – Ongoing small scale vendor solution trials including trials in the central London congestion charging zone;

2006 – Business case development;

2006/07 – Trial system design and behavioural design, volunteer strategy;

Summer 2007 – Consultation on a revised Mayor's Transport Strategy;

Summer 2008 – revised Transport Strategy submitted to Mayor for confirmation, potential start of consultation on a consequential variation to the Scheme Order;

2009/10 – Potential distance-based charging trial in central London charging zone;

2009/10 – Potential distance-based charging trial across Greater London;

Late 2010 – Possible availability of distance based charging as an option in central London.

3.3 Financial assessment of road user charging packages

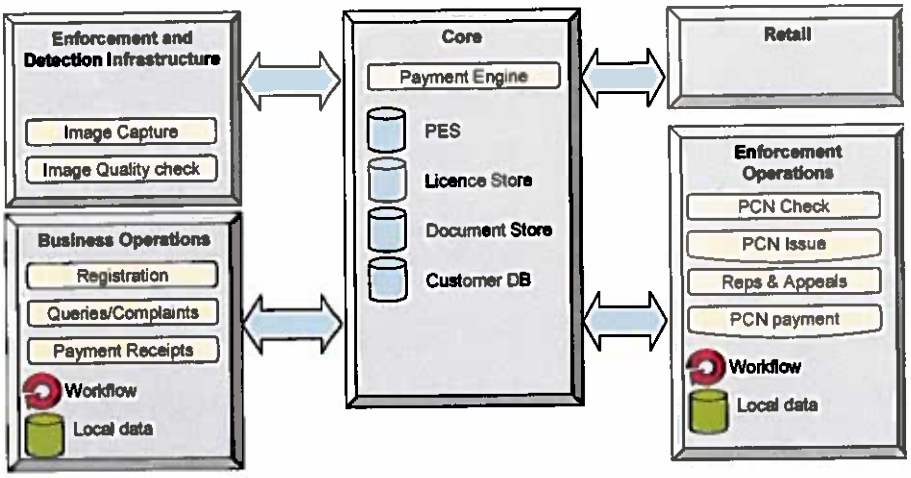
The estimates for the costs of Package RUC-A are well developed as TfL has undertaken detailed planning for the implementation as an extension to the Re-let of the current congestion charging contracts in mid 2010. Preliminary estimates of benefits need to be refined in a formal feasibility study. The estimates of costs and benefits for Package RUC-B are less well developed and so TfL wishes to undertake initial traffic survey and modelling work in order to assess better the costs, benefits and timeline associated with the potential introduction of a scheme outside the existing central area. Package C comprises a trials programme with an implementation programme superimposed from 2009/10 onwards with implementation in late 2010 or later. The trials will allow progressive refinement of the cost estimates.

If the stated delivery dates are to be achieved, feasibility studies and implementation planning and procurements should be initiated in the current financial year. The cost profiles attached to each package show the expenditure from 2006/07 through to 2010/11, the date by which TfL aim to have completed the initial implementations.

3.3.1 Package RUC-A More flexible charging mechanisms: Implementation of DSRC-based charging in central London

TfL is planning to re-let the contracts for the operation of the congestion charging scheme in the extended central zone in late 2009. Rather than just a single area scheme, it is proposed that the Re-let will be used to build a capability to allow new technologies and further schemes which could ultimately enable London wide charging and so a migration to National Road User Charging. It should be stressed that no decisions have been taken at this time and any developments would be subject to detailed analysis, public consultation and Mayoral decision.

To provide this future flexibility, TfL will specify and own the re-let core IT system which will act as the hub into which all event or distance based detections are interfaced and from which the business and enforcement operations draw information. The overall system architecture is illustrated in the diagram below. Distance based charging can be added as an additional detection infrastructure with charge processing and billing undertaken via the core system.



Set Up Costs

TfL has estimated the cost of developing the core system, the associated business and enforcement operations systems and the upgrades to the existing detection management systems at about £190m.

The first stage of the future development programme would be the introduction of variable charging based on time of day and direction of travel for those who register for an account with TfL. This variable charging would be enabled by DSRC equipment working in conjunction with the ANPR cameras which would be retained for enforcement purposes and for charging of non account holders.

Implementation of variable charging for account holders requires enhancement to the core system, further development of the detection management system, the procurement of the DSRC equipment, the distribution of tags to account holders and the installation of the on-street DSRC equipment. The implementation also requires detailed surveys to determine the actual level of the variable charge elements to be applied and the preparation of and consultation on a variation to the Congestion Charging Scheme Order to introduce the revised charges.

A model back office would be built to simulate the operation of the mixed area and tag charging as well as investigate the mechanisms for interoperability with other schemes such as M6 and DART as well as the potential mechanisms for a national scheme. The model back office would be replaced by the core system in the live operational environment in 2010.

TfL is seeking support with these elements in order to introduce DSRC enabled event based charging.

The overall investment in the Re-let programme is shown in the table below together with the relative allocation of funding between TfL and this application for funding under the TIF programme.

Element of Re-let Programme	Planned Investment by TfL	TIF funding under this application -Package A
Re-let of operational contracts for the period of five years extendible to ten years from late 2009 including the core system to facilitate future flexibility (included in TfL Business Plan).	190	-
Development of systems to enable variable charging and the procurement and installation of DSRC equipment, as well as further feasibility and consultation		40
Trials to establish feasibility of using DSRC equipment in London environment and to inform technical specification of equipment and installation requirements (work completed in July 2006)	12	-
Totals	202	40

The estimated spend profile for the funding sought under this application is shown below.

	2007/08	2008/09	2009/10	Total
Package A	7	28	5	40

To meet the planned implementation date of mid 2010 for DSRC enabled variable charging a commitment of £7m is sought for completion of design, for administration of the procurement of the DSRC equipment and for the necessary preparation and consultation on the amendment to the Congestion Charging Scheme Order to introduce the revised charging arrangements. The balance of the direct implementation costs of £33m would be incurred in 2008/09 and 2009/10.

Potential benefits

The exact impact of variable charging for account holders based upon time of day and direction of travel would depend on driver behaviour, the extent of the variations to the area charge and the proportion of chargepayers who switched to the variable charging regime. For example, there could be additional journeys into the zone during 'off peak' periods. The overall economic benefit generated over ten years of operation is estimated at £1,950m net of compliance costs.

Benefit to Cost Ratio

The overall benefit cost ratio for a combined area and variable charging scheme is estimated at 1.6 before an allowance for optimism bias. The components are shown in the table below.

Costs and benefits over ten years	Indicative NPV £ millions
Transport benefits	2,090
Compliance costs	(140)
Overall benefits	1,950
Capital costs	220
Operating costs	890
Additional bus costs	260
Specified costed risks	4
Overall costs	1,220
Benefits less costs	730
Benefit to cost ratio	1.6

3.3.2 Package RUC-B – Charging outside central London: demonstration remote zone scheme supported by the core system

As described in section B of this application, TfL has identified areas outside the existing extended central charging zone which suffer traffic congestion and could potentially benefit from the introduction of road user charging supported by a range of complementary measures. Initial survey work has been carried out by TfL to assess the potential scope for town centre based schemes. This work has indicated the potential benefits that could be derived from such schemes which could be introduced individually but which would progressively build a network which could ultimately enable London wide charging.

This package constitutes the potential introduction of the first of these remote zones based upon the Greenwich Town Centre. The exercise would be undertaken by TfL with the full support of the Greenwich Council.

Set Up Costs

The estimated set up costs for a remote zone is shown in the table below in £ millions together with indicative annual operating costs.

	Set up costs						Annual costs
	2006/07	2007/08	2008/09	2009/10	2010/11	Total	
Feasibility study	1	1	-	-	-	2	-
Charging scheme	-	-	5	25-35	5	35-45	10-15
Public transport measures	-	-	1-3	3-5	1-2	5-10	10-15
Bus priority improvements	-	-	1-3	2-5	1-2	4-10	0.5
Road network management	-	-	1-3	2-5	1-2	4-10	0.5
Environmental management	-	-	1-3	2-5	1-2	4-10	0.5
Smart measures*	-	-	0-1	1	1	2-3	*
Streetscape improvements	-	-	1-3	2-5	1-2	4-10	0.5
Total package	**1**	**1**	**10-21**	**37-61**	**11-16**	**60-100**	**22-32**

**Annual costs of £3.5 million for smart travel demand measures are covered elsewhere*

It is important to note that this is the cost for establishing a single zone in isolation. The strategy for an evolution towards London or UK-wide road user charging posits a scenario where a number of remote zones might be developed, as part of long term strategy to leading to ever wider geographical coverage. In such a scenario, the incremental costs of establishing a remote charging zone would fall, enabling a "unit cost" for each charging scheme to be reduced. Initial tentative estimates suggest the road charging scheme elements of the costs given above could fall by 15-20% if a number of zones were introduced together.

As an indication of the potential costs associated with a multi zone network, the ultimate cost of implementing 20 'independent' remote zones has been estimated as some £450m with a five year operating cost of some £1,600m.

In this case TfL is seeking funding of £1 million to undertake the survey and modelling work which will establish the feasibility and scope of the pilot implementation based on Greenwich, with a further £1 million to study the feasibility of charging on the strategic road network in Greater London.

Potential benefits and revenues

The traffic impacts have been estimated at some -10% to -20% for a remote zone of this nature each area with a consequent traffic congestion impact of -25% to -30%. The estimated gross value of traffic time savings is estimated at some £5m to £25m per annum for a single zone. These estimates would be refined in the feasibility study alongside estimates of other benefits. It should be noted that this could be a stepping stone to distance based charging which could deliver benefits for London of £1 billion annually and generate gross revenues of up to £2.5 billion annually which would be available for further investment in transport.

3.3.3 Package RUC-C – Distance based charging for road use: implementation of distance based charging in central London

In August 2003, TfL commenced a series of technology trials which would enable:

- More cost effective implementation, operation and expansion of the existing zone
- Future technology intercepts with London wide, national and European road pricing schemes.

The first two stages of the trials have contributed to the procurement of the Western Extension which is scheduled to go live in early 2007 and the scoping of the Re-Let contract described under Package A. These stages have proven the technical feasibility of tag and beacon technology in the London environment and identified the key challenges for satellite based road charging.

The financial commitment to trials of distance based charging by TfL to date has been some £1.7m, with a further £9.7m planned.

This application is for funding to cover the next stage of the trial programme that would investigate the application of distance-based charging in the extended congestion charging zone area and subsequently the GLA area using a volunteer group.

Set Up Costs

The estimated cost to implement distance based charging in central London is £25m. The phasing of the expenditure is shown in the table below.

	2006/07	2007/08	2008/09	2009/10	2010/11	Total
On board units	-	-	0.3	2.0	0.2	2.5
Upgrade to back office	0.5	0.5	1.0	-	-	2
GPS definition and trial	2.0	0.5		-	-	2.5
GPS "instation" and systems	0.5	0.5	0.5	-	-	1.5
Trials set up	0.5	0.5	0.5	-	-	1.5
Trials operating costs	-	1.0	1.5	2.0	2.0	6.5
Variation to scheme order	-	-	-	1.0	1.5	2.5
Core system, public information	-	-	-	3.0	3.0	6.0
Total	3.5	3.0	3.8	8.0	6.7	25.0

It is anticipated that the initial operating costs would be high due to the relatively small number of drivers using this payment method. Costs would also be highly dependent on the cost of the on board unit and the shared uses for this unit. In the long term the operating costs should be reduced from the camera and tag and beacon based detection regimes because of the absence of on-street infrastructure.

In this package TfL is seeking initial funding of £6.5m to commence the trials programme and to complete the programme definition and refine the implementation costs.

Potential Benefits

Distance based charging represents a technology alternative which can enable different charging policies. It is the understanding of driver behaviour and the potential impact on road network conditions that represent the benefits of this package. The proposals would be a major step on the route to understanding the role of distance-based charges as part of future local or national schemes.

3.3.4 Combined Impact of Packages RUC-A, RUC-B and RUC-C.

On an individual basis the three packages do not meet the Department's stated objective for congestion related TIF schemes of a benefit to cost ratio of greater than 2. However, the three packages are required stepping stones to achieving potential London wide charging and creating a scheme which could be a model for the national Road User Charging scheme. The ability to implement a working road user charging scheme in late 2010 should provide impetus to the national scheme.

The potential end point of London wide charging has an estimated benefit cost ratio of up to 3. These packages would allow this preliminary estimate to be refined and the costs and benefits of a wide range of options to be appreciated.

A London-wide scheme is estimated to require an overall investment of perhaps £500 million and cost perhaps £400 million per year to operate. However the traffic congestion benefits could exceed £1000 million per year and a London-wide scheme might generate gross revenues of £2500 million per year which would represent substantial additional funding for transport investment within London.

The estimated spend profile of the three packages in £ millions is summarised below.

	2006/07	2007/08	2008/09	2009/10	2010/11	Total
RUC-A: Variable charging		7	28	5		40
RUC-B: Charging beyond central London	1	1	10-21	37-61	11-16	60-100
RUC-C: Distance based charging	3	3	4	8	7	25
Total	4	11	42-53	50-74	18-23	125-165

At this stage the figures for Packages B and C for 2008/9 and beyond are indicative estimates.

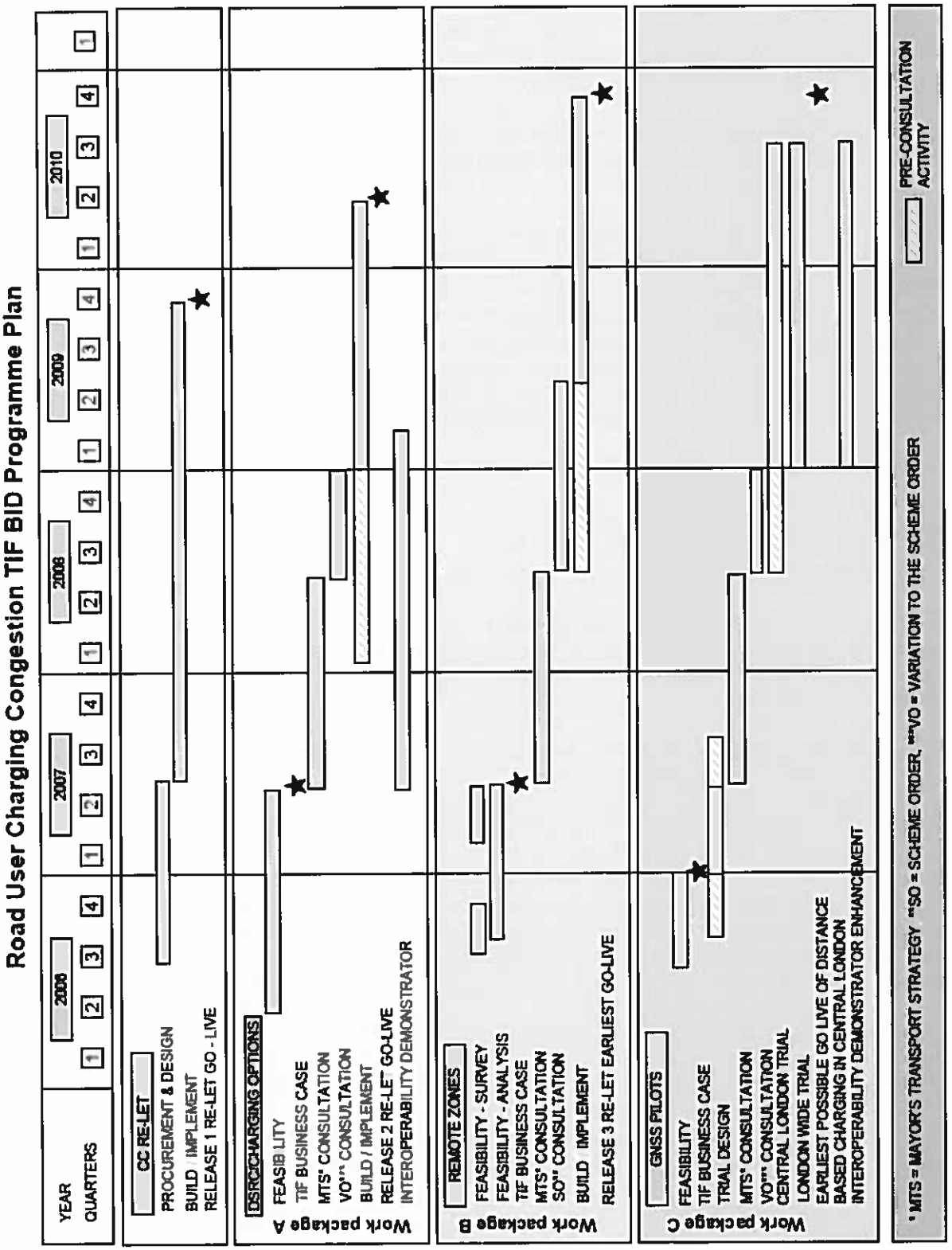
If TfL is to meet its programme for implementation of the Re-Let in late 2009 and be in a position to introduce distance-based charging as charge option in central London in late 2010, the programmes need to commence almost immediately. The work in package A should commence as early as possible if variable charging using DSRC is to be introduced in mid 2010.

On this basis early funding of £15m in 2006/07 and 2007/08 would assist in meeting TfL's target dates and providing the basis for a potential operating model for the national scheme at the earliest opportunity.

All of the necessary procedural steps with regard to any specific proposals would be subject to public consultation and Mayoral approvals. Early funding would also allow the development costs to be substantially refined. In terms of development of GPS in-car equipment and infrastructure, early implementation by London is the most likely route to create a market of sufficient mass to

encourage the private sector to invest in the development necessary to make any future distance charging financially acceptable to the public and viable for the charging authority.

Figure 3.5: Overall road user charging programme plan



4. Smart Travel Demand Management

As discussed at the outset, tackling traffic congestion in London requires the use of a range of policy and operational measures, the overall aim of which should be to change the travel choices and behaviour of individuals and organisations.

TfL believes smart travel demand management is a key element of this range of measures. This section therefore sets out a programme of smart travel demand management packages for which TIF funding is sought.

3.1 The rationale for smart travel demand management

There is growing evidence that voluntary, or smart, demand management tools can have a large and cost-effective impact on people's travel behaviour. Smart travel demand management aims to make better use of transport capacity through provision of information, incentives and infrastructure. This can include a range of measures, from positive incentives to targeted information campaigns. As discussed earlier, the behavioural change might be a decision not to travel or indeed a decision to not use the car, but could also include:

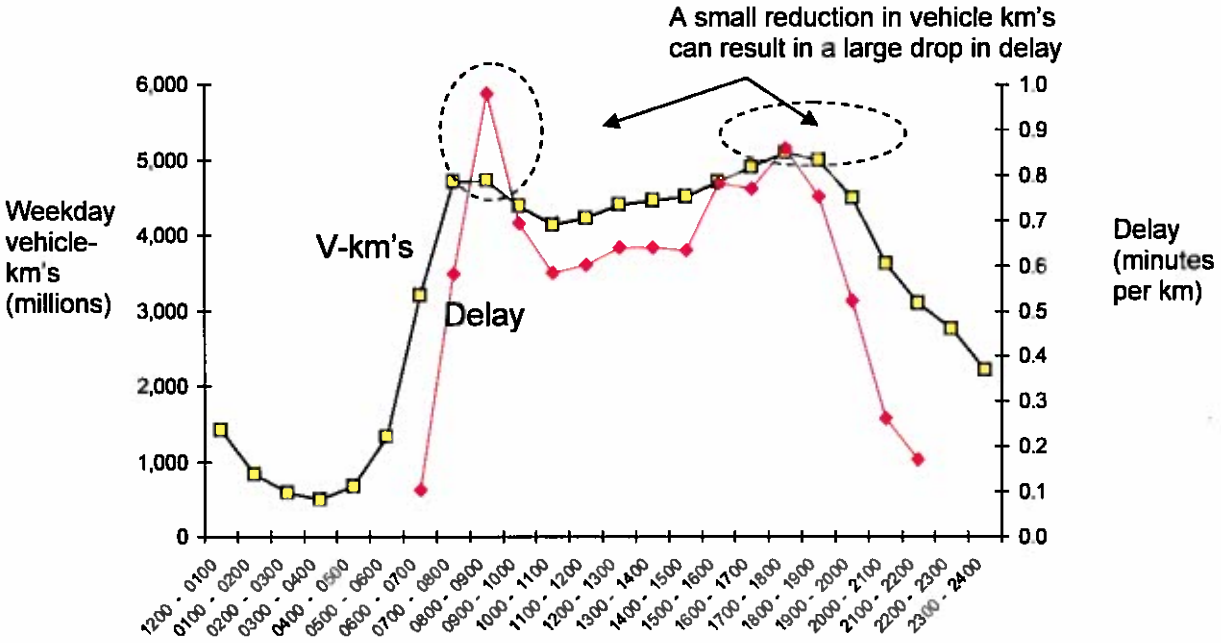
- reducing the extent or frequency of travel;
- changing the time of travel;
- changing the choice of destination;
- changing the mode of travel or car sharing;
- changing the route of a journey.

Smart measures do not fundamentally change the cost of car travel. They focus instead on making people more aware of the costs they impose on themselves and society when using a car and provides them with the information, incentives and confidence to consider and perhaps make use of alternatives.

Existing evidence suggests that, even on their own, smart travel demand measures can have a significant impact on travel behaviour. The DfT's *Smarter Choices* report, for example, suggested that peak period urban traffic could be reduced by up to 20% through a combination of high intensity measures over 10 years. This 'high intensity scenario' relates to specific areas where car use is currently high and a concentration of activity could offer real alternatives e.g. promotion of improved bus facilities or cycle lanes. However, this estimate does not take account of the 'second order' impacts resulting from the adaptations of those not involved in the travel demand programmes. These other road users could shift their travel times or routes to take advantage of the traffic reductions from smart measures. These pilot schemes will monitor both 'first order' and 'second order' impacts.

Smart measures do not necessarily imply huge changes in behaviour, as relatively marginal behavioural changes can have a significant impact. Reducing traffic by a few percent in peak periods, for example, has a disproportionate impact on reducing traffic congestion (see figure 4.1). This type of reduction is possible via a range of demand management measures. Smart travel demand programmes, however, are able to be targeted (e.g. to schools and major workplaces) to maximise the 'first order' effect in specific, congested, areas.

Figure 4.1: The relationship between first order traffic reduction and congestion reduction

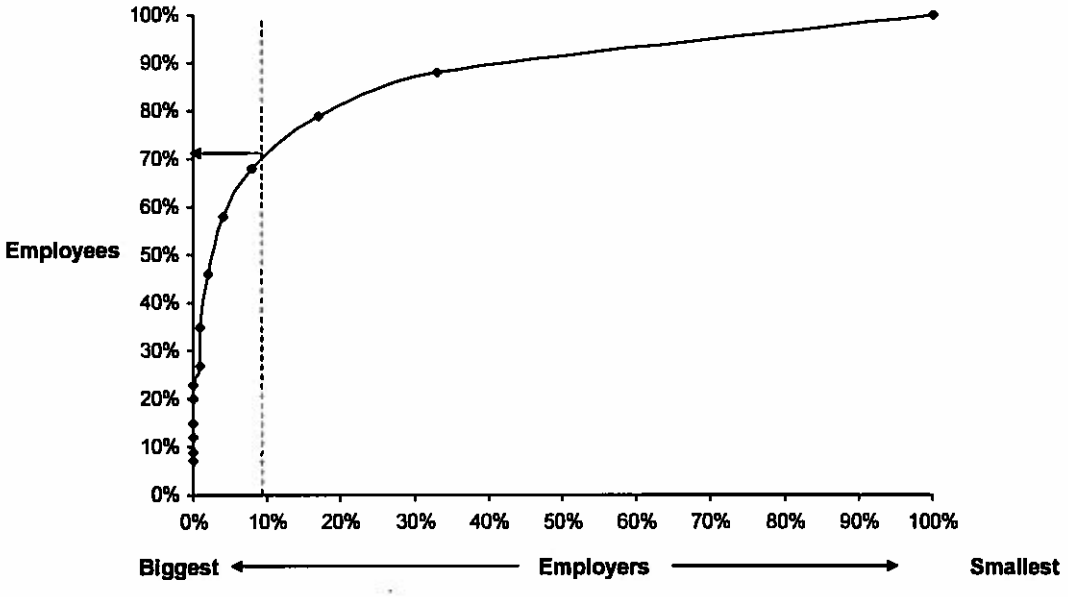


The main smart TDM measures include:

Workplace travel plans - these seek to encourage workers at a given site to reduce travel, particularly by unsustainable modes. Tools used include campaigns to encourage mode shift and the staggering of work hours to reduce car trips or help shift demand for public transport away from the busiest periods. TfL analysis suggests that targeting the biggest 10 per cent of employers in London would cover 70 per cent of all employees (see Figure 4.2).

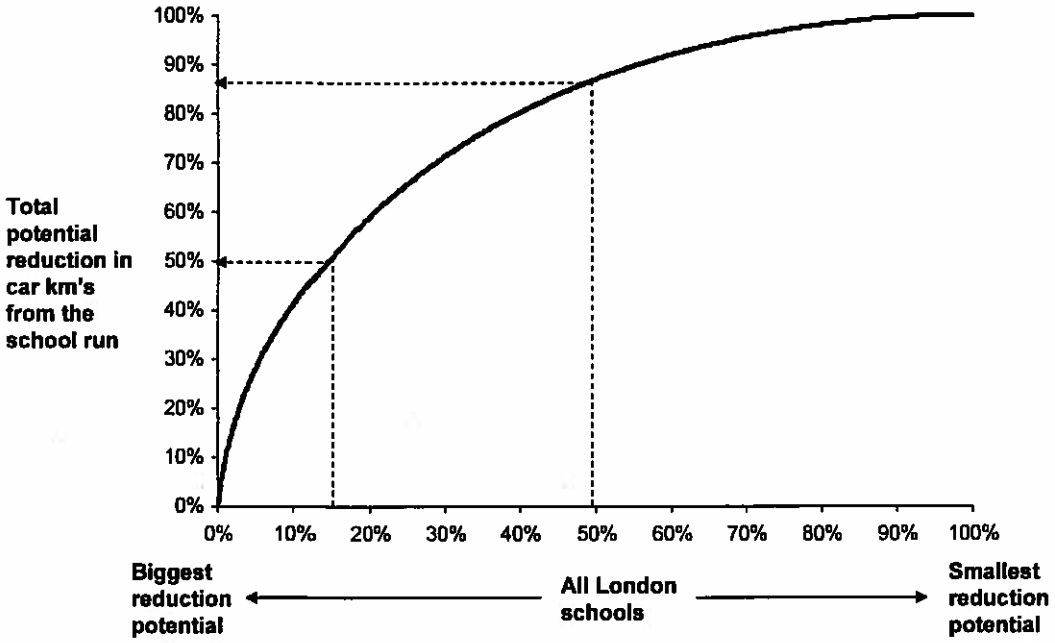
Figure 4.2: The relationship between employers and employees in London

100% of employees = c.3.8m
100% of employers = c.360,000



School travel plans – these can also reduce certain highly-peaked and localised traffic flows. This is achieved through measures such as the provision of school cycle racks and safe cycle routes, the introduction of walking buses and safe walking routes, and the provision of cycle training and safety equipment. TfL analysis suggests that targeting the 15 per cent of schools with the highest potential for reducing traffic congestion would provide the opportunity to reduce school-run associated traffic congestion in the morning peak by 50 per cent (see Figure 4.3).

Figure 4.3: The traffic reduction potential for schools in London



Personalised travel plans – these allow travel information and incentives to be targeted to individuals and households. Face-to-face contact, as well as the Internet, direct mail and telephone is used to interact with individuals. Based on their stated needs and preferences, a customised set of tools can be provided including maps, suggested routes and different mode options.

Freight travel plans – these encourage off-peak and consolidated deliveries (when planning restrictions allow) to be made, to reduce the total number of vehicle trips. Freight travel plans can also form part of a wider workplace travel plan and can play an important role in matching demand and capacity, and consolidating deliveries for optimum use of road and kerb space.

Car clubs and car sharing – these provide flexible and innovative alternatives to private car ownership, by allowing participants to reduce car costs, while maintaining the use of a car. Members of car clubs tend to use cars less frequently than car owners, only using a car when they cannot make the journey by public transport, on foot or by bicycle.

Teleworking and teleconferencing – these often form part of workplace travel plans but can be useful in their own right, with the potential to reduce a large number of work trips. The effects of wider social changes in work practices may help increase the impact of investment in initiatives designed to encourage teleworking and teleconferencing.

Marketing and promotion – in addition to targeting specific trips and locations, marketing and information campaigns can also target specific user groups. For instance, 74% of car users indicate that they would consider changing their behaviour but either require more information about alternatives or information for planning their journeys.

4.2 A smart travel demand management strategy for London

Smart travel demand management is a relatively new policy intervention and systematic, robust empirical evidence is limited. The evidence that does exist is typically based on small scale/local projects and over short time periods.

To maximise the impact of the programme, TfL's smart travel demand management strategy aims to target:

- trips made at the most congested times of day;
- trips made in the most congested locations;
- the most common trip types at congested locations;
- specific customer segments that are most likely to be prepared to change behaviour;
- areas where single-occupancy car use is comparatively high.

Because smart measures can be so precisely targeted at individual homes, workplaces, or schools, they are particularly appropriate for addressing specific trip and customer segments and particularly congested areas.

4.3 TfL's current smart travel demand management activity

Since TfL was established there has been a significant increase in smart travel demand management activity year-on-year. This has been developed and executed in tandem with the boroughs, London businesses and other organisations such as Sport England.

Key results to date include:

- Accreditation of over 1,000 school travel plans for DfES and DfT (47% of state primary schools and 34% of state secondary schools now covered). Initial survey results from the 2005/06 academic year have shown a 10 to 15% drop in the number of children being brought to school by car. As an example, Bromley reports a 13% average shift away from the car for the school trip, with some schools as high as 30%;

- Across London, 120,000 children are now walking to school one day each week as part of the TfL-initiated 'Walk on Wednesday' campaign. This consistently creates up to 30% reduction in car use for the school trip on the relevant day in the local areas affected;

- Workplace travel plans, in conjunction with physical and operational measures, introduced in key congested areas are producing positive results. Stockley Park (a large business park in West London) has seen a 20% reduction in the proportion of staff arriving by car over a 2 year period. Their workplace travel plan encompasses improved bus connections and communication of real-time arrivals; a car share scheme with on-line access; a bicycle loan scheme; and a dedicated commuter information centre;

- Partnerships have been created to develop and promote best practice in workplace travel planning e.g. Sport England and the NHS Good Practice Guide;

- Successful personalised travel planning pilots have indicated a 6% reduction in trips in the "car as driver" category amongst engaged households;

- Support and promotion of the "Good Going" travel awareness campaign (launched in September 2004) which unifies previously-fragmented travel awareness campaigns under one banner.

In 2005, TfL developed a business case for significantly increasing the scale of smart travel demand management activity in London. This business case covered the extent of the problems that smart measures can address, the investment required and the potential impacts that could be achieved. The business case based on this analysis was approved by the TfL Board in October 2005. As a result, in November 2005, TfL confirmed increased investment in smart travel demand management measures from £17m in 2005/2006 and £18m in 2006/2007 to £25m in 2006/2007 and to £30m in 2007/2008.

This increased scale of investment and support will allow TfL to build on its knowledge and experience of TDM delivery to deliver a step-change in activity level that will put London, and the UK, firmly at the forefront of this new approach to urban traffic management.

The specific deliverables supported in 2006/07, the first year of this increased programme of activity, are set out in the table below. Future years' deliverables will be determined by the further experience derived from the expanded programme.

Programme	Budget - £m	Outputs and outcomes
School travel planning	13.2	40% school travel plan coverage across London
Workplace travel planning	4.3	25,000 employees covered by workplace travel plans
Personalised travel planning	1.0	30 000 households involved in the process
Travel awareness	2.4	Linked to events such as Mobility Week, Car Free Day
Other initiatives	2.3	See below
Central - salaries etc.	1.3	
Total	25.0	

These delivery programmes are being supported by continuing analysis and development work. Highlights of this include:

- A programme of work by a marketing agency (Dragon) which has identified key market segments within London and their attitudes to different travel modes. A series of marketing concepts have been developed from this analysis to further strengthen TfL's core TDM programmes. For example, a Travel Pack has been developed for children moving to secondary school. The pack provides information to children and their parents on their travel options with the aim of increasing their confidence in the use of public transport, bicycles or walking, in place of car journeys.

- Detailed analysis of traffic congestion levels in key areas, especially in support of the town centre pilot referenced below. This has provided traffic congestion "heat maps" and lists of key potential workplaces to support targeting of those with the greatest congestion-reduction potential (see Annex 2)

- Third party research into the potential impact of teleworking. This has been undertaken with BT and local universities.

4.3.1 Smart travel demand management town centre pilot

A key element of the current smart travel demand management programme is a co-ordinated pilot of *all* the above activities in Sutton, one of London's metropolitan town centres. Sutton was chosen following desk research on the demographic and transport characteristics of all ten of London's Metropolitan Town Centres, followed by submissions of proposals from a short-list of London boroughs.

The Sutton pilot is expected to be launched in September 2006 and will be a three-year programme with £5m funding secured from TfL. Based on its success, the project will be sustained with borough funding following completion of the pilot stage. As the first of this scale in the world, it will be used to test, monitor, capture and share best practice. Both the programmes themselves and the monitoring of outcomes will be used to create a robust base of lessons which can be utilised to influence future smart travel demand management investments and activities in the UK and worldwide. London metropolitan town centres such as Sutton have the significant advantage that they are comparable in character to other town centres outside London. This means that the lessons learned from the Sutton pilot will have wide applicability for communities across the UK

The Sutton town centre pilot will also provide valuable experience, in terms of managing concentrated, multiple programme initiatives. This experience will be directly relevant to package STDM-A: Town Centre approach as described in this bid which is, in turn, linked to package RUC-B: Understanding road user charging beyond central London.

In particular, the pilot will provide robust data on the extent to which a combination of smart measures on their own can lead to changes in behaviour, including reduced car use, and hence reduced traffic congestion. The pilot will also provide an opportunity to assess whether reductions in car use, traffic levels and congestion achieved via smart measures are offset by induced traffic (e.g. by a car not being used for work, being used for other purposes).

4.3.2 Monitoring of current smart travel demand management programme

Rigorous and sustained monitoring is undertaken across TfL's travel demand management programme. This monitoring process represents the most comprehensive examination of smart travel demand management impacts to date anywhere in the world, the outcomes of which will be invaluable to the smart components of the road user charging proposals within this TIF bid, as well as future interventions made elsewhere in the UK.

This process begins with the collection of detailed information on a number of measures, prior to the introduction of an intervention, and subsequent monitoring of behavioural changes post implementation. Through careful definition of the spatial boundaries of the pilot and the comparator areas, it allows the impact of smart measures to be monitored over time. This means that both 'first order' and 'second order' effects can be measured: first order being the impacts on those directly affected second order being the overall impact taking account of any adaptations from those not directly affected.

In addition to using bespoke vehicle tracking and GIS mapping technology (a system called *i-Trace*) to measure and report mode shifts linked to individual travel plans for schools and workplaces, TfL also uses other survey methods such as face-to-face and telephone interviews. Personalised travel planning uses large scale surveys of individuals to assess take-up of individual plans and evaluate their impact on travel behaviour.

The Sutton town centre project is designed to allow TfL to fully evaluate the impact on behaviour and outcomes of a combined and concentrated approach in a single area. Due to its localised focus, TfL's TDM team will be able to augment current monitoring of specific travel plans with a wider impact measurement in the town centre. The full monitoring programme will include base traffic levels, road traffic congestion, travel mode, attitudes and air quality. Baseline data will be gathered at the beginning of the pilot with monitoring undertaken throughout its duration. TfL has commissioned research by *Synovate to* cover the behavioural and attitudinal surveying part of the monitoring program for the Sutton town centre pilot. The pre-stage of the survey will start in August 2006.

Further detail of the proposed monitoring programme is provided in section 4.7 'Monitoring the outputs and outcomes of smart travel demand management'.

4.4 TfL's smart travel demand management TIF proposition

TfL takes the view that smart measures can play a significant role in reducing traffic congestion in London, but that this requires two key elements:

- adequate resource, in terms of levels of funding and activity, high-quality research, materials and staff, and a prioritised approach to target areas and organisations
- implementation in conjunction with other policy interventions

The need for joint implementation with other measures is partly because "carrots" – attractive alternatives to car travel – must be offered in parallel to messages and incentives persuading people to shift away from the car. Joint implementation is also required because charging and/or strategies for a more active management of road space will be most effective at 'locking in' traffic decongestion benefits, without which gains from freed-up road space will be partially filled in again through induced demand.

The need for a package of measures is support by recent research suggesting that the use of effective demand management tools, both prior to and in conjunction with road user charging, is the most effective way of achieving and sustaining traffic reduction targets in urban areas. By increasing awareness of, and access to, alternatives to car use ahead of the introduction of road user charging, smart travel demand measures can help increase public acceptance of charging and take-up of alternative travel choices.

TfL therefore proposes using TIF funding for two broad purposes:

- to test the impact of robust, high-quality smart measures programmes implemented on a larger scale in traffic congestion problem areas (such as workplace travel plans in Outer London);
- to develop, test and implement a number of smart packages in conjunction with other interventions (including road user charging).

This programme aims to inform TfL and Government policy making going forward, as well as to start delivering real traffic decongestion benefits on the ground in London.

TfL is seeking TIF funding for a total of three smart travel demand management packages to be used to build on our previous successes and augment current plans. The programme also seeks to develop and test new policy directions to inform London and UK policy development in this area. The three packages are:

STDM-A Town Centre approach
STDM-B Workplace Travel Plans – the Next Phase
    1. Outer London
    2. Central London
STDM-C Managing demand on major transport corridors

The contents of each package are set out in more detail below.

Each package includes an estimate of its potential outputs and outcomes. It is important to note that the actual outcomes – both 'first order' and 'second order' – will vary according to relevant local factors

Package STDM-A: Town Centre approach

This package will be introduced as an integral part of package RUC-B (Understanding road user charging beyond central London) set out earlier in this proposal. It will build on TfL's existing experience in managing a range of smart travel demand management programmes to complement the introduction of a town centre road user charging scheme outside central London.

In particular, it will benefit from the experience TfL will gain from the Sutton town centre pilot, described in section 4.3.1. It will deliver:

- Workplace travel plans at all engaged workplaces within the selected area;
- School travel plans and implementation of the designated 'safer routes to school' programme at each school within the area;
- A personalised travel plan programme to willing households across the area
- A car club for the whole area, and;
- The development and promotion of an area wide travel awareness campaign explaining the benefits and disadvantages of current behavioural choices.

The main objectives of the package would be to minimise the impact of traffic congestion within the town centre area and utilise better the transport network. Initial activities will act as preparation for the road-user charging initiative.

As mentioned, this package will build on, and be additional to, the Sutton town centre pilot. It is important to stress that the criteria for the selection of a suitable location for a road user charging town centre pilot (which are the criteria being used in this case) will be different to those used for the selection of a standalone smart travel demand management town centre pilot. As a result, the town centre selected for this package will have different characteristics in terms of population profile, current travel patterns, transport services etc, to those of the existing smart travel demand management town centre location in Sutton. Therefore, the balance between different components of the package and the expected outcomes may also be different from those in Sutton.

On 12 June 2006, the London Borough of Greenwich agreed to be a partner in the TfL bid to investigate and survey options for local travel demand management as outlined in package RUC-B. The feasibility study described in that package will confirm (or otherwise) this proposed location. On confirmation of that location, the smart measures programme will be scoped in greater detail.

The outcomes in terms of impacts are expected to include:

- A mode shift away from car use. The extent of the shift will be informed by the Sutton pilot but it is estimated that smart travel demand management could contribute some 20% of the overall aggregate impact of an integrated package (including road user charging);
- an increase in cycling and walking;
- an increase in public transport usage;
- rationalisation of delivery services;
- an increased take up in the marketing of cleaner vehicles;
- the creation of a car club network which will be able to expand to rest of the Borough.

Problems and identified risks

The main risks to this package relate to the need to secure buy-in and support from local organisations. This should be offset by the work TfL is developing with London First and the CBI as well as with the trade unions. TfL will also need to work closely with the relevant borough, local employers and community organisations to develop the appropriate partnerships and relationships.

Strategic fit

The project meets a number of TIF strategic objectives as outlined in 3.10 of the TIF guidance January 2006. It would:

- Increase the mobility of people or goods in a way that reduces business costs;
- Support agglomeration of business activity, in contrast to charging, which may have a dispersing effect;

- Increase international competitiveness and trade through improving ease of movement of goods and services.

Key stakeholders
The key stakeholders for this package are: TfL, the selected chosen borough, DfT, LDA, the health authority, Sport England, Metropolitan Police, the town centre manager, local schools, employers and community groups.

This partnership will provide effective working mechanisms to support the strategic lead for each of the elements of the project as well as specific project expertise, management of delivery partners, delivery of programmed, project management, marketing and quality assurance.

Package STDM-B: Workplace Travel Plans – the Next Phase

This package will build on TfL's existing Workplace Travel Planning programme with the aim of developing a new phase of activity. The funding provided will enable TfL to radically improve the level of sophistication applied to workplace travel planning.

In terms of strategy and approach, TfL will improve the prioritisation of workplaces targeted for travel planning support. This will be based on:

- Further advances in traffic congestion "heat mapping" (as described in Annex 2) including its application to crowding on the public transport network;
- Research and modelling to understand the impact of a reduction in 'first order' localised traffic flow on overall road network congestion, thus allowing for 'second order' effects from those unaffected by the travel plan;
- Development of an advanced criteria matrix: to include type of employment; number of sites; type of workers; size of business; stated interest in corporate social responsibility; etc

These advances in targeting will be supported by a new range of tools and resources for individual workplaces. This will include:

- business case documentation detailing the potential benefits associated with travel plan activities e.g. the expected reduction in office costs due to increased teleworking;
- incentives and toolkits tailored to different types of employment and location;
- programmes and case studies to assist the development of car share schemes; teleworking and teleconferencing and policies to support flexible working hours.

The strategy will be designed to be fully flexible to different types of businesses in terms of size, location and type of employment.

Furthermore, awareness activity and best practice sharing targeted at business groups and individual businesses will be intensified. This will involve greater visibility at relevant conferences; organisation of tailored workshops; and partnership with interested bodies, such as the Travel Plan Network for smaller businesses.

B.1: Outer London – workplace travel planning

The larger element of this package will be a workplace travel planning programme aimed at businesses in outer London. The updated strategy outlined above will allow TfL to focus effort across the areas of London where car use for commuting remains high. Further, the approach will be flexible to the range of needs which exist across outer London due to the varied level of provision of public transport, cycle lanes, etc.

The principal aims of this package will be to:

- Reduce driver-only car commuting;
- Encourage cycling and walking;
- Increase the uptake of teleworking, teleconferencing and flexible working.

These will be achieved via a programme of delivery as summarised in section 3.1 of this document. This new phase will, however, require specific application across outer London where the focus will be on encouraging non-car travel and/or, where appropriate, reducing numbers of trips. Upgraded heat-mapping of road congestion will be used to identify target areas. Within those areas, workplaces will be prioritised and categorised according to their individual characteristics.

Based on the advanced prioritisation approach, TfL would expect to implement travel plans to cover 40,000 incremental employees each year.

Tailored packages of tools and incentives will be made available to employers to support the implementation and maintenance of travel plans, for example through protocols and techniques for implementing teleworking and teleconferencing. Employees will receive information tailored to the location of their workplace and the transport options available, plus information about any new flexible working policies to be implemented within their workplace.

B.2: Central London – workplace travel planning

Central London has unique transport characteristics. In particular, the high availability of public transport coupled with the existing road user charging programme, means that car usage is already relatively low. TfL's workplace travel plan strategy needs to reflect this by moving into a new phase where mode shift from cars is no longer the primary objective.

The principal aims of this package will be different to those of workplace travel planning in outer London. They will be to:

- Encourage walking and cycling in place of short trips using public transport;
- Support sustainable work-related travel for workers for whom public transport may not be an option (e.g. shift workers operating outside core hours);
- Encourage cycling as a feasible commuting option;
- Work with businesses to rationalise the use of freight and fleet vehicles within central London.

The objectives of this new phase are not primarily focussed on mode shift away from car driver, as they are in outer London. While the techniques used to deliver workplace travel plans will be the same, the specifics of the delivery process will be different. Crowding on the public transport network will be modelled to create a new type of 'heat map' which identifies key 'pinch points', for example, around key interchanges and/or public transport links and routes. This will be linked to analysis identifying key areas within central London where a high number of very short public transport journeys are made, such as those from major network railway stations to neighbouring underground stops.

The analysis outlined above will be cross-referenced to a matrix of central London workplaces in order to identify priority targets. This will encompass employers within the existing road user charging area as of 2008, that is, those in the City of Westminster, City of London and part of the Boroughs of Southwark, Lambeth, Kensington and Chelsea, Camden, and Hackney.

Tailored packages of tools and incentives will be provided to these workplaces, albeit with different contents to those utilised in outer London. Teleworking and teleconferencing will still be promoted but there will be considerable emphasis on the encouragement and facilitation of walking or cycling for short journeys, plus sustainable transport options for shift workers.

The expected outcomes will include:

- an increase in cycling and walking;
- rationalisation of delivery services;
- improved freight and staff access to all sites enabling better delivery and increased productivity;
- broadened accessibility of all work places – increasing labour pools by joining housing and employment through better access to public transport and direct access by walking and cycling
- increased take up of teleconferencing.

Key specific outcomes by sub-package are as follows:

For B1 – Outer London:
mode shift away from car drivers of 5 to 10% at individual workplace sites with plans;
For B2 – Central London:
A decrease in public transport use for short public transport journeys within zone 1, leading to a reduction in crowding at peak times and at key interchanges.

Problems and identified risks
The risks are in the level of buy-in and support from local business. This should be offset by the work TfL is developing with London First, the CBI and the trade unions and direct engagement with local business organisations and individual businesses.

Strategic fit
The project meets the following TIF strategic objectives, as outlined in 3.10 of the TIF guidance January 2006:

- increase the mobility of people or goods in a way that reduces business costs;
- support the mobility and flexibility of the labour market;
- increase international competitiveness and trade through improving ease of movement of goods and services;
- increase network resilience for business users.

Key stakeholders
Key stakeholders involved throughout the development of this project will be: TfL, the relevant boroughs, employers and business organisations, DfT, LDA, Strategic Health Authority, Sport England and the Metropolitan Police.

Package STDM-C: Managing demand on major transport corridors

The current smart measures town centre pilot in Sutton aims to test a concentrated programme of measures in a metropolitan town centre location. TfL is also keen to explore this approach along key transport routes. This will focus in the first instance on routes where a corridor approach to traffic management can be undertaken in parallel. It could be extended, however, to routes or corridors where major new transport infrastructure, such as a tram scheme, is being developed. Funding for this package would allow TfL to pilot this concept.

This package would build on TfL's existing experience in travel planning for workplaces, schools and individuals. Should funding be confirmed, an initial phase of this programme will be undertaken in 2007/08. The principal element of this phase would be a desk-based feasibility study to identify the most appropriate corridors for the initial pilot. This study would be similar to that undertaken to identify the shortlist of potential locations for the current smart measures town centre pilot, from which Sutton was chosen. It would focus on an assessment of transport routes

being considered for corridor management that have particular traffic congestion-reduction potential. The types of routes reviewed would include the principal arterial routes into London such as the A1, A23, A41, etc.

Two initial pilots, each lasting three years, would be planned to begin in 2008/09. Based on success, TfL would aim to rollout a further three year pilot in 2010/11 and two more in 2011/12.

Individuals would be targeted by workplaces, by schools and directly by personalised travel planning.

Support for the development of workplace travel plans would be offered to all priority organisations within the travel corridor identified. This targeting activity would link into that outlined in package STDM-B, such that target businesses will be identified based on prioritisation and will benefit from a flexible strategy. TfL would expect to target around 5,000 employees per three year pilot. The relatively low focus on workplaces within this package is due to the significant funding of workplace travel planning associated with STDM-B. TfL would ensure that these two initiatives were co-ordinated and any overlap managed. Support will be provided throughout each pilot to ensure that travel plans are updated in line with changes and upgrades to the infrastructure and traffic management in the chosen areas.

Schools affected by the transport corridors chosen for each pilot would be prioritised for school travel planning support. Existing TfL funding would be used to ensure that the Mayoral commitment of 100% of schools having travel plans by the end of 2008/09 is met. The school travel planning element within this package would focus on ensuring that the travel plans are of the highest quality. Those in place already would be refreshed and updated. New and existing plans would benefit from revitalised collateral and upgraded initiatives.

Personalised Travel Planning would be offered in specific residential locations affected by the chosen corridors. The activity in this area would build on TfL's experience from early pilots undertaken in 2006/07. The personalised travel planning programme empowers and enables individuals to make changes to their transport choices from home, by considering the following:

- the impact of their transport choices;
- the trips they can do by a different mode, at a different time or to a different destination, and;
- ways to support and optimise the trial of the changes made.

As part of this developing programme, individuals are engaged in one-to-one dialogues about their travel requirements and options. A specific aim will be to maximise individuals' use of services local to their homes and workplaces, such as shops, post offices and public buildings.

Funding within this package would allow TfL to target 40,000 individuals per three year pilot.

Whilst these programmes could be run separately, the key expectation here is that a concentrated programme will create benefits that are greater than the sum of the individual parts. As mentioned above, the existing Sutton pilot will test this view on a town centre location, package STDM-C will pilot this approach based around key transport routes.

The outcomes in terms of 'first order' impacts would include:

- a 10-20% mode shift at each work site with an implemented travel plan;
- 5 to 7% reduction in car kilometres travelled by drivers engaged in the personalised travel planning pilot;
- an increase in cycling and walking;
- an increase in public transport usage;
- rationalisation of delivery services.

Problems and identified risks
The key risk for this package is insufficient funding for the systematic review of corridor road space allocation. Of course, the smart measures package can be implemented without reviewing road space allocation and signals along the corridor, and it would be expected to have a positive impact on traffic congestion. However, the purpose of the package is to test the combined impact of both sets of interventions.

Risks are in the level of buy-in and support from local business. This should be manageable in the context of TfL's engagement with London First and the CBI as well as with trade unions. A further risk is associated with any delay in the implementation of corridor management and, in due course, in securing of consent or funding for the major infrastructure works affecting corridors within this approach.

Strategic fit
The project meets the following TIF strategic objectives, as outlined in 3.10 of the TIF guidance January 2006:

- increase the mobility of people or goods in a way that reduces business costs;
- support the mobility and flexibility of the labour market;
- increase international competitiveness and trade through improving ease of movement of goods and services;
- increase network resilience for business users.

Key stakeholders
The key stakeholders are: TfL, the London boroughs impacted, employers and business organisations, community groups, LDA, DfT, the health authority, Sport England and the Metropolitan Police.

3.5 Smart travel demand management package implementation

The three packages outlined above will begin their implementation during 2008, prior to the introduction of any further potential road user charging schemes. Throughout, programmes will be executed to integrate with the developing transport infrastructure. Each will benefit from the experience derived from TfL's current TDM activity as outlined in section 3.3.
Package STDM-A is intended to form part of the preparation of the chosen location for a town centre road charging initiative. It directly relates to Step 3 of the 'road user charging' strategy (as illustrated in Figure 3.3). Package STDM-B would make a step change in the approach to workplace travel planning and will then pilot the flexibility of the updated programme in both central London and outer London. Package STDM-C would focus on traffic congestion issues along major transport routes. These last two will, therefore, introduce ways to help businesses and households in London reduce their car use prior to the potential adoption of further or wider road user charging schemes in London in the future.

Each of these packages would involve one or more elements of TfL's current TDM programme. The experience referred to above, plus other factors inherent within each package would affect the specific deliverables and outcomes. The packages would remain, however, broadly consistent with that outlined in this paper.

3.6 Financial bid

Package	Annual Budget	Year (s)	Total Budget
STDM-A	3.5	08/09 – 13/14	21.0
STDM-B			
1. Outer London	4.0	08/09 – 13/14	24.0
2. Central London	3.0	08/09 – 13/14	18.0
STDM-C	6.0 - 9.0	08/09 – 13/14	45.0
Project Totals	16.5 - 19.5		108.0

3.7 Monitoring, outputs and outcomes of smart travel demand management

Policies and programmes designed to support changes in travel behaviour have an important role to play in managing the response to travel demand across London's transport system. They also have a specific role in facilitating the implementation of road user charging schemes. The long-term outcomes of these combined programmes will be a reduction in car driver journeys and a shift to more sustainable modes such as walking and cycling, with the associated benefits for the environment and society.

Experience from other behavioural change campaigns, such as those tackling smoking or drink-driving, suggests that effecting behaviour change takes time and requires a long-term policy commitment. Although smart travel demand management initiatives can be implemented in shorter timeframes than renewal or major transport projects, the full benefits are only likely to be realised in the medium to long term.

The monitoring of the impacts of the packages outlined in this proposal will build on TfL's existing programme of behavioural change surveys (as discussed in section 3.3). This will measure both outputs (e.g. number of workplace travel plans delivered) and first and second order outcomes (e.g. travel behaviour change achieved). Monitoring the long-term shift in travel behaviours is a core aim of the smart measures programme and, as such, the process is undergoing continuous development and extension. The packages within the TIF bid will benefit from this extended programme to provide additional evidence of effectiveness in line with the following three objectives:

- the long-term shift in travel behaviour and the resulting changes in traffic patterns and congestion levels;
- the social impact of the interventions in relation to road safety and health;
- the environmental impact of the interventions in relation to air quality, greenhouse gas emissions and noise levels.

A range of different monitoring tools within the extended programme will be deployed as part of a robust strategy. TfL will define several case study areas (some as control or comparator areas and the others as pilot areas) to provide a particular focus for study. Both before and after surveys will be conducted on the chosen case study areas, using the panel survey method, so that the current behaviour and the post intervention behaviour can be compared. TfL will carry out the post-intervention stages at yearly intervals following the implementation of the smart travel demand management projects.

Specifically, TfL will use *i-Trace* and other techniques and surveys to monitor:

- the 'first order' shift away from car driver to car passenger, to public transport, walking or cycling;
- the first order and second order reduction in vehicle kilometres;
- the changes in the intensity and disposition of traffic congestion in the longer term;

i-Trace will help to target traffic speed and traffic count monitoring and surveys of travel behaviour in the target and comparator areas. TfL will use large scale survey techniques, telephone and face-to-face street interviews, to assess behavioural and attitudinal change of individuals. This will be based on the work undertaken by Synovate to monitor the smart travel demand management town centre pilot in Sutton, described in 4.3.2.

The impacts in terms of road safety will be evaluated using existing assessment measures. The London Accident Analysis Unit has monitored personal injury accidents in London for the last 20 years.

TfL will use a number of environmental impact measures to monitor the effects of the interventions in the target and comparator areas. This includes assessing the relative contribution of smart measures alongside other factors influencing air quality in London. However, it is expected that the observed changes in air quality and ambient noise levels will be minimal.

3.8 Outputs and outcomes of proposed smart travel demand management programme

The monitoring programme will provide the basis for measuring the outputs and outcomes of the three smart travel demand management packages outlined in this proposal. However, as noted above, specific results in areas such as the town centre will depend on chosen locations. The high-level outputs for each package are summarised below:

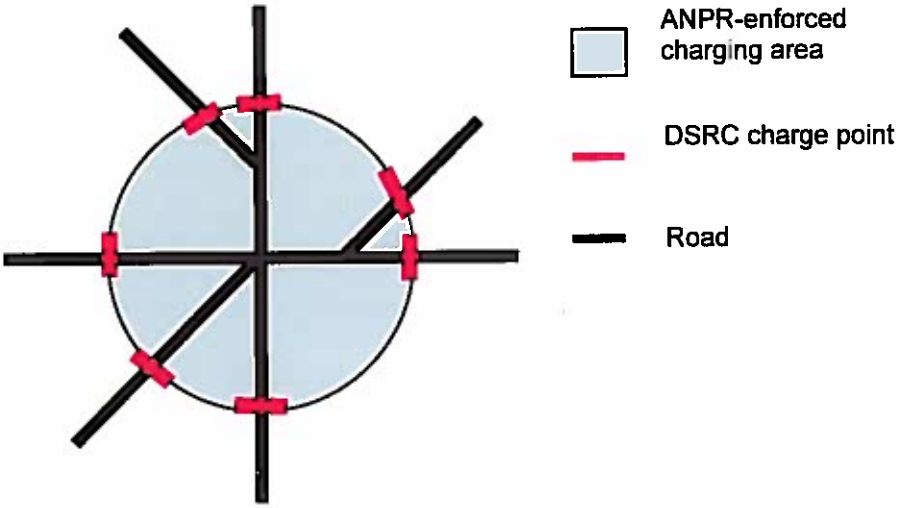
Package	Year(s)	Outputs / deliverables
STDM-A: Town Centre approach	08/09 – 13/14	Each year 40,000 individuals would be involved in personalised travel planning and 5,000 employees covered by workplace travel plans. All schools in the chosen area would have travel plans and there would be a high-level awareness campaign and the provision of a car club. These measures and their monitoring would be integrated with package RUC-B and its monitoring. By 2014 the smart demand measures could be delivering some 20% of the overall aggregate impact of the integrated scheme.
STDM-B: Work Place travel Plans – the Next Phase	08/09 – 13/14	40,000 new employees would be covered by travel plans each year in outer London (B1). 30,000 new employees would be covered by travel plans each year in central London (B2). By 2014, TfL would be expecting a first order 5 to 10% mode shift by car drivers at individual workplaces with travel plans by 2014, though the monitoring would also look at second order impacts.
STDM-C: Managing demand on major transport corridors	08/09 – 13/14	Around 5,000 employees and 40,000 individuals would be covered by each three-year pilot.

Annexes

Annex 1: Possible scenarios for a road user charging 'remote zone'

For a traffic node, for example an outer London town centre area, a charging scheme might take the form of a cordon or area charge around the congested area or areas. This could, according to local need, operate either as a flat-rate daily charge like that in central London, a peak hour charge, a charge which varies across the day or a direction-based charge. Charges could be paid on the basis of travelling within an area or crossing a defined cordon. The more flexible forms of charging would be available to those fitted with some form of tag or on-board detection unit.

Figure: Model of a possible remote charging zone at a traffic node or other trip attractor

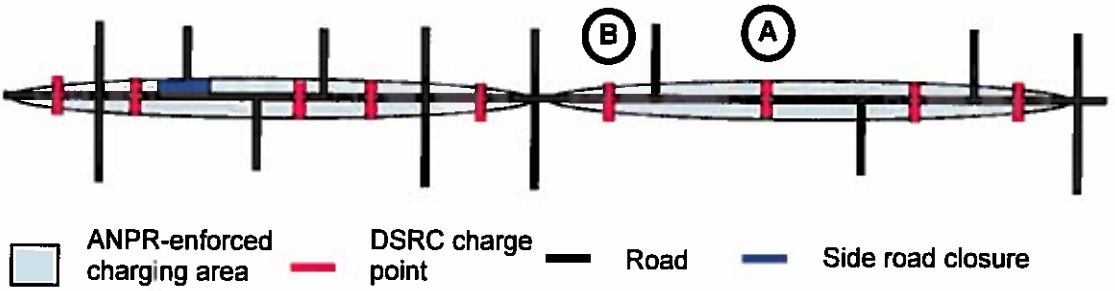


In this scenario:

- Non-equipped vehicles pay a flat rate for journeys in the charging area, enforced using ANPR equipment at the boundary and at key locations within the area;
- Vehicles equipped with a tag pay a smaller amount each time they pass a charge point, perhaps at a higher rate inbound during the morning peak or outbound during the evening peak. The total daily payment would be capped at or below the daily flat rate;
- Vehicles fitted with mobile positioning equipment could pay according the distance they travel within the zone, again capped at the daily flat rate.

For a strategic route, the charge could be a flat rate for use of any congested section, or series of sections, of that route, enforced using camera and ANPR technology, with more flexible payment using a tag and beacon system. This could enable a quasi marginal social cost charge for vehicles using the congested sections of the routes, with lower charges for vehicles using the less congested sections. Vehicles with the appropriate equipment would pay according to the exact distance travelled along any charged route.

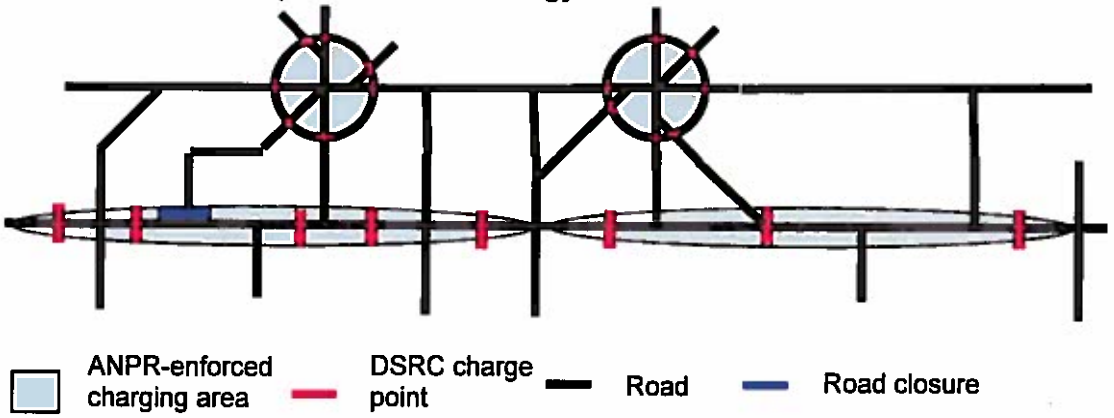
Figure: Model of a possible remote charging zone based on a strategic route



In this simple distance-based scenario:

- Non-equipped vehicles pay a flat rate for journeys in each of the two charging areas, enforced using ANPR equipment along the route;
- Vehicles equipped with a tag would pay a smaller amount each time they pass a charge point, perhaps varying by time of day or direction of travel, and capped at the daily flat rate. Charges could be proportional to the length of the link on which the charge point sits – for example the charge at point A could be double that at point B, reflecting the different distances travelled between junctions;
- Vehicles fitted with mobile positioning equipment could pay according to the precise distance they travel along the route, again capped at the daily flat rate;
- Access from some side roads could be stopped up, reducing the number of entry/exit points from the charged route and minimizing the possibilities for diversion.

Figure: Model of the possible local strategy with a series of remote zones



This example combines the use of charging on strategic routes with zones around key traffic nodes or trip attractors. Diversion from the charged route to the 'free' parallel route is discouraged by charging zones around the two 'town centres' along the parallel route.

Annex 2 - Targeting of workplaces for smart travel demand management plans

This annex describes the initial step in the development of a more objective approach to prioritisation of workplaces for travel planning support.

It is based on 150,000 business sites in Greater London. The objective is to determine how workplaces would be prioritised and which should be targeted.

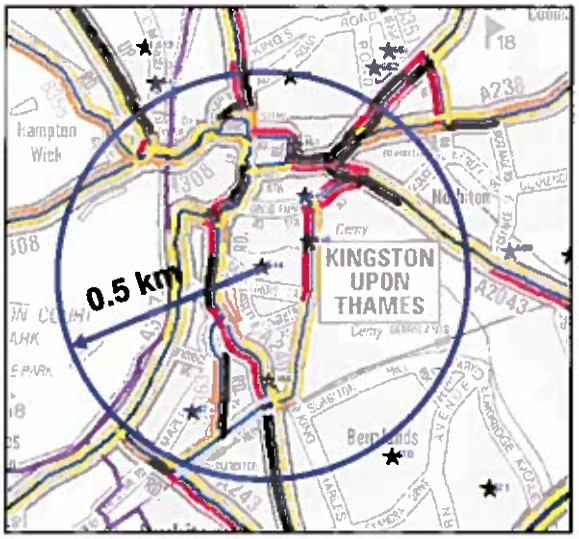
Step 1 – Prioritisation Methodology:

This details a formula for prioritising workplaces, on the basis of a simple 'first order' traffic congestion reduction potential (CRP) compound score. The four factors of workplaces used to determine the score are:

- Employment size;
- Work trip car mode share;
- Work trip distance;
- Average road traffic congestion.

The formula for first order traffic congestion reduction potential is shown below, using the example of Kingston upon Thames.

$$\frac{\text{CRP}}{\text{Minutes}} = \frac{\text{Employment Size} * \text{Car Mode Share} * \text{Trip Distance}}{\text{Vehicle} * \text{KM}} * \frac{\text{Average Congestion Delay}}{\text{Min / (Vehicle} * \text{KM)}}$$



Link ID	Traffic Flow (Veh/Hour)	Link Length (KM)	Link Delay (Min/Veh/KM)
...	...	...	...
5001	500	1.2	2.2
5002	750	0.8	1.4
5003	300	1.5	0.1
5004	600	0.4	0.8
...	...	...	...

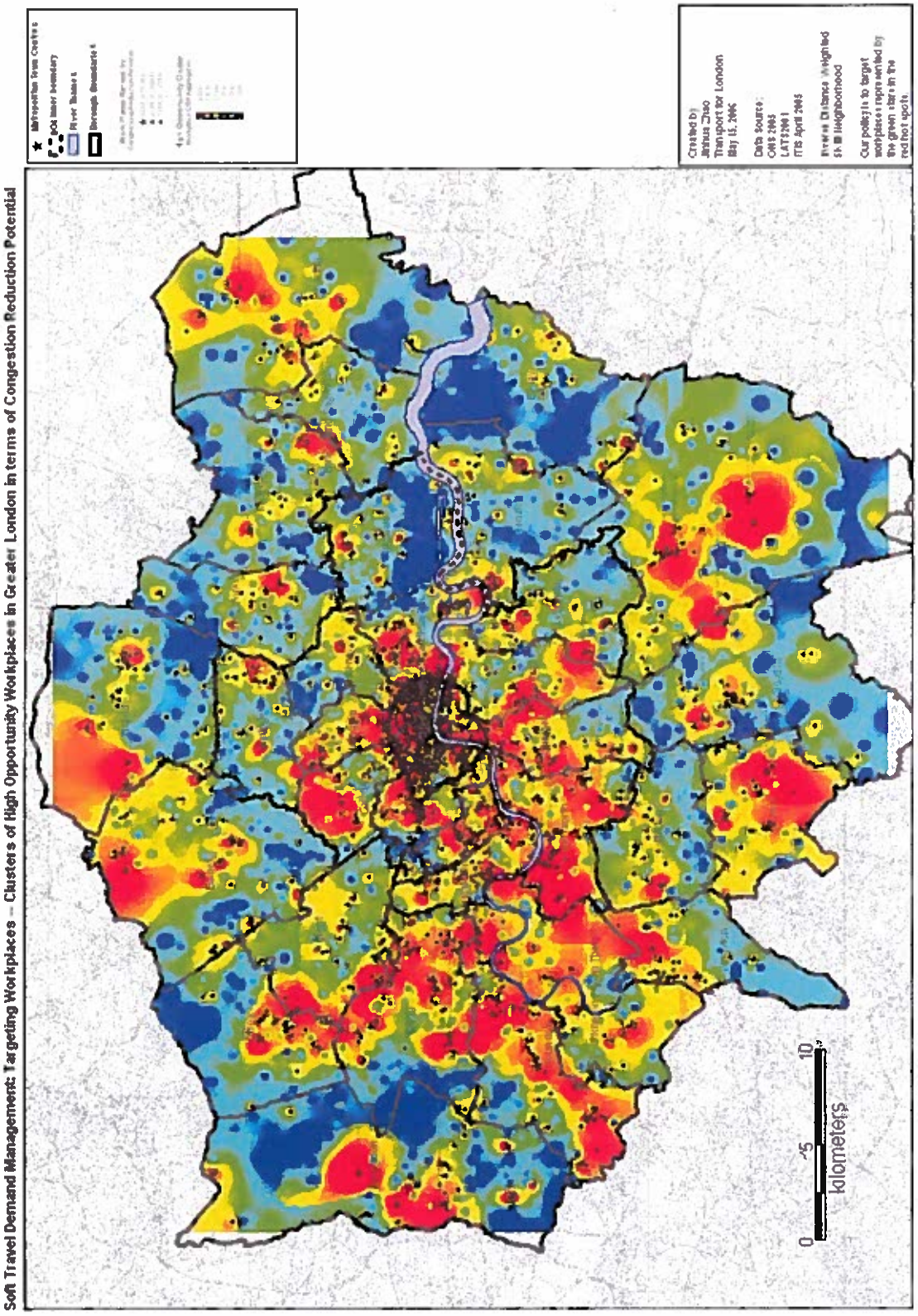
Weighted average delay

$$AvgDelay = \frac{\sum_i Delay_i * Flow_i * Length_i}{\sum_i Flow_i * Length_i}$$

Source: ITIS Data on the Network of Interest (April 2005)

Step 2 – Traffic congestion "heat map":

This is a map illustrating exactly where workplaces are located and where road traffic congestion occurs.



Step 3 – Prioritisation of selected workplaces

Business Name	# Sites	Total Employees	CRP
METROPOLITAN POLICE*	767	47828	183381
J SAINSBURY	146	32428	154811
POST OFFICE LTD	358	26879	129163
BRITISH TELECOMMUNICATIONS PLC	217	22553	103450
SODEXHO LIMITED	537	15145	89383
TESCO STORES PLC	168	21925	78569
MARKS AND SPENCER PLC	79	13743	70355
NATIONAL WESTMINSTER BANK	221	12743	63499
LONDON BOROUGH OF EALING*	153	9239	56188
NEWS INTERNATIONAL NEWSPAPERS	1	3199	50829
GUYS AND ST THOMAS NHS FOUNDATION*	4	8816	48990
BARCLAYS BANK PLC	418	14436	47990
LONDON UNDERGROUND LTD*	265	11501	46908
BBC*	35	17123	43950
DEUTSCH BANK (AG) LONDON	10	6750	42969
DEPARTMENT FOR WORK AND PENSIONS	473	14279	42045
SAFEWAY STORES PLC	43	7033	41747
LONDON BOROUGH OF TOWER HAMLETS*	279	9282	39811
SECURIPLAN PLC	4	5144	39672
HOME OFFICE	56	11808	39259
THE HAMMERSMITH HOSPITALS NHS TRUST*	3	9588	39208
JOHN LEWIS PLC	10	9605	38860
UBS AG	8	5764	37224
KINGS COLLEGE HOSPITAL*	1	5210	37152
LONDON BOROUGH OF HARINGEY*	183	9099	35555
THE ROYAL FREE HOSPITAL*	1	4373	35338
J P MORGAN CHASE BANK NA	15	7159	33808
NETWORK RAIL INFRASTRUCTURE LIMITED	5	6557	33771
COMPASS CONTRACT SERVICES UK LTD	1148	16506	32346
BARNET LONDON BOROUGH COUNCIL*	160	9136	32056

* Denotes Current Top 10 Workplaces (priority given to London Borough's, Metropolitan Police and NHS hospitals)