

19. Intelligent Transport Systems Strategy

19.1 Introduction

Intelligent Transport Systems (ITS) is increasingly playing a major role in supporting the delivery of national and regional goals related to enhanced mobility of people and goods, safer travel, better social inclusion and improvement in air quality. ITS is now widely adopted in some form by authorities to deliver specific objectives linked to these goals and doing so in a cost-effective manner. It has also become vital to Local Authorities (LAs) to adopt ITS to support the delivery of network management duties placed on them by the Traffic Management Act (2004).

The main goals for Warwickshire County Council focus on managing congestion on key local routes, ensuring Warwickshire's transport networks are resistable and adaptable to incidents, improving local air quality, tackling climate change by promoting alternatives to the car and improving accessibility and road safety.

ITS offers a range of services and tools to the Network Manager, operators and the end-user (the public) to make suitable decisions for managing traffic on the network and making travel plans. These services are based on leading edge technology systems that enable the collection of data from roadside sources and then the timely dissemination to users. Therefore, ITS has the effect of 'increasing' capacity on the road network and facilitate the usage of other modes of transport such as public transport. The indirect effect of managing traffic on the roads appropriately and helping to increase use of other modes of transport means that air quality is improved by reduction in pollution levels.

Warwickshire has at present ITS systems deployed that enable the monitoring and control of the network as well as facilitating the provision of information services to the public. Details of the ITS systems implemented in the county are detailed later on in the report.

As ITS continually gains prominence in delivering the overall LA goals, it is treated as a specialist area in its own right when formulating transport plans. This has certainly been the case when LTP2 was developed and now has greater focus within LTP3. Warwickshire have proactively taken steps to consider and deploy ITS in the region which has meant that a strong foundation is already in place. This work has been further supported by the development of a formal ITS Strategy that covers the period of 2007-2012. This strategy will underpin the specific ITS roll-out programme that is proposed as part of this LTP. The underlying theme of the ITS strategy is very much based on modular growth in the county which ensures that the authority maintains the use of innovative technology as and when required.

This document aims to outline the specific plans that Warwickshire County Council have for deployment of ITS in the context of the national and local goals over the period of 2011 – 2016. It also looks at the longer term and provides a forward look to desired ITS implementation in the proceeding period as well for meeting ongoing goals.

The developing strategy described in this report is intended to be a 'living document'. This will enable regular review in conjunction with other relevant policies and ensure that the views of stakeholders are assessed to meet the needs of those organisations and individuals on whom the ITS service delivery has an impact.

19.2 The Policy Context

Over the last 10-15 years, the Government has issued numerous policies, directives and white papers that are drivers for an integrated and sustainable transport system to meet national and regional objectives. A key aspect of these policies is that building new roads to increase capacity

is no longer considered a viable option. Alternative measures to improve network management to improve efficiency and increase capacity had to be considered.

The 1998 Transport White Paper – “A New Deal for Transport: Better for Everyone” and subsequent Transport Act 2000, set out a new integrated transport policy in which the costs of transport, especially to the environment, were recognised. Building new roads was no longer considered an effective or acceptable solution and sustainability was encouraged.

In July 2000 the Government published its 10-Year Plan for Transport setting out a more strategic approach to transport. Subsequently the Government published a White Paper in July 2004 “The Future of Transport” looking at the factors that would shape travel and the transport networks over the next 30 years. More recently, the Traffic Management Act 2004 has placed statutory requirements on the LAs to ensure the appropriate management of the network.

The role that ITS can play in supporting both national and local delivery of road transport objectives and policies has been specifically recognised in the publication of an ITS policy framework for the roads sector by the DfT in 2005 - “ITS - The Policy Framework for the Roads Sector”. The framework identifies a step change in the way the DfT seeks to bring ITS development and deployment together in a transparent and integrated way for road users and travellers.

In establishing the role that ITS can help deliver the transport objectives at the local level, the agenda, and the longer term strategy being developed for ITS in Warwickshire takes account of the Government’s ITS policy framework for the roads sector. Also ITS provides development and implementation across all of the transport sectors in Warwickshire in an integrated and holistic approach.

Table ITS1 below summarises the main national policy documents and directives that have been issued by the Government.

Table ITS1 – Summary of National Transport Polices and Directives

Year	Policy/Directive
1998	Transport White Paper – “A New Deal for Transport: Better for Everyone”
2000	Transport Act 2000
2000	Government 10-Year Plan
2004	White Paper – “The Future of Transport”
2004	Traffic Management Act (TMA2)
2005	ITS – The Policy Framework for the Roads Sector
2008	DfT Draft Guidance
2008	Delivering a Sustainable Transport System (DaSTS)
2009	DfT Final Guidance

The Delivering a Sustainable Transport System (DaSTS) policy that was issued by the Government in November 2008, is a key reference document for developing the ITS strategy to be contained within LTP3. It sets out five key goals which are:

- Improving economic competitiveness and growth;
- Addressing issues related to emissions of CO2 and other greenhouse gases;
- Enhancing safety, security and health;
- Improving quality of life;
- Enabling equality of opportunity to people.

It is against the policy background that an agenda and strategy for ITS within Warwickshire has been developed and is refreshed on a ongoing basis. To date the County Council has developed

the following to enable it to meet the overall national and regional transport objectives set by the Government.

Table ITS2: Summary of Warwickshire CC Transport Documents

Year	Policy/Directive
2001	Warwickshire County Council LTP1
2006	Warwickshire County Council LTP2
2007	ITS Strategy 2007-2012

The County Council’s ongoing ITS Strategy delivers the key objectives outlined below that are linked to DaSTS goals:

Table ITS3: Specific WCC Objectives Linked to DaSTS Goals

DaSTS Goal					
	Economic Competitiveness and Growth	Emissions Issues	Safety, Security and Health	Improving Quality of Life	Equality of Opportunity
WCC Objectives	<ul style="list-style-type: none"> To maintain and enhance the vitality and prosperity of Warwickshire To encourage the integration of transport, both in terms of policy planning and the physical interchange of modes To reduce congestion on key roads and improve journey times 	<ul style="list-style-type: none"> To support other local transport policies aimed at encouraging a shift from private to sustainable modes of travel To reduce the impact of transport on people and the [built and natural] environment and improve the journey experience of transport users 	<ul style="list-style-type: none"> To improve the safety of the local transport network To improve conditions of for pedestrians and cyclists Incident management and contingency planning 	<ul style="list-style-type: none"> To improve the operation, efficiency and effectiveness of the local transport network To improve the quality and reliability of travel information Consideration of the needs of all road users 	<ul style="list-style-type: none"> To identify and allocate funding for investment in transport schemes To promote greater equality of opportunity for all citizens in order to promote a fairer, more inclusive society To seek reliable and efficient transport networks which will help promote full employment and a strong, sustainable local and sub-regional economy

19.3 ITS Links to Wider Corporate Objectives and stakeholders

The delivery of ITS supports the specific local aims and priorities of the authority, as defined in the overall corporate strategy developed by the Council.

ITS plays a key role in helping to deliver these priorities. As part of LTP3 some of the key transportation areas of focus include:

- Significantly enhance the quality of public transport services in the area and increase bus patronage. Achieving this goal will support the objectives of keeping congestion to a manageable level and improving accessibility to the transport system for the public. Therefore, a strong focus is planned on developing ITS to support these areas over the LTP period.
- Improve the systems and processes in place to adequately manage congestion, incidents and overall traffic flow on the network which also leads to more safer roads for the public.
- Managing emissions levels at key points on the urban and inter-urban network and suitably handle demand management – especially in tourist areas such as Stratford-Upon-Avon and Warwick.

To ensure that the stated goals related to network management are effectively achieved, there is a requirement to interface with other stakeholders. This includes the Highways Agency, neighbouring LAs and the Police. Warwickshire has established a degree of links to these bodies which have worked well thus far. However, it is recognised that further work can be done in this area in particularly in sharing ITS services and data to ensure holistic management of traffic on the network. It is planned via the ITS Strategy to strengthen this area via creation of systems interfaces and data sharing as well as operational processes.

19.4 Overview of the Current Situation

Warwickshire has a long and successful association with ITS demonstrated by participating in the UTM 29 demonstrator programme in Stratford-Upon-Avon as well having a range of ITS services related to traffic control and management and travel information provision to the public. These implementations have supported meeting the wide transportation objectives for the county.

Going down to next level of detail for the council's transport objectives the following can be stated:

- *Consideration of the needs of all road users;*
- *Gathering information and meeting information needs;*
- *Incident management and contingency planning;*
- *Dealing with traffic growth in the region.*

Warwickshire has adopted the **Monitor, Control and Inform** approach when considering and deploying ITS services and tools to deliver the above objectives.

19.4.1 Monitor

This category of ITS tools relate to systems that are in place that allow the control centre to obtain real-time network data from various roadside sources that informs it as to what the current situation is regarding traffic flow, congestion, incidents, air quality on the road network and also car park occupancy levels. This is for both urban and inter-urban roads. Systems include CCTV cameras, sensors/detectors and journey time measurement engines. On an operations and maintenance level systems in this category relate to the analysis and fault management applications for maintaining the actual ITS services.

19.4.2 Control

ITS applications that fall under this category are concerned with the implementation of operational decisions to manage and control the traffic on the network. Applicable ITS services

include Urban Traffic management Control (UTMC) for overall management of ITS systems, common database (CDB) for data management, signalised junctions, priority to public transport at junctions, demand management, diversions and alternative routes advice via Vehicle Management Systems (VMS) systems, operations decision making support tools for implementing traffic plans for specific scenarios.

Warwickshire have implemented a second Common Database (CDB) system to enable remote document management (for example, access to engineering drawings) and also a web based mapping fault reporting system called Voyager.

19.4.3 Inform

A core part of the county's ITS strategy is to provide reliable and timely traffic and travel information that enables users to make informed decisions before and during their journeys. Services in this category are usually referred to as Traffic and Travel Information (TTI) services and include dedicated websites that provide specific information, RTPI for public transport users, air quality levels, car park information for visitors, VMS signs at strategic points on the network and information to mobile devices via SMS or mobile web alerts.

The ITS systems deployed to date have gone a reasonable way towards delivering the overall transport objectives set by the Government and at local network level for LTP2. By adopting the Monitor, Control and Inform approach the tools and applications implemented has enabled:

- Better congestion management;
- Improved accessibility:
 - To the road network and public transport via real-time information;
 - Pedestrian mobility in key areas by providing signals and crossing facilities;
- Improved road safety due to enhanced incident management and congestion control at key points;
- Control of emissions by monitoring air quality and setting traffic plans accordingly to manage emissions levels

Table ITS4 below outlines the county's ITS systems that fall into each category and an asset list for systems currently deployed in the county. The roll-out of these systems has been in part been supported during the LTP2 programme.

Table ITS4: Current ITS Equipment

Monitor	Qty	Control	Qty	Inform	Qty
RMS	156	UTMC + CDB	1 + 2	Car Park Management Systems	33
ANPR	7	Signals (UTC) (MOVA)	93 (48) (14)	VMS	3
		Pedestrian Crossings (UTC – inclusive of types below) (Puffin) (Toucan) (Pelican) (Pegasus)	199 (37) (94) (35) (69) (1)		
CCTV	3	Bus Priority	4	RTPI	13
AQM	4	Car Park Management Systems	33	Web/Mobile TTI	Car Park Management data to public Roadworks Information (ELGIN)
		Speed enforcement cameras	37		
		Red light enforcement cameras	9		
		Access Control – Rising Bollards	9		

Table ITS5 shows the ITS roll-out plan as defined under LTP2 and the level of achievement of the aspirations that were set. There are some factors to consider when assessing progress made to date against the LTP2 programme - at the time of development and inception of LTP2, the County Council did not have a formal ITS Strategy in place as this was undertaken in late 2007. Since the development of a strategy a sharper focus has been achieved by the ITS group in terms of ITS deployments. Therefore, a certain degree of lag in implementation may have occurred when compared against the original programme.

Also, a degree of evaluation of priorities has taken place in light of the funds and resources currently available which have influenced certain implementations. Another important consideration is the dependency on local Borough and District council organisations to roll-out ITS to a wider spatial area and share assets. Due to a lack of an ITS Strategy at the outset, this task proved to be difficult in the early stages of the LTP2 programme. However, this was recognised and priority was given to developing a strategy that is refreshed at set intervals. As a result of this there is wide coordination between individual authorities which has begun to aid in more productive ITS deployments and shared procurement which leads to efficiencies.

Table ITS5: LTP2 ITS Roll-Out Programme and Achievements

Activity	Spatial Area	2005/6	2006/7	2007/8	2008/9	2009/10	LTP3	Achieved
Validate UTC sites	County	X	X		X	X		Yes
Appropriate sites to be on the fault monitoring system	County	X	X	X				Yes
Review condition and performance of signals	County	X	X		X	X		Yes
Automatically monitoring journey times on specific routes	County		X	X	X	X		No
Development of automatic traffic management strategies	Stratford	X						Partial
	Leamington / Warwick		X	X				Partial
	Nuneaton			X	X			No
	Rugby				X	X		Partial
Car park information	Stratford	X						Yes
	Leamington / Warwick			X				Yes
	Rugby				X			Yes
Variable message signs	Stratford	X						Yes
	Rest of County			X	X	X		No
Real time passenger information	Bedworth					X		Yes - ongoing
	Leamington / Warwick			X				Yes - ongoing
	Rest of County						X	Proposed
Bus priority at signals	Nuneaton	X	X					Yes
	Leamington / Warwick			X				Yes
	Stratford	X						Yes
CCTV	County	X	X	X				No
Website	Location of all traffic signals	X						Yes
	Car park information	X						Yes
	Congestion		X					No
	Incidents and roadworks		X					Yes
	Bus information		X					Partial
	Air quality		X					Yes
	CCTV			X	X	X	X	

19.5 Challenges and Opportunities

The county of Warwickshire is a major attractor of traffic as well as having strategic routes to other areas. The traffic problems are therefore created by a variety of factors including:

- Movement of traffic around centres;
- Movement of traffic between centres;

- Movement of traffic into the area on motorways and trunk roads or non-trunk roads;
- The two road networks are managed by different authorities: the Highways Agency is responsible for all motorways and trunk roads and the Local Authority responsible for the non-trunk road network. The management of the traffic needs to be seamless and better information dissemination is required to marry the systems together;
- Traffic problems and congestion on the Highways Agency network have an impact on the Local Authority network and vice versa.

Despite a reasonable level of ITS deployment in the county, it still faces a number of challenges to adequately meet mandatory requirements placed on it by the TMA 2004 as well as the objectives set-out in the various policies outlined earlier in the document. The main challenges presented are:

- High revenue costs - includes maintenance, communications and power;
- Fault & performance monitoring / reporting is limited and not sophisticated enough;
- Access to live information from disparate and third party systems requires further development – ANPR, CCTV, incident detection and roadworks;
- The various District/Borough Councils have ownership of their individual car parks and CCTV system – better collaboration for sharing systems and data required to improve network management;
- Lack of holistic data available – interface to HA and neighbouring other authorities is limited;
- Resources – sufficient number of Officers to focus on ITS roll-out as per the strategy defined is a continual problem.

Table ITS6 below summarises the challenges faced by the authority and link them to each ITS strategy area while also identifying the spatial impact.

Table ITS6: LTP3 Challenges & Priorities by Spatial Area

LTP3 Challenges and Priorities	Relevance to spatial area				
	Main urban area	Other urban area	Villages & rural areas	Inter-urban	Countywide
Accessibility					
Increase use of public transport – mainly bus services					✓
Real-time information for journey planning					✓
Improve conditions for pedestrians and cyclists	✓	✓	✓		
Traffic and Congestion Management					
Improve the operation, safety, efficiency and effectiveness of the local transport network					✓
Improving public transport to create modal shift and have mass transit system usage					✓
Emissions and Air Quality Management					
Improve air quality by reducing CO2 and other greenhouse gas emissions	✓	✓			
Improve the environment by managing adverse impacts caused by transport incidents	✓	✓			
Safety					
Improve incident management and contingency planning	✓	✓		✓	

Facilities for pedestrians to maintain mobility around network	✓	✓	✓		
Improve traffic management at identified high-risk points on network	✓	✓			
Information Management					
Access to holistic real-time information for network management					✓
Accurate dissemination of RTI to travelling public for journey planning					✓

19.6 The Strategy

Policy ITS1: Optimising existing assets

The County Council will seek to increase the benefits from ITS existing systems.

The ITS strategy outlines some key priorities that it wishes to deliver over the next short/medium term. Due to a steady deployment of ITS services over the preceding five years, it is necessary to take stock and rationalise the ITS assets and ensure that they are exploited fully so as to get maximum return on investment. Therefore, a significant amount of the initial intended work is centred around optimising the current assets and developing an ITS architecture. Using this work as a base it will be feasible to seamlessly introduce further ITS services concentrating on integration with other stakeholders and sharing network data, supporting public transport services and undertaking adequate demand management.

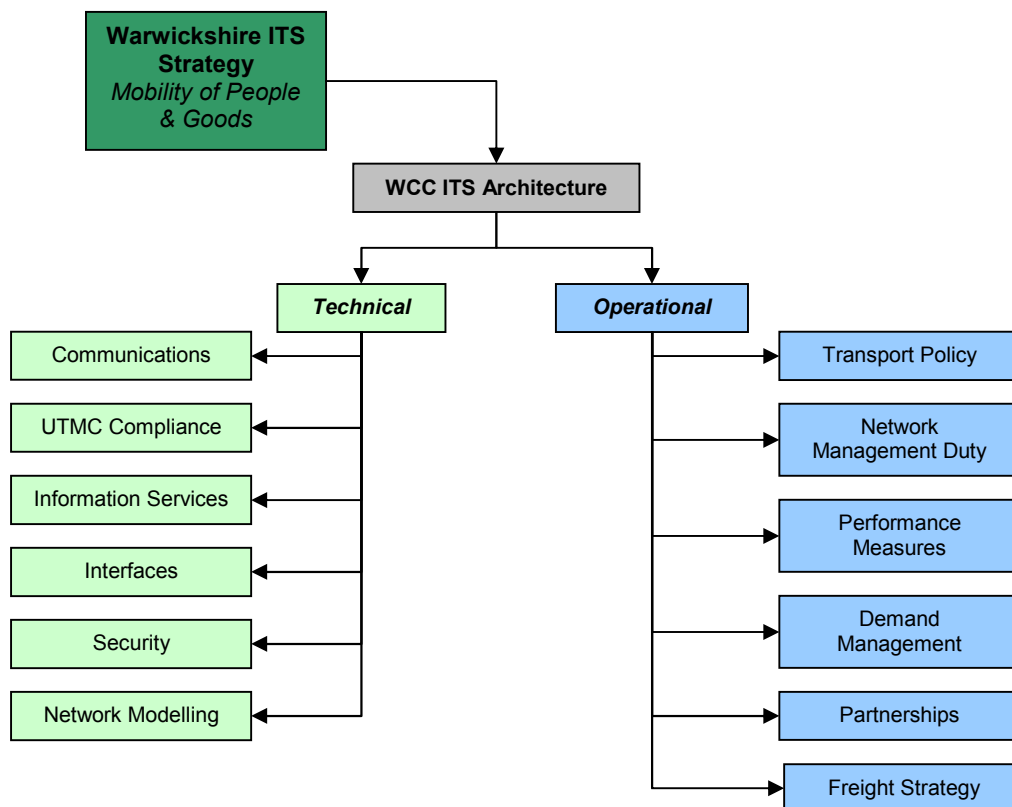
A large part of current ITS deployment in Warwickshire is as a result of a number of years of investment via LTP funding amongst other sources and participation in the UTMC programme. However, it must be acknowledged that whilst this deployment has met the county's requirements to date, the overall ITS system constitutes a number of separate components that now requires a greater level of integration and development to fully realise the benefits of the **Monitor, Control and Inform** approach.

To maximise the benefits from the current systems and future development it is important that Warwickshire continue with their forward thinking approach to ITS deployment and realise the benefits they wish to achieve. To enable this the initial steps intended to be taken are:

- Refresh the existing ITS Strategy and cover the period of LTP3 as a minimum and;
- Developing a robust ITS Architecture that will deliver the 'living' strategy.

An example of how this may be approached is illustrated in Fig ITS1:

Fig. ITS1: ITS Strategy: Technical and Operational Components



The resulting ITS Architecture will encompass the technical and operational requirements and ensure that the subsequent ITS systems are:

- Planned logically;
- Meets the required performance levels;
- Can be economically managed and maintained;
- Can be easily expanded when required;
- Is open standards for easy integration of new systems;

Finance is a key element to successful ITS deployment and the successful use of an ITS Architecture will enable the council to:

- Procure from an open market;
- Benefit from economies of scale;
- Plan investment more effectively;
- Avoid unforeseen additional costs.

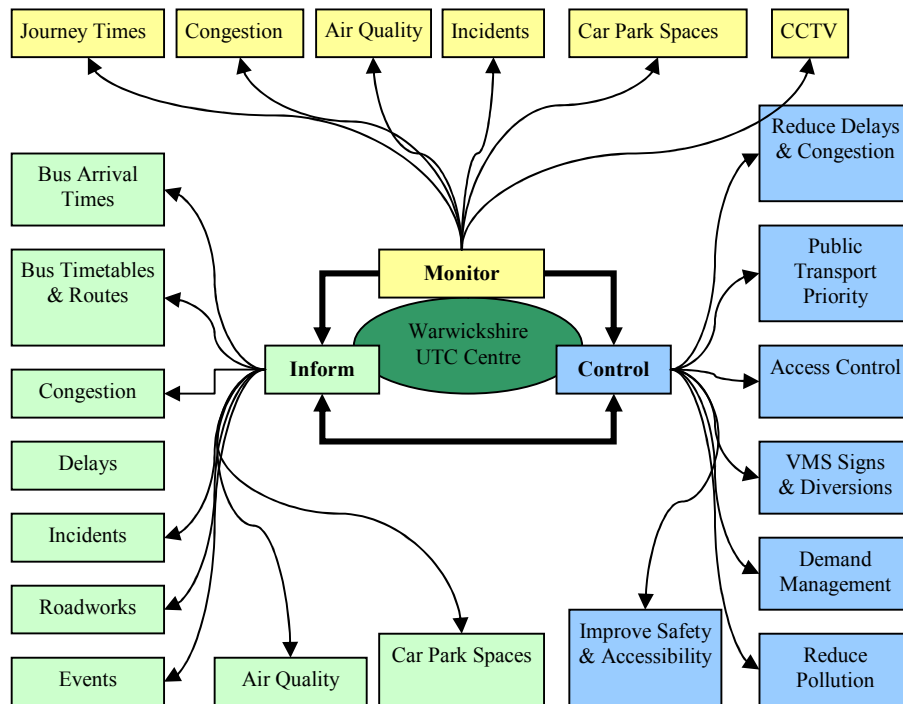
Policy ITS2: Development of future ITS systems

The County Council will seek to deploy appropriate new systems made possible through further development in technology.

The requirements of the Local Transport Plan and the Traffic Management Act require and emphasise the need to monitor and control the network and to provide comprehensive travel information. To meet these requirements a number of different elements are required to provide

a system that will enable better management of traffic thereby reducing delays and congestion as illustrated in Fig ITS2.

Fig. ITS2: Monitor, Control and Inform Related ITS Systems



To deliver on the principal transport objectives set-out by the authority, it is planned that ITS systems will be deployed over the course of the LTP3 programme and would be incorporated by the ITS architecture that would be developed. Some of these systems already exist and will be expanded on, or completely new deployments will be undertaken.

Policy ITS3: Consideration of the needs of all road users

In the development of the road network the County Council will plan the use of the road network to balance the competing needs of all road users and will seek to achieve safety and environmental polices.

Policy ITS3 will be delivered via:

- VMS deployment to improve information services to drivers;
- Journey time ANPR cameras to provide accurate and reliable travel information;
- An inclusive demand responsive traffic signal strategy that meets the requirements of all road users including freight, public transport, cyclists and pedestrians;
- To meet the council's network management duty requirements, performance measures, evidence gathering and reporting facilities.

Policy ITS4: Gathering information and meeting information needs

The County Council will give priority to developing system that involves people making informed choices and understanding why they must comply with controls measures and restrictions.

Policy ITS4 will be delivered via:

- Improved data gathering from the deployment of UTMC compliant devices across strategic routes and transport interchange points;
- Operational information shared across strategic partners and stakeholders via internet client and UTMC common database facility;
- Public traffic and travel information delivered via web based services across multiple platforms and devices targeted to meet all user need requirements.

Policy ITS5: Incident management and contingency planning

The County Council will seek to implement systems that automatically select the appropriate strategies to be deployed to manage the road network.

Policy ITS5 will be delivered via:

- Development of strategic diversion routes and the ability to provide adequate signs and usage information. This will be facilitated by closer links to the Highways Agency and the Police;
- Ability to manage planned and unplanned incidents and events that leads to the development and use of automatic and manually invoked strategies that are available at all times.

Policy ITS6: Dealing with traffic growth

The County Council will seek to ensure that the systems that are deployed benefit all road users in a resilient and cost effective manner.

Policy ITS6 will help enable the County Council to have:

- the ability to measure and manage the network with a greater degree of accuracy than present;
- the ability to forecast traffic growth with greater accuracy and the ability to react to traffic growth provided by a dynamic UTMC compliant network management system;

Policy ITS7: Supporting public transport services

The County Council will seek to work in partnership with the bus operators to provide effective and efficient services.

There is an overall desire within the authority and bus operators in the area to enhance the quality of bus services provisioned to the public via journey time reliability and ensuring punctuality of service. This covers all of the individual districts and boroughs in the County. Specific routes are listed in the action plan.

The ITS Group will be looking to support the meeting of objectives in this area by developing and/or supporting Real Time Passenger Information (RTPI) and Bus Priority measures. These two ITS systems already exist in certain areas of Warwickshire (see Table x above) and the plan is to expand the services to cover a much wider area in the County. The key to gaining an improved service in public transport will require commitment from fleet operators to provide real time bus location data from a vehicle location system. Provision of this data will allow accurate real time information and bus priority whilst maintaining network stability.

Policy ITS8: Traffic signal junctions and pedestrian crossings

The County Council will investigate the need for traffic signal junction and controlled pedestrian crossing facilities based on the County Council's policy (see policy appended to this strategy).

The traditional realm of the traffic signal junction, previously largely limited to junctions in urban areas, has extended to rural roundabouts that were previously thought to provide greater capacity, but which have subsequently suffered from congestion and deteriorating road safety. Priority junctions in more rural locations, where higher approach speeds exist, have also been found to benefit from a system that allows conflicting traffic to be segregated more effectively. In Warwickshire as elsewhere, the volume of traffic continues to grow and it has become increasingly important to provide a safe environment for pedestrians and cyclists. The result is that new pedestrian and cycle crossing facilities may be appropriate now that were not considered necessary at the time a junction was first constructed.

Warwickshire County Council guidance on providing controlled crossings, as opposed to other non-controlled facilities such as pedestrian refuges, uses the adjustable PV^2 assessment criterion, which takes into account the age and ability of pedestrians crossing the road, the types of vehicles using the road, the length of time pedestrians have to wait to cross the road, the width of the road and the pedestrian injury accident record at the site.

In addition to the above procedure the following approaches for the provision of crossings will coexist with other initiatives.

- **Safer Routes to School** – where the aim is to encourage more children to walk and/or cycle to school with less use of the car.
- **Casualty Reduction Schemes** – where the rate of return from likely casualty savings is sufficient to justify the expenditure on a crossing.
- **Developer Funded Schemes** – where crossing facilities are required to mitigate anticipated traffic impact of developments and/or anticipated increases in pedestrian flows.
- **Facilities installed on Key Pedestrian or Cycle Corridors** – where crossing facilities may be considered as part of a package of measures on a strategic walking and/or cycling corridor.
- **Facilities funded by Area Committee Delegated Budget** – this is to address local priorities as opposed to strategic ones i.e. where a scheme does not satisfy the criteria for funding from the Integrated Transport capital programme, but notwithstanding this, there are very special local circumstances where it would be appropriate to provide a crossing. In this case the decision to fund a crossing must be informed by a consideration of the whole-life costs of the crossing including the likely annual revenue costs of maintenance and energy.

The following priorities have been set for the management of traffic signals and pedestrian crossings:

- Review and develop the operation and maintenance regime seeking to reduce or keep costs at a cost effective level.
- Develop strategies for the improved monitoring and operation of traffic signal junctions and traffic control techniques.

Capital expenditure will be directed at improving the performance of systems, replacing older, less efficient equipment with more modern alternatives. Examples could include improving vehicle detection, replacing Pelican crossings with Puffin crossings, introducing MOVA or SCOOT to optimise the operation of traffic signals or altering the phase timings to reduce delay on the main road.

Opportunities will be sought to recover, repair and reuse equipment, and to recycle equipment that is beyond economic repair. The current procurement strategy will be reviewed in the light of this work, with opportunities sought to utilise equipment with longer life expectancy and reduced energy consumption.

The majority of traffic signal equipment is continuously monitored by electronic systems like RMS and UTC, and a programme of routine inspections by County Council's maintenance contractor ensures sites are regularly checked to verify their safe and efficient operation. RMS and UTC can also be used by operators to confirm the accuracy of faults reported from members of the public before passing the fault to the maintenance contractor. In addition, operators are able to adjust the signal timings remotely, saving unnecessary journeys to site.

The requirement of the Traffic Management Act in respect of the expeditious movement of traffic is a priority for both traffic control and information systems. The effective management of these systems requires accurate information, and it is the ITS tools available for monitoring that make this information available. Developing these monitoring systems will therefore be a priority.

Developing ITS by means of UTMC compatibility will enable the County Council to reduce costs by procuring equipment more competitively. UTMC equipment, which is interchangeable and available from multiple suppliers, will ensure that the County Council is not locked into proprietary solutions. In addition, the interoperability of UTMC systems will enable the County Council to make the most effective use of modern telecommunications by connecting multiple systems together.

19.7 Action Plan

Table ITS7: Strategy Action Plan by Spatial Area

Policies	Action	Timescale
Policy ITS1	Refresh ITS Strategy annually to cover 2011-2016	Short/medium
	Network equipment and asset audit	Short
	Full validation and system maintenance of traffic signals and pedestrian crossings systems	Short/medium
	Rationalise communications systems to ensure sharing of assets within local networks and introduce cost efficiencies	Short
Policy ITS7	Introduce bus priority at key bus routes – Services 4, 48, X17, 16, 19, G1 and 28	Short/medium
	Introduce RTPI for bus routes - Services 4, 48, X17, 16, 19, G1 and 28	Short/medium
Policy ITS4	Develop robust interfaces with other road related authorities to share network data, i.e. HA, Police and neighboring authorities	Short
Policy ITS3	Wider deployment of ANPR systems for journey time management, enforcement of speeding or bus line violations	Short
Policy ITS3	Moving vehicle enforcement (bus lanes, yellow box junctions, one-way street)	Medium
Policy ITS4	Develop CCTV and ANPR links with Warwickshire Police and District/Borough Councils	Short
	Relocate to more suitable traffic control centre that enables integrated working of staff and systems	Short
Policy ITS3	Implement demand responsive traffic signal strategy for Stratford-Upon-Avon, Leamington, Warwick, Nuneaton and Rugby	Short
	Develop and implement car park strategy to improve the efficient use of major car parks in Nuneaton	Short
Policy ITS5	Implement demand responsive traffic strategy for M6 Junction 3	Short
Policy ITS3	Implement VMS on A444 corridor from Ricoh Arena to Nuneaton	Short
	Integrate RTI and floating vehicle data for journey time and route management system	Medium
Policy ITS4	Expand rationalised communications infrastructure and incorporate onto corporate WAN	Medium
Policy ITS5	Integrate road works system to UTMC CDB for Traffic and Travel Information services and VMS displays	Medium
Policy ITS5	Integrate weather detection and monitoring system to UTMC CDB for Traffic and Travel Information services and VMS displays	Medium
	Introduce emergency planning systems remote access for staff to undertake network management	Medium
	Introduce real-time information services delivery to mobile devices relating to planned journeys	Short/medium
	Implement TTI services at key locations, rail and bus stations, shopping centres by provision of display boards and kiosks	Short/medium
	Introduce smartcard and e-ticketing service	Long

19.8 Targets and Monitoring

National Indicators

NI167: Congestion (Average journey time per mile during the morning peak)

NI178: Bus services running on time

Local Indicators

There are no Warwickshire Local indicators that are directly relevant to this strategy.

Monitoring the delivery of the actions outlined in the Action Plan above will be an important part of the management and control process. Progress against the identified actions and standards will be reviewed on a regular basis (at least annually) to ensure that the Action Plan is achieving the desired outcomes.

ITS Strategy: Appendix A

Policy for the Provision of Pedestrian Crossings and Pedestrian/Cycle Facilities at Traffic Signal Junctions

1. Introduction

This policy explains how requests for new pedestrian crossings will be considered. This document must be read in conjunction with the Technical Procedure.

The demand for new crossings far exceeds the County Council's ability to provide funding. For this reason we will compare the need at requested sites, so that decisions can be made in a consistent way and best value obtained from the available resources.

2. Safety

We will consider safety first, so we will only assess the need for crossings at locations where the appropriate design standards for safety can be met. In exceptional cases where these cannot be met, the Head of Transport for Warwickshire may agree to a departure from standard if a case can be made to demonstrate that safety would not be compromised.

3. How we will assess the need for a pedestrian crossing

We will assess the level of need for a crossing by:-

- 3.1 Measuring the degree of conflict between pedestrians crossing the road and the two-way traffic flow and
- 3.2 We will also take into account the following factors
 - the age and ability of pedestrians;
 - the suppressed demand;
 - the different types of vehicles in the flow of traffic;
 - the length of time pedestrians have to wait to cross;
 - the width of the road;
 - the speed of traffic;
 - the pedestrian injury accident record at the site.

However, all this depends upon having the necessary resources initially to implement the scheme and then to maintain the installation.

4. The survey

If the safety requirements for a crossing can be satisfied then we will measure the degree of conflict between the traffic and pedestrians by carrying out a 12-hour survey which will count:-

- the number of pedestrians crossing in an hour (P)
- the flow of vehicles in both directions in an hour (V)

Our assessment will be based on the average of the four busiest hours in the day (between 7am and 7pm). When the survey is carried out, the pedestrians will be classified by their age and ability. Vehicles will be classified by vehicle type so that we

can take into account the differences between cars, heavy goods vehicles, buses, motorcycles and pedal cycles.

Where it is evident that a significant increase in pedestrian access to services will result from the provision of a crossing, we will seek to establish suppressed pedestrian demand at the location and add these estimated figures to the actual measured pedestrian figures obtained by the survey.

We define “suppressed pedestrian demand” as the estimated additional number of pedestrian journeys likely to be generated as a consequence of a crossing being provided. We will estimate this through an appraisal of local circumstances and the potential increased access to services.

5. The appropriate type of crossing

We will use the information gathered in the survey and the various factors listed in 3.2 to determine whether a crossing should be provided and which type of crossing (if any) is appropriate at the site.

There are three main types of crossing - refuges, Zebra crossings and signal-controlled crossings (Puffin, Toucan and Pegasus). The type of crossing to be provided will also be subject to engineering considerations (e.g. there must be sufficient road width to install a refuge).

To justify a signal-controlled crossing it will be necessary to demonstrate a much higher level of need than a refuge. We will consider a Zebra crossing at the intermediate level of need.

6. Upgrading a Zebra crossing to a signal-controlled crossing

Generally the pedestrian accident rates at Zebra and signal-controlled crossings are low. However, a Zebra crossing may be considered for conversion to a signal-controlled crossing at certain locations where it can be justified that a poor pedestrian injury record is likely to be improved.

We may also consider upgrading a Zebra crossing to a signal-controlled crossing as part of a wider traffic management scheme linked to the County Council’s Urban Traffic Control System in appropriate circumstances.

7. Provision of pedestrian/cycle facilities at traffic signal junction

We will investigate the need for pedestrian/cycle facilities at an existing traffic signal junction in a similar way to a stand-alone pedestrian crossing. However, providing a pedestrian/cycle facility will have the effect of reducing the capacity of the traffic signal junction and at busy junction this can result in long queues of vehicles. For this reason each junction will be considered individually.

8. The priority list

We will include any justified crossings on a list, ranked by the level of need for future funding. The list will be used annually to inform the selection of schemes to be included in the County Council’s Integrated Transport capital programme.

9. Other circumstances where crossings will be provided or upgraded

This policy describes the way in which we will consider requests for new crossings based on surveys of existing pedestrian and vehicle flows. The following approaches to the provision of crossings in the County Council's Local Transport Plan will coexist with the method of justifying schemes in this policy.

- **Safer Routes to School** – where the aim is to encourage more children to walk and/or cycle to school with less dependence on the use of the car.
- **Casualty Reduction Schemes** – where the rate of return from likely casualty savings is sufficient to justify the expenditure on a crossing.
- **Developer Funded Schemes** – where crossing facilities are required to mitigate anticipated traffic impact of developments and/or anticipated increases in pedestrian flows.
- **Facilities installed on Key Pedestrian or Cycle Corridors** – where crossing facilities may be considered as part of a package of measures on a strategic walking and/or cycling corridor.
- **Facilities funded by Area Committee Delegated Budget or other budget intended to address local priorities** – this is to address local priorities as opposed to strategic ones i.e. where a scheme does not satisfy the criteria for funding from the Integrated Transport capital programme, but notwithstanding this, there are very special local circumstances where it would be appropriate to provide a crossing. In this case the decision to fund a crossing must be informed by a consideration of the whole-life costs of the crossing including the likely annual revenue costs of maintenance and energy.

10. Removal of pedestrian crossings

It is possible that in the future traffic volumes and/or pedestrian flows may reduce or other factors may change which may require the removal of a crossing. In this case, a risk assessment and public consultation will be carried out to inform the action to be taken. However, when the crossing is due for an upgrade the evaluation for its need will always be carried out.

The Technical Procedure

A procedure covering the technical details of the operation of this policy is maintained by the County Council's Head of Transport for Warwickshire.

The content of this procedure may be reviewed and updated by the Head of Transport for Warwickshire, but it is to be expected that the same technical process will be used to assess all schemes during an annual funding cycle.

This procedure covers the technical details of operation of the County Council's Policy for the Provision of Pedestrian Crossings and Pedestrian Facility at Traffic Signal Junctions.

Survey

The survey for obtaining values of P and V as described in the Policy shall take place along the stretch of road approximately 50 metres either side of the requested location. Should the weather deteriorate during the survey period, than arrangements will be made to repeat the survey on another day.

When pedestrian surveys are carried out, the pedestrians will be classified by their age and an indication of their ability.

Determining the level of need for a pedestrian crossing

The level of need will be determined by calculating the degree of conflict between pedestrians crossing the road and the two-way traffic flow as described in the paragraphs below.

The degree of conflict used will be **the adjusted PV² value** calculated as follows.

P_{mod} = the number of pedestrians crossing in an hour (P) weighted by age and ability in accordance with the table below

type of pedestrian	multiplying factor
Child <16	1.25
Adult	1
Elderly	2
Disabled	3

The multiplying factor for cyclist is 1 and for equestrian is 3.

V_{mod} = the flow of traffic in passenger car units (PCUs) in an hour calculated from the survey data using the weightings in the table below

type of vehicle	multiplying factor
Cars	1
Light goods vehicles	2
Bus	2
Heavy goods vehicles	2.5
Motorcycles	1*
Pedal cycles	1*

* Since this impacts on pedestrians in the same way as cars, the PCUs are up-rated to reflect this.

For each hour between 7am and 7pm the weighted **P_{mod} V_{mod}²** value is calculated by multiplying the weighted number of pedestrians by the weighted number of vehicles squared, i.e. $P_{mod} \times V_{mod} \times V_{mod}$.

The **P_{mod} V_{mod}²** figures are ranked in order and the top four figures are divided by four to obtain the **average P_{mod} V_{mod}²** value (representing the four busiest hours of the day).

The **adjusted PV²** value is obtained by multiplying the **average P_{mod} V_{mod}²** value by the pedestrian waiting time factor (T), width of road factor (W), speed limit factor (S) and accident record factor (A). Hence the **adjusted PV² value** is calculated as follows:

adjusted PV² = average $P_{mod} V_{mod}^2$ value $\times T \times W \times S \times A$ using the factors T, W, S & A from the paragraphs below.

Waiting Time Factor (T)

The Average Waiting Time will be derived by the engineer attempting to cross the road at five random times during the known peak traffic period.

The waiting time factor (T) will then be taken from table xx below.

Average Waiting Time	Waiting Time Factor (W)
Less than or equal to 20 seconds	1
21 seconds to 30 seconds	1.2
31 seconds to 40 seconds	1.25
More than 40 seconds	1.3

Width of Road Factor (W)

This factor considers the standard road width to be 7.3 metres. The Road Width Factor is obtained by dividing the road width by 7.3m i.e. ($\frac{\text{road width}}{7.3}$).

Speed Limit Factor (S)

The Speed Limit Factor (S) is based on the speed limit and will be taken from the table below.

Speed limit of the road	Speed Limit Factor (S)
20 mph speed limit	0.8
30 mph speed limit	1
40 mph speed limit	1.2
50 mph speed limit	1.3

Accident Record Factor (A)

The pedestrian injury accident record at a site is taken into account in the following formula:

$$A = 1 + \frac{N}{10}$$

where N is the number of pedestrian injury accidents in the previous three years.

Estimating suppressed pedestrian demand

Suppressed pedestrian demand will be estimated taking into account the potential for generating new pedestrian journeys of 20 minutes or less.

Criteria for justifying pedestrian crossings

To justify a **refuge**, the adjusted PV^2 value should be greater than 0.4×10^8 , but the width of road needs to be at least 7.8m.

To justify a **zebra crossing**, the adjusted PV^2 value should be greater than 0.6×10^8 , but a zebra crossing should not be installed on roads with an 85th percentile speed of 35 mph or above and the two-way traffic flow should be less than 500 vehicles/hour.

To justify a **signalled-controlled** crossing (Puffin, Toucan or Pegasus), the adjusted PV^2 value should be greater than 0.9×10^8 . Current national guidelines indicate that it is not advisable to install a signalled controlled crossing where the 85th percentile speed is greater than 50 mph. At such locations serious consideration should be given to speed reduction measures before installing a signalled-controlled crossing.

ITS Strategy: Appendix B

Policy for the Provision of a Traffic Signal Junction

1. Introduction

This policy explains how proposals for new traffic signal junctions will be considered.

The demand for new traffic signal junctions far exceeds the County Council's ability to provide funding. For this reason we will compare the need for traffic signal control at requested sites so that decisions can be made in a consistent way and best value can be obtained from the available resources.

2. Safety

We will consider safety first, so we will only assess the need for traffic signal junctions at locations where the appropriate design standards for safety can be met.

3. Objective of traffic signal control

The primary objective in providing traffic signal control at a junction is to reduce the conflict between opposing traffic streams, as these conflicts can result in traffic delay and accidents. Traffic signal installations are designed to minimise the occurrence of both of these.

4. Design standards and capacity

Any traffic signals scheme which is to be installed on the highway needs to meet all of the current relevant design standards. In exceptional cases where these cannot be met, the Head of Transport for Warwickshire may agree to a departure from standard if a case can be made to demonstrate that safety would not be compromised.

In order for traffic signals to operate safely and efficiently, it is essential that they can cope with the demands presented to them such as the volume of traffic, the requirements of pedestrians and the physical constraints of the junction layout.

It is therefore necessary to carry out a technical assessment of the proposed layout and to take into account any changes in demand that may occur as a result of installing the traffic signals junction. The proposed scheme will also need to ensure that the installation can operate with a practical reserve capacity to allow for a reasonable degree of future traffic growth.

5. Criteria and strategies for the justification of traffic signals

There are four main factors to take into account when assessing the need for the justification of traffic signal control :- traffic delays, accident record, traffic management and the provision of a pedestrian/cycling crossing facility.

However, all these depend upon having the necessary resources initially to implement the scheme and then to maintain the installation.

5.1 Traffic delays

It is inevitable that, on arterial roads, delays will occur on the side roads at priority junctions during peak hours. However at the majority of these locations, queues will quickly disperse after the peak period.

The assessment will consider the traffic conditions over the four busiest hours of the day. If the delay experienced by drivers is more than eight minutes at the junction during each of the four busiest hours, then consideration will be given to installing traffic signal control at the junction.

5.2 Accident record

The average accident rate at existing traffic signal junctions in Warwickshire is 0.56 injury accidents per year. This implies that at any set of traffic signals installed this level of accidents could be expected.

As a responsible authority, WCC would not want to introduce any facility onto the highway that would increase the risk of accidents at a particular location. Therefore if the existing accident record at a location being considered for traffic signal control is less than 0.59 injury accidents per year, there is a potential risk of making the accident record worse.

The provision of traffic signals mainly for casualty reduction purposes will only be considered if the accident rate at a particular junction is six or more injury accidents (average) per year for three years, to ensure a reduction in accidents to the average rate of 0.59 per year or less.

It must also be realised that the provision of traffic signals at a junction which has an established accident record may not be the most appropriate remedial measure and other measures may be required.

5.3 Traffic management

A junction may be signalised to provide better traffic management control within a certain region of the road network. This may allow the junction to be linked and co-ordinated with other adjacent traffic signalised junctions to influence the pattern and speed of traffic progression.

5.4 Pedestrian and/or cycling facility

If a controlled pedestrian crossing is justified within close proximity to a junction, it may not be feasible to implement due to relevant design standards. In this case, consideration should be given to signalising the junction to provide the pedestrian and/or cycling facility.

5.5 Developer funded schemes

A junction may be signalised to mitigate anticipated traffic impact of a development and/or anticipated increases in pedestrian flows.

5.6 Safer Routes to School

A junction may be signalised where the aim is to encourage more children to walk and/or cycle to school with less dependence on the use of the car.

6. Advantages and disadvantages of traffic signals

The following will be taken into account when appraising the proposal for new traffic signal junction.

6.1 Advantages

- (a) Pedestrians can cross at traffic signal junctions by taking advantage of breaks in traffic caused by the intergreen periods (one approach losing right of way and the other approach gaining right of way). Where pedestrian movements are high or there are few gaps within the traffic flow, a separate full or partial pedestrian facility could be incorporated into the installation.
- (b) They are usually more economical in their use of road space, particularly at constrained sites where physical restrictions could make other types of control more costly and difficult to provide.
- (c) Their flexibility to assist specifically one particular approach (e.g. signalling right-turners separately) or category of road user, and their ability to respond to different traffic conditions.
- (d) Their ability to link and co-ordinate with other adjacent signalled junctions to influence the pattern and speed of traffic progression.

6.2 Disadvantages

- (a) They can produce increased delay during off peak times.
- (b) They may increase the risk of certain types of traffic accident.
- (c) They incur regular maintenance costs which are essential to the safe and efficient control of the junction together with the additional requirement to regularly monitor their operation.
- (d) They do not cater for "U"-turning movements.
- (e) To ensure the safe and efficient operation of the junction, no waiting "at any time" restrictions may have to be introduced. This may lead to loss of on street parking for residents and/or traders.
- (f) They are not recommended on high speed roads (where the 85th percentile approach speed exceeds 65 mph).

6.3 Capital and revenue expenditure

The typical installation cost to provide traffic signal control at a simple T Junction is approximately £90,000 (2010 prices). In addition, the annual cost associated with their operation and maintenance requirements is approximately £2,850. Also, traffic signal equipment has a limited life cycle, ranging between approximately 6 to 15 years, therefore additional funds are required to upgrade this equipment after this period.

7. Removal of traffic signal junctions

It is possible that in the future traffic volumes may reduce or other factors may change which may require a junction not to be signalised. In this case, a risk assessment and public consultation will be carried out to inform the action to be taken. However, when the junction is due for an upgrade the evaluation for its need will always be carried out.