

Warwickshire County Council

Application for Funding: Transport Asset Management: Element 2

Introduction

The local highway network is vital in ensuring the economic, social and environmental well being of Warwickshire's population. Due to the importance of the highway network, Warwickshire County Council (WCC) prioritises the management of this vital asset via a strategic approach that identifies the optimal allocation of resources for the management, operation, preservation and enhancement of the highway infrastructure to meet the needs our customers.

Successful asset management relies on good data. WCC has relatively good quality, comprehensive data on most of its highway assets. Some areas however still need work to bring them up to a similar standard. During the preparation of the County Council's Transport Asset Management Plan (TAMP), an audit of data was undertaken to identify the current gaps in asset inventory information. This highlighted a number of areas where it would be desirable to improve the scope and quality of information in order to assist the asset management decision making process. The priority areas for data collection were subsequently highlighted in the Action Plan which was included in the final version of the TAMP.

WCC operates a **H**ighway **M**anagement **I**nformation **S**ystem (HMIS), this is a tool for gathering information from different sources and keeping a historical record of all changes that have occurred on the highway. A flexible system allows the road network to be viewed and interrogated at different levels and maximises the opportunities for innovative data use. HMIS continues to evolve as more modules are developed to meet the ever widening needs of highway maintenance, both to meet Government requirements for reporting performance and to provide cost effective management of the network.

Climate Change is arguably the most significant environmental issue facing Warwickshire and the UK as a whole and the effects (real and potential) are well documented. It is vital that climate change issues, including measures to help reduce energy consumption are taken into account when managing the highway asset. During 2007, WCC launched its Climate Change Strategy, the overarching aim of which is to *'reduce greenhouse gas emissions in Warwickshire to at least the level set out by Government policy; 15-18% reduction by 2010 and a 60% reduction by 2050 (against 1990 levels)'*. This demonstrates the County Council's commitment to reducing carbon emissions.

It is vital that the highway asset both adapts to help meet the Warwickshire climate change targets, and responds to the effects of climate change (e.g. more extreme weather conditions). Potential interventions include;

- ❖ **Traffic and highway management to help reduce bus journey times**
- ❖ **Reducing street lighting material use and energy consumption**
- ❖ **Improving drainage solutions**
- ❖ **Reducing material use whilst maintaining asset value.**

Traffic and Highway Management to Help Reduce Bus Journey Times

Local Transport Plan Strategies Delivered	
Reducing Congestion	Improving Accessibility
Improving Air Quality	Improving Road Safety
Strategic Aim: Pursuing a Sustainable Environment & Economy	

WCC identified a gap in the data held regarding bus punctuality and where congestion 'hotspots' exist on core bus routes in Warwickshire. In order to address this information gap and use the associated data collected to provide improved service provision the Bus Punctuality Improvement Partnership (BPIP) was established.

The BPIP has been established to help bus services in Warwickshire adhere to the published timetable (reducing the variability of bus arrival and departure times, improving reliability and maintaining existing frequency). WCC is at the forefront of the development of BPIPs. Reducing bus journey times will assist in the delivery of the LTP Congestion, Air Quality and Accessibility strategies in addition to the County Council's strategic aim of 'pursuing a sustainable environment'.

Innovative Use of Data: Our Progress to Date

The Partnership, which involves the County Council and Stagecoach has, to date focused on the Service X17 (Coventry- Kenilworth-Leamington - Warwick). Data collection has been undertaken with the aim of identifying highway locations where the Service X17 experiences the most significant delays. Using GPS data loggers, the study focused on the analysis of bus journey time data and compared this data to the scheduled timetable, thereby allowing points of congestion to be identified.

As a result of this use of data, traffic management/highway management solutions have been identified to help reduce congestion and reduce delays. During the 2008/09 financial year a box junction will be implemented at a key congestion hotspot to enable buses to negotiate the junction more easily. In addition we are currently investigating the feasibility of introducing loading restrictions on Warwick Road, Kenilworth to help improve traffic flow and therefore improve bus journey time reliability. Other improvements, including bus priority at traffic lights, are being planned for delivery during 2009/10.

Likely Benefits Accrued

The majority of highway improvement measures identified via the data analysis are yet to be implemented. However, the benefits associated with the BPIP are likely to be significant and include:

- **Increasing Bus Patronage:** ensuring that bus journey times are more reliable may make travel by bus more attractive and help to encourage **modal shift** away from the private car, helping to **deliver benefits for the wider community** (reduced congestion and improved air quality). Patronage figures will be monitored to measure the impact of the PIP improvements.
- **Financial Benefits:** A reduction in the average journey time will reduce the amount of fuel used, therefore improving air quality and **reducing fuel costs** for the operator. Patronage increases will result in **increased revenue** for the operator
- **Reduced Congestion:** As a result of the highway measures implemented and as a result of increased modal shift away from the car.
- **Improved Air Quality:** A reduction in journey time results in lower fuel consumption and therefore reduced quantities of particulates are released into the atmosphere helping to improve air quality in the local area (Warwick and Leamington both have existing areas designated as Air Quality Management Areas).
- **Improved Staff Efficiency:** Reduced bus journey times will allow the route operator to utilise staff more efficiently.

Further Work to be Developed – Sustaining the Benefits

- We propose to ensure the **benefits** of the X17 BPIP **are sustained** via the implementation of two **Interurban Quality Bus Corridors** (Warwick to Leamington and Leamington to Warwick). We propose to work in Partnership with CENTRO and Coventry City Council to establish a BPIP for a route serving the North/South corridor, a key Warwickshire - Coventry bus route.

Reducing Street Lighting Material Use and Energy Consumption

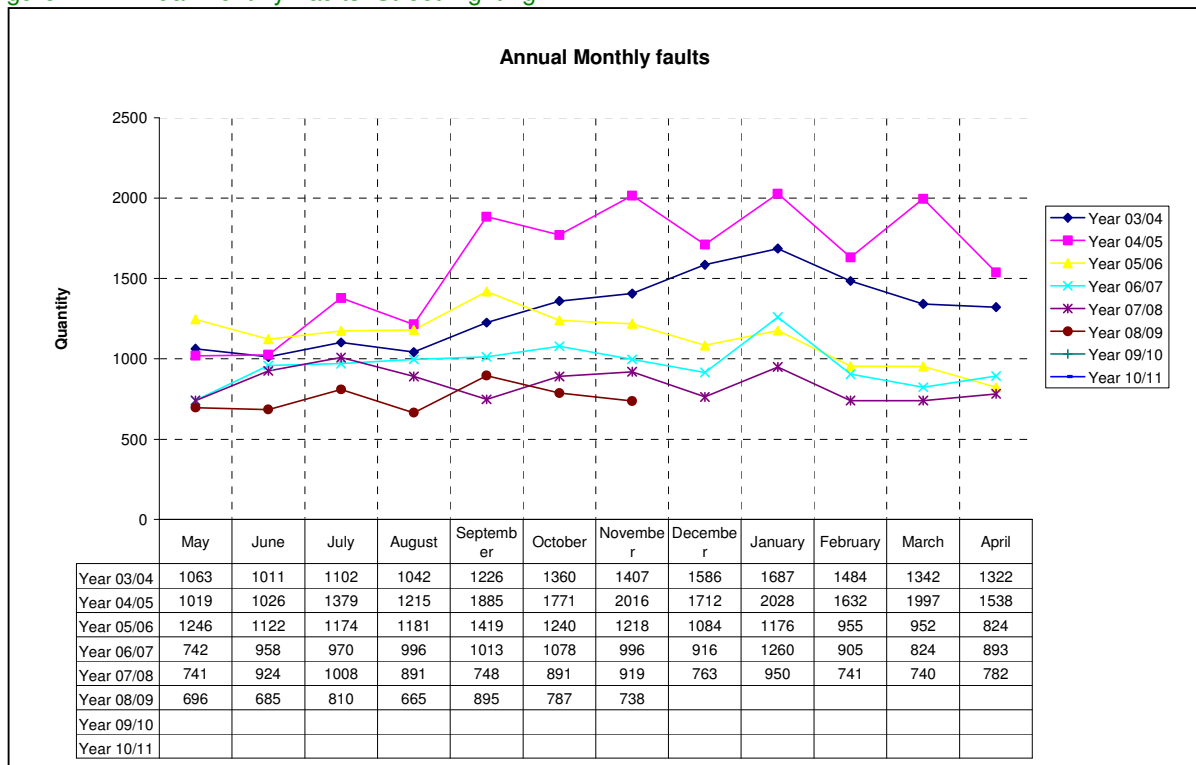
Local Transport Plan Strategies Delivered	
Reducing Congestion	Improving Accessibility
Improving Air Quality	Improving Road Safety
Strategic Aims: Pursuing a Sustainable Environment & Protecting the Community & Making Warwickshire a Safer Place to Live.	

Over the past few years WCC has developed a comprehensive inventory for all street lights and illuminated signs in Warwickshire. The County Council have ensured that this valuable data source is used to maximum effect, by optimising maintenance allocations and programmes of work, and more recently, has been used to help us reduce the amount of energy we use.

Innovative Use of Data: Our Progress to Date

- We identified the fact that newer improved lamps failed less often and had a longer life. As a result we are now changing lamps as part of a 'bulk lamp change' programme every 4 years instead of every 3 years. This has reduced our annual bulk change by 4000 a year giving an annual saving of some £40,000
- We are working with our contractor Carillion to continually improve the lighting units we use to reduce maintenance costs. The success of the approach we have taken is shown in the following graph which shows that the number of repairs required has dropped considerably during the course of our contract. This information is taken from one of our databases.

Figure 1.1: Annual Monthly Faults: Street Lighting



- We have used the street light inventory to identify where it is appropriate to implement lighting improvements for whole areas using **High Pressure Sodium lanterns** which contain electronic control gear. Electronic control gear generally uses less energy and **is** more reliable than conventional control gear (it is however more expensive).

Table 1.0 Number of High Pressure Sodium Lanterns & Associated Financial Benefits

Lamp	Qty @ 03/09/2008	Annual Elec Saving per unit*	Present Annual Cost Saving**
70W HPS	806	49.56 kWh	£3,994.54
100W HPS	12	4.13 kWh	£4.96
150W HPS	72	66.08 kWh	£475.78
Total			£4,475.28

* Compared with Conventional control gear

** Based on 10p per kWh

- We specify and install **Solar Powered Flecta signs** as new or as replacement Keep Left Bollards (no energy costs (this saves approximately 280.32 kWh of electricity per annum over traditional lamped bollards) and are extremely vandal and impact resistant. This means maintenance costs are kept to a minimum except for replacing the battery every 5 years. As of September 2008, 50 of these have been installed **saving 14,016 kWh of electricity** which equates to **around £1,400 per annum**. The total additional saving when all remaining bollards are changed equates to £60,000 per annum.
- We have installed 8,647 (as of Sep 08) 0.25W photocells when replacing or specifying units instead of 1W photocells. This **saves about 6.57 kWh of electricity per annum per unit**. By installing over 8,000 0.25w photocells we will save **56,810 kWh of electricity and £5,681 per annum**. The total additional saving when all remaining 1W photocells are changed will be £27,800 per annum.
- We specify and install LED sign lights where possible as new or as replacement along with photocells (this saves about 105.12 kWh of electricity per annum if old traditional lamped unit being replaced burns continuously or saves around 49.56 kWh of electricity per annum if replacing a unit that has a photocell) . LED sign lights are 12 year maintenance free except for an electrical safety test after 6 years. As of September 2008 we have had 36 of LED sign lights installed, **saving at least 1,784 kWh** of electricity which equates to at least around **£178 per annum**. The total additional saving when all LED sign lights are installed is approximately £22,800 per annum
- Virtually all existing Belisha Beacons have been converted to LED Belisha which are more vandal resistant and more reliable (**saves about 692.04 kWh of electricity per annum per unit over traditionally lamped**); As of September 2008 we have had 101 of LED Belisha Beacons installed saving at least 69,896 kWh of electricity **which is a saving of at least £6,989 per annum**.

Further Work to be Developed & Likely Benefits

WCC wish to continue to build on the benefits already accrued to date, using the street lighting inventory we are proposing to:

- ❖ Increased use of reflective signs across the highway network
- ❖ Operate part night street lights, where applicable, in rural areas

Increased use of Reflective Signs

WCC are responsible for approximately 150 illuminated direction signs located across the Warwickshire highway network. Inventory data indicates that the sign lanterns and plates are generally very old equipment containing 2 x 20W lamps which operate continuously day and night. It is now permissible for Direction Signs to be either directly lit or unlit if the surface of the sign plate is a retro reflective material.

Existing Running Costs and CO2 Emissions

- Each 2x 20W lantern that burns 24 hours a day consumes 534.36 kWh of (which costs approximately £61.21 per annum at our current electricity rate) and produce approximately 230 Kg of CO2 per annum.
- Lamps are changed and the sign lantern and plate cleaned at an approximate cost of £12 per unit plus any unplanned maintenance costs such as lamp failures. In addition Electrical Safety Testing amounts to £1 per annum.
- Total Annual Electricity/Maintenance Cost per sign = Approx **£74.21**
- Total Annual CO2 Emissions (electricity only) = **230 kg**

Cost to Remove lanterns and Electricity Supply and Replace Sign Plate

Cost to Remove Electricity Supply	= £258
Cost to Remove Lanterns and old plate	= £ 30
Cost to Install Retroreflective sign plate*	= £210
Total	= £498

(*Assuming Average Plate size as 2 sq.M)

Total Saving (based on 150 units) = £11,100 per annum

Operate Part Night Street Lights

There are many traffic routes within Warwickshire that have no or extremely minimal vehicular or pedestrian use between the hours of Midnight and 0530 where there could be potential for turning the street lights off between these hours. It is vital that a wide range of data is fully utilised when choosing traffic routes that could benefit from turning off street lights. The roads chosen would have to be carefully selected so that they are in low crime areas and have no, or low records of Night Time Traffic collisions. The roads chosen should not be in major residential or Town Centre areas where the fear of crime caused to residents in changing street lights to Part Night operation could cause them concern. Potential traffic conflict areas such as junctions and pedestrian crossing areas would also be avoided. Additionally areas where CCTV is in operation will not be considered.

By innovatively using the available data when selecting appropriate traffic routes this also means that the biggest cost and CO2 emission savings can be made (as certain road types generally have the higher end of the street lighting lantern Power consumption range employed).

The change from an All Night operating regime to a Part Night operating regime is, in general a simple task of just unscrewing the existing photocell on top of the lantern and replacing it with a Part Night operating photocell. It has been estimated that this can be carried out at a cost of approximately **£30 per unit** depending on quantities and Traffic Management requirements.

Likely Benefits to be Accrued

Table 1.1 below indicates the annual cost and CO2 emission savings that can be made by changing to Part Night operation from the different types of lamp that are generally employed in Warwickshire.

Table 1.1 Likely Financial and Environmental Savings/ Benefits Accrued

Lamp Type	Likely Use	All Night £	Part Night £	Saving £	All Night kGCO2	Part Night kGCO2	Saving kGCO2
SON250	Typically used on Traffic Routes	£130.52	£74.52	£56.00	490	280	210
SON150		£80.46	£45.94	£34.52	302	172	130
SOX180		£104.32	£59.56	£44.76	392	224	168
SOX135		£74.38	£42.47	£31.91	279	159	120
SON100	Typically used on lower hierarchical	£53.33	£30.45	£22.88	200	114	86
SOX90		£57.54	£32.85	£24.69	216	123	93

	traffic routes						
SON70	Typically used in residential areas.	£42.10	£24.04	£18.06	158	90	68
SOX55		£39.29	£22.44	£16.85	148	84	64
SOX35		£30.41	£17.36	£13.05	114	65	49

Changing the operating regime from All Night to Part Night operation on carefully selected Traffic Routes can result in significant environmental and financial benefits. CO2 emission savings are sizeable and the financial payback period is 12 months, therefore financial benefits will be accrued after one year.

In broad terms if between a quarter and half of all those lights on selected Traffic Routes could be switched off between midnight and 5.30pm, annual savings of between £136,000 to £270,000 after converting the lights can be made. Estimated saving in first year after Photocell Change are between £25,000 to £50,000.

Improving Drainage Solutions

Local Transport Plan Strategies Delivered	
Reducing Congestion	Improving Accessibility
Improving Air Quality	Improving Road Safety
Strategic Aim: Pursuing a Sustainable Environment & Economy Protecting the Community	

The reality of Climate Change has been demonstrated with devastating results, during recent flooding events, particularly in July 2007. It has become clear that there are many faults within drainage systems and/or the capacity of the existing systems is insufficient to deal with these more intense rainfall events. We have also identified a significant backlog of drainage problems which has been exacerbated by the recent extreme weather events. A medium term strategy has been formed to try to minimise the impact of any future flooding. Over the past 12 months extensive flood mapping, modelling, feasibility studies and detailed design work have led to a series of projects being identified for funding. In addition, work has commenced on a programme of focussed drainage investigations in areas badly affected by the flooding of July 2007 and some projects are underway to repair or upgrade highway drainage systems as a result of these investigations/data collection.

Innovative Use of Data: Our Progress to Date

Even before the severe floods of July 2007, steps had been made to develop a more structured approach to drainage maintenance using a data led approach and a variety of projects have been developed since 2005/06, including:

- A centralised database of known drainage problems has been created. This helps inform decision making and assists with the prioritisation of drainage works;
- A prioritisation regime for identified problem sites has been developed (and is continually being updated);
- The central database of known drainage problems has been conducive to the allocation of 2, 3 or 4 work gangs dedicated to drainage work;
- We have been able to carry out more CCTV camera survey work to evaluate and map drainage systems;
- We have developed a number of local flood forums involving the District or Borough Councils, the Water Company, the Environment Agency and WCC. Flooding and drainage information collected and held by the WCC is used to inform these forums;
- We work in partnership with District Councils, Water Companies, the Environment Agency and Parish Councils to ensure that relevant information is shared and to co-ordinate and deliver joint projects.

Sustaining the Benefits

We plan to further develop our asset management approach to Highway Drainage maintenance by:

- Implementing Recommendation 16 of the Pitt Report to “collate and map the main flood risk management and drainage assets ... including a record of their ownership and condition”, which will dovetail with Severn Trent Water Ltd’s drainage records.
- Implement new software to enable the above to be achieved;
- Continue to carry out extensive CCTV survey work as part of the inventory and condition data collection.
- Equip drainage staff with GPS compatible data capture devices;
- As part of an ongoing departmental restructuring, implement a suggestion of the Pitt Report, i.e. to set up a specific Drainage Team.
- Develop a more stringent prioritisation system, to target actions to the most appropriate locations and cut the drainage work backlog.
- Develop better working and information sharing relationships with other bodies (including other Authorities, Water Companies and the Environment Agency).

These initiatives are regarded as an investment which will provide quick results in helping to deal with some of the known risk sites. They will also help develop and demonstrate real long term benefits and efficiencies that will be realised in future years. The Asset Management approach to Highway Maintenance which is being increasingly promoted, many Highway Authorities have recognised that the field of Highway Drainage has lagged a long way behind other assets. We intend that additional funding will help to kick start the modernisation of Highway Drainage Asset Management with an immediate focus on flooding risk management.

WOOTON WAWEN FLOOD DEFENCE FORUM

Wooton Wawen village flooded four times in 2006 and 2007 with water entering at least 15 properties. This prompted the local County Councillor to set up a flood defence Forum with representatives attending from the Parish, District and County Council and from Severn Trent. Drainage investigations were carried out and a consultant was commissioned to produce a report on the flooding. The main cause of the problem was water from the surrounding hills entering the village and the forum worked to identify solutions both on and off the highway. Upgrading existing drainage systems would cost over £1 million so alternatives have been sought. Joint working has produced several cost effective actions including:

- An innovative £50,000 swale, funded by the WCC, constructed across the village Hall car park with a barrier wall to divert floodwater thus saving seven properties from further future flooding.
- £23,000 Funding from the Stratford on Avon District Council to upgrade a section of storm water drain.
- Work by Severn Trent to increase capacity in drainage pipes restricted by past sewer and water works.
- A thorough clean and repair of all existing pipes to improve flow and reduce the likelihood of flooding.

Further work being investigated includes:

- An extensive balancing pond being a reinstatement of an old village pond filled in by past Trunk Road improvements.
- Changing water flows on private land to reduce flows into the village.

Similar approaches are being followed in other Warwickshire villages where the data shows the problems are not the responsibility of a single authority.

Benefits to be Accrued

- Progress on projects regarding already identified risk areas will be delivered to a shorter timescale.
- New software will enable all collected data to be stored and maintained in a computerised map format which will be available in perpetuity, avoiding wasteful duplication of investigations in the future.
- Continued collection of data will result in an inventory that is continuously improved. Eventually a complete map of the drainage asset will be constructed.
- Long term storage of asset condition data will reduce un-necessary maintenance and therefore result in financial and efficiency savings. Maintenance programmes can be delivered more effectively, ensuring we undertake routine cleansing operations at appropriate intervals.
- Better data collection will reduce the reliance on individuals knowledge, helping to ensure the continuity of information over time.
- Reduce instances of flooding to properties, businesses and the highway and the resulting costs and disruption to all concerned.
- Reduce hazardous flooding of roads, helping to improve road safety.
- We will be better equipped to implement Pitt Report Recommendations 5 and 17, “to work with partners...to develop tools and techniques to model surface water flooding” and “share information and cooperate...to facilitate the management of flood risk”.
- A significant step towards modernising this aspect of our asset management process.
- Improved public confidence in the management of flood risk.
- Help to reduce congestion on the highway network as a result of fewer instances of flooding, which can also help to improve air quality.

Reducing Material Use while Maintaining Asset Value

Innovative Use of Data: Our Progress to Date

WCC have been using condition survey information to inform investment decisions since the 1970's when the Warwickshire ASPECT survey was introduced. The surveys have evolved over time, in line with National developments. The way in which the data has been used by Warwickshire has changed and been refined to maximise the value of the maintenance investments and minimise the use of materials and the waste material from the operations. Our present process has been developed in several stages over the last 25-30 years and has resulted in an asset management approach that includes the following:

The Warwickshire Maintenance Approach (as included in the Warwickshire TAMP)

Since 1997 the approach to managing the maintenance of the highway network has been consistent across the County. This involves the following stages:-

- Condition surveys to identify roads with defects
- Assessments to identify most appropriate treatments and costs
- List of sites requiring treatment (5 year programme list)
- Scoring system to prioritise schemes in the 5 year programme
- Annual programmes of work

Whilst using condition data to help inform maintenance programmes is not innovative in itself, it is Warwickshire's thorough processes that ensure maximum value from the data which is innovative compared to processes in other authorities.

To identify most appropriate treatments, and to an extent prioritise schemes, the following information needs to be available

- Traffic flow and percentage of HGV's
- Existing construction thicknesses

- Subgrade material
- Drainage systems
- Previous treatments and when applied
- Rate of increase in defects (rate of deterioration)

In Warwickshire the processes to help ensure the maximum value from the maintenance spend include

- A surfacing data base containing details of all structural maintenance work back to 1983.
- A surface dressing data base containing details of surface dressing sites back to 1980.
- 5 year lists which were introduced as a result of the 2002 Highway maintenance best value review.
 - These lists include all work identified as likely to be required in the next 5 years.
 - The rate of deterioration in the condition of those sites on the lists are monitored.
 - Higher priority given to overlay sites where these will reduce future maintenance need.
 - Reconstruction sites left as long as possible before any work to secure the maximum value from the existing road construction.
- Scheme estimates are produced for those sites on the 5 year lists to help inform the future maintenance requirements.

Benefits Accrued

- £2 million Prudential borrowing was approved in 2004/05 to secure a reduction in the backlog of outstanding work to be repaid from reduction in patching need.
- **Better than average road condition:** The National Performance Indicators confirm that the condition of the roads in Warwickshire is **better than the average** even though **the spend is below average**.
- **Minimising material use while maintaining asset value:** the approach, which identifies the optimum time for treatments, keeps material use to a minimum while maintaining asset value.
- **Reduced amount of construction waste:** The asset management approach which requires work to be carried out before extensive patching or reconstruction is needed has **reduced the amount of construction waste produced**.
- **Lives of surface dressing:** The database containing information on surfacing and surface dressing work has allowed the monitoring of the lives of treatments. Extensive use of this data has resulted in the **Warwickshire approach to surface dressing**, which is regarded **as one of the best in the Country**. This database, covering approximately 30 years, is an important resource. This resource, giving the lives of various treatments, is not only of benefit to Warwickshire but also to **other highway authorities**.
- **British Standard materials:** Surfacing material developed in Warwickshire, in conjunction with a local quarry as a result of using the condition based data is now part of the British Standard materials.
- **£500k a year benefit:** Warwickshire estimate that the asset management approach is giving some £500k a year benefit from the £5 million a year carriageway spend.

Further Work to be Developed

- We propose to ensure the numerous benefits already accrued are **sustained** and developed further. During 2009 we propose to find ways to carry out further analysis of this data to help inform future treatments. Warwickshire will be engaging with Universities and Institutions to help with this research
- We will continue to monitor highway and footway condition over and above the statutory requirements. This will help to cement Warwickshire's data led approach to inform future maintenance programmes.

Data Sharing and Conclusions

To ensure the maximum effectiveness of our data, policies and work programmes, we propose to share information, where appropriate across all our work streams with a variety of internal colleagues, partners, stakeholders. These include:

- Arup (WCC's term consultant).
- Midland Service Improvement Group (groups exist for maintenance, street lighting etc) and provides an excellent forum for data/best practice sharing).
- Carillion (WCC's contractor).
- Stagecoach and other bus operators (BPIP work will be shared with other relevant operators)
- Neighbouring Local Authorities (e.g. Coventry City Council when looking at further BPIPs in the region).
- Environment Agency (particularly in relation to helping reduce incidents of flooding).
- Severn Trent Water Ltd.
- The Exor Group
- The CSS

The local highway network is a key element in contributing to the County's economic, social and environmental well being. Climate Change is a significant issue and the causes and consequences must be managed where appropriate to do so. It is important that such issues are taken into account when managing the highway asset, especially if WCC are going to achieve the overarching aim to *'reduce greenhouse gas emissions in Warwickshire to at least the level set out by Government policy; 15-18% reduction by 2010 and a 60% reduction by 2050 (against 1990 levels)'*.

Successful asset management relies on good data. This application for funding demonstrates that WCC has good quality, comprehensive data for most of its highway assets and is able to use this information to maximum effect, helping to ensure that transport and highway maintenance programmes are delivered effectively and efficiently whilst simultaneously contributing to meeting WCC's wider strategic aims and objectives. In addition we have identified areas of improvement/further work that will enable WCC to sustain and expand the many benefits already accrued to date.