

The A28 mainline flow, and the joining traffic from the A291, is constrained by the capacity of the level crossing and other downstream factors such as a pedestrian crossing and a variety of junctions serving the 'old' village, King's school, and the village of Fordwich. In addition there are a number of bus stops in the area (Stagecoach's 'Triangle' via the A291 to Herne Bay and the 'Breeze' via the A28 to Thanet), and traffic dropping off at Sturry station.

The functioning of the A291/A28 priority junction is complicated by the proximity of the level crossing, and can lead to unpredictable driver behaviour. This includes vehicles squeezing into the A291 'out' pocket and forcing into the queued A28 inbound traffic whilst the outbound flow is held at the level crossing.

All of the above factors combine during peak network conditions to cause a notable delay, as illustrated in **Figure 3-3.** 



Figure 3-3 AM Peak Average Journey Times (Herne Bay Rd to Island Rd)

# 3.4.4 Queues

There are sustained AM queues on the A28 Island Rd, reflected in a queue survey at the A291/A28 priority junction. Due to the level crossing in near proximity this survey measured queues on the mainline A28 as well as the 'give-way' traffic on the A291. It is noted that the queue on the A28 (WB) is moving, however the considerable length and sustained nature of the queue is pertinent (**Figure 3-4**).



The PM peak exhibits lower queues in comparison on the A28, however there are queues elsewhere due to different traffic tidality and loading (**Figure 3-5**).







Figure 3-5 PM Peak Queue Lengths



The observed AM peak queuing is supported by the typical traffic conditions given by Google (**Figure 3-6**).





## 3.4.5 Journey Time Variability

For this area, it is more important to highlight the journey time variability rather than the journey times per se. This is due to the presence of the level crossings, particularly Sturry with longer down-time, and the variability pattern that ensues due to whether the journey encountered the crossing being down. It is accepted that there are other contributory factors to the movement through the corridor but the level crossing is the key delay point. As can be seen in **Figure 3-7** the profile has a noticeable periodicity rather than either a hump or erratic pattern.



Figure 3-7 AM (ANPR) Journey Times from Sturry Rd to Island Rd

# 3.4.6 Level Crossings

Whilst Network Rail could not provide confirmation of how many level crossings are currently situated on 'A' roads, it is assumed that it is a relatively rare occurrence. Other examples in the South-East are the A265 in Etchingham (East Sussex) and A286 in Chichester (West Sussex).

The Sturry Level Crossing has a high vehicle flow. In a search of Network Rail's database it is in the top ten highest flows in the UK. This is given as **Table 3-1**.



#### Table 3-1 Traffic Flows at Level Crossings Data from Network Rail database

Boston Bypass	Boston District (B)	29916
Reigate	Reigate and Banstead District (B)	22518
Harlescott	Shrewsbury CP	20250
Walton Street	City of Kingston upon Hull (B)	20182
Llanbadarn Fawr	Llanbadarn Fawr Community	19710
Cherry Tree	Beverley CP	18010
Sturry	Sturry CP	17928
Malton	Norton-on-Derwent CP	17225
Low Gates	Northallerton CP	17121
Oulton Broad North	Waveney District	16092

Of these instances of level crossings with high traffic flows, the Sturry level crossing has the highest number of trains per day.

The crossing is on the Thanet to Ashford International line which serves Canterbury via Canterbury West. The line has both classic and High-speed (HS1) Domestic services. On average, six trains pass each hour resulting in five or six level crossing activations of approximately 2.5-3 minutes in length.



#### Figure 3-8 Traffic Flow/Train Frequency at Level Crossings

In addition the two level crossings adjacent to the scheme, Sturry and Broad Oak, have been compared against other Kent level crossings. **Figure 3-9** shows Broad Oak level crossing also has a notably high flow; with the combined corridor therefore being very significant in this regard.



The scheme would add to the reducing of traffic flows over level crossings in Kent and Medway; after the completion of the bridge on the A228 in 2012 removing Stoke crossing as a trafficked route.



## Figure 3-9 Traffic Flows at Kent Level Crossings

Network Rail assesses level crossing risk based on the following categories:

> Individual risk - which applies only to crossing users. The score is presented as a letter ranging from A to M where A is the highest value and M is the lowest.

> Collective risk - which considers the total risk for all people who use the crossing, including: pedestrians, road vehicle drivers, train staff and passengers. The score is presented as a number ranging from 1 to 13 where 1 is the highest value and 13 is the lowest. This 'collective risk' score is the most important part when prioritising crossings.

The Network Rail risk categories are given for the two crossings in **Table 3-2**. On the collective risk scale (all users rather than crossing users) both crossings are in the higher three risk ratings, however both score a little lower in the individual risk category.

Sturry level crossing also has 900 pedestrian and cyclist movements.

	Collective risk (1 to 13)	Individual risk (A to M)
Broad Oak	2	E
Sturry	3	Н

## **Table 3-2 Network Rail Risk Categories**



## 3.4.7 Accidents

The accident plot for the study area is given as **Appendix B**.

There is an accident cluster at the junction of the A291/Sweechgate (**Figure 3-10**). This seems to be caused by the excessive use of Sweechgate as an alternative route to the A291.



Figure 3-10 Accident cluster at Sweechgate

In addition the accidents on the alternative route have a higher proportion of severe accidents (**Figure 3-11**).



Figure 3-11 Accidents by severity



In terms of road users or themes of accidents, no particular trends are apparent; with accidents varying from involving pedestrians, cyclists, buses, turning, stopping at shops, and parked cars.

## 3.4.8 Air Quality

Sturry is a little outside of the Canterbury Air Quality Management Area (AQMA), which is contained to the urban area.

However, there has been some additional monitoring of other areas. Sturry itself has not been monitored but nearby Herne has. There is some evidence, via diffusion tubes (DT25 Herne Street), of excessive  $NO_2$  and monitoring is on-going. It is considered reasonable to assume, due to similar conditions, that Sturry has comparable environmental conditions.

# 3.4.9 JTI project

There are also possibilities that the introduction of the Sturry Link Road can assist in the delivery of the Journey Time Improvements (JTI) project for rail services between Ashford and Ramsgate. The Sturry Link Road delivery is expected to help Phase 2 of this project.

# 3.4.10 Likely Impact of No Change

The Canterbury Local Plan presupposes the delivery of the link road, and if it is not forthcoming the local plan development quantum will be brought into question.

If direct Government funding (LGF) is not forthcoming; the transport strategy for the local plan could potentially be found to be unsound; and a reduced quantum may be appropriate.

**Table 3-3** summarises the current and future problems that the scheme is intended to solve.

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## Table 3-3 – Summary of Problems

Summary of Identified Problem Issues to be Resolved by the Scheme				
Strategic / Local Context & Primary / Secondary Problem			Details of Problems (e.g. Type, Scale, Timeframe, Affected Groups and Impact Severity)	
		Identified Problem Issue	Existing Problems	Future Problems
Strategic / Localised	Primary / Secondary			
Localised	Primary	Localised congestion	Link capacity of level crossing	Growth numbers will add to current delays
	Secondary	Poor elements of existing design	Proximity of junctions to level crossing	
Strategic	Primary	Wider network rat- running	A291 to Canterbury traffic uses alternative route through Broad Oak village	Increase rat-running
	Secondary			

# 3.5 Scheme Objectives and Scope

## 3.5.1 Objectives

**Table 3-4** summarises the broad scheme objectives / identified problems and intended outcomes.

#### **Table 3-4 Summary of Objectives**

Scheme Objective to be Achieved	Main benefits for Respective Stakeholders
<b>Objective 1</b> Improve operation of Sturry highway network	UsersImproved journey time and reliabilityCyclists / Local usersImproved journey quality on original alignmentLocal Authorities,Improved attractiveness of the area for inward investment and job creationImproved attractiveness of the area for housingDevelopers and EmployersAbility to develop schemes without excessive planning conditionsAbility to create employment and attract employeesNetwork RailLess traffic over level crossingResidents of Sturry and Broad OakLess traffic / improved noise and air quality

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Scheme Objective to be Achieved	Main benefits for Respective Stakeholders
<b>Objective 2</b> Remove poor elements of existing layout	<b>Users</b> Improved journey quality.
<b>Objective 3</b> Provide transport system which can deliver local plan	SELEP Canterbury District can assist in delivering housing growth
<b>Objective 4</b> Enhance use of Park-and-ride	Users A more reliable arrival at the Sturry Rd park-and-ride. Bus operator Increased patronage Local Authorities Improved use of sustainable modes

## 3.5.2 Scope

Table 3-5 summarises the scope of the project.

Table 3-5 -	Summary of	<b>Project Scope</b>
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Items Within and Outside the Scope of the Scheme Project			
Item of Interest	Details Within Scope of the Scheme	Details Outside Scope of the Scheme	
Functioning of local highway network	Delays at approaches and within network including level crossing	Wider network operation	
Local plan delivery	Proportion of delivery quantum (North- eastern quadrant of district)	Balance of delivery quantum	

There is minimal opportunity to reduce the scope of the scheme project, as the factors causing congestion, including the level crossing, are close together and highly interacted and entwined. Minor improvements may alleviate current conditions. However, this would be limited and at the expense of the local plan delivery.

# 3.6 Determining Success of the Scheme

Fulfilment of certain successful performance criteria, together with negotiating a number of essential hurdles to fund and deliver the scheme, can be regarded as 'Critical Success Factors' (CSF) for the *Sturry Link Rd*, in accordance with HM Treasury's 'The Green Book' (July 2011).



# 3.6.1 Critical Success Factors

There are several 'Critical Success Factors' (CSF) that will determine if the *Sturry Link Rd* can be introduced satisfactorily. These CSF are essentially a combination of performance, finance and delivery assurances, as suggested in HM Treasury's 'The Green Book' (2011) and which can be assessed qualitatively and broadly aligned under the five criteria of the 'Transport Business Cases' (DfT, January 2013).

The CSFs for the Sturry Link Rd project have been selected and categorised as follows:

## • CSF1: Strategic Fit

- Will reduce congestion in critical area;
- Will enable housing and employment development;

# • CSF 2: Prosperous and Sustainable Economy and Value for Money

- Will reduce cost of travel and increases journey reliability for scheme users;
- Will maximise return on investment, striking a balance between the cost of delivery and the cost to the economy of non-delivery;

## • CSF 3: Affordable Finance

- Can be delivered within the likely capital funding available;
- Can be afforded, in terms of financing revenue liabilities within current budgets;

## • CSF 4: Achievable Construction

- Can be delivered using current engineering and technological solutions;
- Can be procured through accepted methods of commissioning;

## • CRF 5: Manageable Implementation and Operation

- Can be delivered within the timeframe of available funding;
- Can be operated satisfactorily in accordance with its intended remit.

## 3.6.2 Successful Performance Criteria

Some of the critical success factors for the *Sturry Link Rd* relate to the operational performance of the intervention.

For this scheme the key operational parts are a successful re-design of the A28/A291 junction introducing efficient signals and an improved design considering all modes.



#### 3.6.3 Measurement of Successful Scheme Performance

Scheme monitoring and evaluation is discussed in Section 7.10 of this report.

## 3.7 Constraints and Dependencies

#### 3.7.1 Scheme Constraints

#### Engineering challenge

A bridge over the railway is a significant engineering challenge, reflected in the scheme costs. In addition the alignment crosses the Great Stour River and the associated riparian environment.

#### **Network Rail Liaison**

KCC have entered into a Basic Services Agreement with Network Rail and have had early high level discussions about the project. KCC are in the process of completing the Front End Pack required by Network Rail. To minimise the impact to Network Rail the proposed viaduct would overfly the rail boundaries minimising the need for possessions of the railway.

KCC have experience of delivering projects involving Network Rail, and will employ consultants and contractors that also have experience and knowledge of Network Rail procedures.

In addition to the bridge, proposed alterations to the junction between the A28 and A291 will require discussions with Network Rail in order to ensure the proposals do not interfere with the safe operation of the Sturry Level Crossing.

#### **Environment Agency Liaison**

Early discussions have been held with the Environment Agency to obtain their views on the form of bridge and the impact on the Great Stour and its flood plain. Initial preferences were:

- The bridge should maintain continuity of the flood plain
- Columns and piles are preferred as the support of the structure rather than abutments and embankments
- Both branches of the Great Stour are classified as a main river and will require access for maintenance



• With columns spanning the flood plain the EA would be less concerned about modelling the river with the bridge structure in place. With embankments detailed modelling would be required.

Feasibility designs of various forms of structures have been carried out and a high level impact assessment undertaken. The conclusion was that the bridge would need to be a viaduct crossing both branches of the Great Stour, its flood plain as well as the railway. The viaduct option has been included in the cost estimate.

The benefits of the viaduct option are:

- Minimal impact on the flood plain and flood storage
- Minimal impact on river flows
- Reduces need and extent of any land required to provide flood storage compensation
- Piled foundations and columns reduce the risks associated with construction over poor ground.
- Reduces the quantity of imported fill necessary to construct the road.

A viaduct, removes the key concerns raised by the EA reduces the risk of objection and provides an engineered solution within the site constraints.

#### Combined scheme and development

The scheme is being delivered in co-operation with the developer promoting the Sturry / Broad Oak site (1,000 houses). The financial implications are detailed in the financial case. The dependency of the 1,000 homes on the scheme is covered in the appraisal assumptions (section 4.3.2).

## 3.7.2 Scheme Dependencies

As highlighted, the current 'scheme' is working in tandem with a developer site and its new road network. Therefore in terms of current funding aspirations both elements need to be delivered. If the developer site does not proceed, the scheme would be 'shelved'.

This combined scheme can be considered as stand-alone. However, there are other improvements to the local network that are working as a package to deliver the local plan quantum.



The scheme can provide a more reliable car-leg to the park and ride site at Sturry Rd, located beyond Sturry towards Canterbury on the A28. However to be effective in enhancing park and ride usage the bus leg needs to be addressed by measures to improve the Sturry Rd bus lanes for the journey to the city centre. This is dealt with in another LGF funded scheme ('Sturry Rd Integrated Transport Package').

To deliver all of the named sites in the north-east quadrant, a bypass is being promoted of the village of Herne further out of Canterbury on the A291. These sites will maximise the 'value for money' by providing a greater number of users.

# 3.8 Stakeholders and Interests

Stakeholders are identified and a stakeholder-strategy introduced in a later chapter.



# 4 Economic Case

## 4.1 Overview

The Economic Case provides evidence of how the scheme is predicted to perform, in relation to its stated objectives, identified problems and targeted outcomes. It considers the relative performance of possible scheme options, in order to determine the optimum scheme. Ultimately, the Economic Case determines if the proposed scheme is a viable investment, whose strengths outweigh its weaknesses and which provides good value for money.

The predicted scheme appraisal focuses on those aspects of scheme performance that are relevant to the nature of the intervention. However, we do acknowledge the strands of assessment that are required under various pieces of statutory guidance (e.g. DfT WebTAG, VfM Assessment, LSTF; HM Treasury 'Green Book').

The *Sturry Link Rd* is being assessed from VISSIM results of the travel time of the highway-network comparing the 'with' and 'without' scheme scenarios. These results are available for the AM and PM peaks. The method used was, predominantly, a TUBA calculation for travel time savings. The VISSIM path files were converted into matrices in excel using pivot tables.

The scope for the VISSIM model was presented to the incumbent ITE prior to the modelling being undertaken. The modelling reports, LMVR and forecasting report are available. The model coverage for the links and the zones are shown in **Figure 4-1**. The VISSIM Origin-Destination matrix was constructed from a commissioned ANPR survey.

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Figure 4-1 VISSIM coverage (links and zones)

In accordance with the requirements of HM Treasury's Green Book 'Appraisal and Evaluation in Central Government', (July 2011), this section of the TBC report gives an appraisal of the scheme options that have been considered as possible solutions to the project objectives and problems identified in the strategic case.

# 4.2 Background

Achievement of the scheme objectives is intended to resolve the identified transport problems and result in the anticipated stakeholder benefits. Evidence is needed to determine if these predicted outcomes are attainable and this is appraised in the `Economic Case'.

This appraisal is focused on predicting the scheme's performance against the selected success criteria.



A subsequent part of the Economic Case is to predict the scheme's ability to satisfy its Critical Success Factors (CSF) which represent a combination of performance, funding and delivery expectations, in line with HM Treasury guidance. These CSFs are categorised according to Strategic Fit, Value for Money, Achievability, Affordability and Timescale, reflecting the 5-case TBC model. They enable the scheme and its options to be appraised and compared in order to identify the most effective solutions.

The following subsections describe the scheme options, their advantages and disadvantages and whether they have shown sufficient merit to take forward for more detailed economic appraisal. A summary of the options, mapped against the scheme objectives and CSFs is provided.

Following this, the approach towards more detailed economic appraisal is described, followed by the scheme option appraisal itself.

An Appraisal Summary Table, setting out the key issues relevant to this scheme is provided. Although some aspects of this (including the economic appraisal) have been explored in outline at this initial stage, other aspects will not be explored in detail until a later Transport Business Case stage, if necessary.

# 4.3 Appraisal Assumptions

With devolution of major scheme approval to Local Enterprise Partnerships, it is important that an approach to appraisal is used that gives regard to local priorities (especially in enabling investment, job creation and housing construction). This must be done with due regard to standard practice, which in transport terms means the use of WebTAG guidance. Discussions with the Department for Transport have indicated that a 'proportionate' approach to WebTAG should be used. Kent County Council has held discussions with the South East Local Enterprise Partnership, in the light of Government Guidance, on how the appraisal of devolved small major schemes should be handled ('Growth Deals Initial Guidance for Local Enterprise Partnerships', HM Government July 2013).

The following assumptions have been made during transport modelling and appraisal of the preferred scheme;



#### TUBA

- TUBA version 1.9.5
- AM and PM peak hours have been weighted as two hour periods and annualised over 253 days (see below). As the benefits are being claimed for non-modelled periods, the matrices included part of the pre-load to be a more robust estimate. Also, it is noted that there is evidence for some inter-peak and Saturday benefits but these have been excluded.
- Two forecast years entered into TUBA, opening and forecast year. Opening year
  has been assumed to be the same as base. Forecast year reflects local plan
  horizon year. The TUBA runs used the model scenarios excluding dependent
  housing (Scenarios A and D in Webtag A2.3).
- 60 year appraisal
- Standard TUBA economics parameter file used.
- Traffic flows assumed to be all cars. This is reasonable as average vehicle VOT are similar and there are no specific differences for HGV costs.

## Modelling

- Downstream capacity outside of modelled area assumed not to be a limiting factor. The first downstream junctions inbound to Canterbury (Vauxhall Rd roundabouts) have been included in the modelled area.
- Average vehicle hours extracted, with the journey time variability from the level crossing ignored in quantitative appraisal terms.
- Estimate of 'with-scheme' signal timings
- No variable demand responses, particularly trip distribution have been included.
- Future year growth established from first principles based on working TAs from the development sites in the north-east quadrant, plus a small TEMPRO uplift to reflect other factors, using the alternative planning assumptions to remove double-counting.

#### Scheme costs

 Combined scheme cost, and commensurate developer contribution, included in TUBA input. Further detailed in financial case, including 'Treatment of scheme costs' (WebTAG A1.2).