Mersey Gateway: Scope of Services

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Chapters and Appendices

1 Introduction

This document is provided as the basis of the scope of work proposed for the Mersey Gateway which is expected to cover:

- Traffic demand forecasting;
- Economic appraisal; and
- Accident analysis.

Fees are indicative only as the full scope of work and the availability and quality of key input data is not known at the time of writing.

1.1 Background

The Programme Entry approval for Mersey Gateway listed a number of conditions that would need to be satisfied to ensure that the funding support from the Department for Transport remains in place. One of the conditions requires that a new traffic model be developed to produce more robust forecasts of the traffic impact of the proposed scheme.

The new traffic model is a critical component of the project plan designed to deliver the following Mersey Gateway project objectives:-

- To relieve the congested Silver Jubilee Bridge, thereby removing the constraint on local and regional development and better provide for local traffic needs. (The crossing must provide a viable alternative route to the Silver Jubilee Bridge);
- To apply minimum toll charges to both Mersey Gateway and Silver Jubilee Bridge consistent with the amount required to satisfy affordability constraints and to manage road travel demand to ensure the delivery of transport and environment benefits by maintaining free flow traffic conditions on the MG and SJB;
- To maximise local development and regional economic growth opportunities;
- To improve local air quality and enhance the general urban environment;
- To improve public transport links across the river; and
- To encourage the increased use of cycling and walking.

The proposed traffic model update is expected to be extensive suitably robust for scrutiny during the planning and procurement process. The key change in the modelling approach relates to the appraisal of variable demand in the context of congested networks where travel behaviour is also influenced by road user charging. The model will need to comply with policy guidance in what is a relatively new area of DfT appraisal. In addition to satisfying the DfT's challenging appraisal standards, the model forecasts will be used to derive the estimated toll revenue for the proposed concession arrangements and these forecasts will need to withstand the intensive due diligence of potential bidders and lenders.

1.2 Objectives of the New Traffic Model

To deliver the required support for the Mersey Gateway Project the new traffic model will need to achieve the following:-

1. Produce Base Year model results that meet DfT model validation criteria.

2. To evaluate the impact of the proposed Mersey Gateway scheme on existing travel behaviour taking into account strategic and local reassignment, changes in trip distribution and induced traffic effects.

3. To investigate the influence of toll charging options for SJB and MG.

4. To provide the output required for economic evaluation, including the wider economic effects, and environmental appraisal, accommodating the full scope of investigation required to complete the outline business case and to produce the evidence required to support the planning application and public inquiry process.

5. To enable operational assessments to be undertaken in selected future years to inform the final scheme reference design and level of service specifications to be used to support the planning process and procurement.

6. To appraise options for re-balancing the local transport infrastructure based on the adjusted role of SJB in providing a local river crossing, to support the Council's future Local Transport Policy, including options to improve public transport.

In addition to the above performance objectives the following delivery objectives will apply:-

7. The Local Model Validation Report will be forwarded to DfT for approval by the end of January 2007.

8. The model forecast outputs will be available as defined in the Project Plan to achieve business case sign off from the DfT by the end of July 2007, thereby obtaining the authority to commence the planning process and/or procurement.

9. To operate the delivery of the new traffic model as a sub project of the MG Project Plan including regular change management reviews that will need to address DfT policy development risks and changes to regional transport programmes (including the Transport Innovation Fund and Northern Way investment strategies).

It should be noted that the DfT has not been definitive in its advice and it is expected that consultation with the DfT will be required throughout the development of both the base year and future year traffic models. To this end, the objective will be to have a traffic model, structured in a manner that allows future change in the appraisal policy of the DfT, to be incorporated in parallel with the delivery of the MGTM.

The road network to be modelled is expected to be extensive due to the need to allow for sufficient route choice within the model. However, this should not be interpreted as providing the basis for a model that is validated over the entire road network to be modelled.

The focus of the model's development will be an area close to the Mersey Gateway. There is no intention for the model to be validated either in Liverpool, Birkenhead, St Helens or Warrington. Having said this, the expectation is that the modelled traffic volumes on roads within areas such as Merseyside and Warrington will be substantial to enhance route choice within the model. This level of forecast traffic flow would be adequate for the purposes of the Mersey Gateway but does not mean that the traffic model will be validated in these areas.

This focus on the area "local" to the Mersey Gateway, should allow the traffic model to be developed in a manner that allows the provision of level of service information, for different times of day, not only for the Mersey Gateway but also key approach roads within Halton and other key strategic roads and junctions. This information would be used to refine and further develop the scope of the Mersey Gateway and assist in the development of the service specification, the latter including free flow electronic versus manual toll collection, differential time of day road user charging etc.

2 Base Year Traffic Model

2.1 Variable Demand Modelling

In accordance with the DfT's Transport Analysis Guidance Website (WebTAG or TAG), it is not considered acceptable to limit the assessment of the scheme to a fixed demand assessment as the criteria as laid out in TAG Unit 3.10.1 are not met, i.e.:

- This scheme is not expected to be modest in respect of travel costs;
- There is already significant congestion in the area of the proposed scheme; and
- The scheme is expected to have an appreciable effect on competition between private and public transport in the corridor containing the scheme.

Consequently, variable demand modelling is to be built in to the processes of the model from the outset. This includes DfT advice in relation to variable demand modelling in accordance with TAG Unit 3.10.3 and 3.10.4, based on the base year traffic model, including:

- Travel market segmentation;
- Local parameter (lambda) values for trip distribution; and
- Realism and sensitivity testing of adopted values.

2.2 Modelled Road Network

As part of the development of the updated traffic model, the road network as described within SATURN would be coded to provide confidence that route choice modelling is "coherent".

This would include factors that have the potential to affect the forecast traffic flows for the MG, such as assumed road traffic capacities, assumed area of simulation etc. Tasks that would be undertaken include a review and update to:

- Road network coverage;
- Extent of the simulation network and junction coding;
- Link and turn capacities and saturation flows;
- Link distances and coded free flow speeds / speed limits;
- Distances for centroid connectors;
- Bus services and bus networks coded; and
- Speed / flow curves, link and junction coding, especially for the SJB.

It is also proposed that the assumed generalised cost of travel for each user class would be reviewed based on advice in TAG Unit 3.5.6.

In developing the modelled network, existing traffic models and other data would be reviewed (if made available) for their applicability to the MG. Examples of this include the Merseytram traffic model, the Birkenhead traffic model, south Liverpool traffic model and the Warrington traffic model. Other models and data exist (for example from DfT studies such as MidMan and the M60 Box) and permission to review and potentially use data from them would be sought.

2.3 Time Periods

It is proposed that the model be developed to cover the following weekday time periods (the actual times to be modelled would be confirmed through analysis of traffic counts on the Silver Jubilee Bridge):

- AM peak period (0700-0900);
- PM peak period (1600-1800);
- Inter peak period (0900-1600); and
- Off peak (i.e. 1800-2400 and 0000-0700).

The above are proposed as they allow the most important periods of the day, in terms of demand and toll collection, to be modelled separately as well as over the whole day. This allows for the derivation of 12 hour and 24 hour traffic flows. These are required as the basis of a variety of applications such as scheme design, economic appraisal, accident, air and noise assessments etc. It should be noted that the off peak period model would be built largely on the basis of the inter peak trip matrix as data for this time period is not to be collected. It is not expected to be validated to the same level as the other modelled time periods. It is included as it may be required as part of the accident analysis. This will depend on discussions with the DfT.

Analysis of traffic count data would be required for the purposes of toll revenue calculations, i.e. the derivation of annualisation factors, and is a task not covered specifically within this document. Clearly, for the purposes of annualisation within TUBA and the accident analysis, a set of factors is also required and this would need to be consistent with those assumed for revenue forecasting. Once the project is underway, clarification would be required in relation to the basis of any annualisation factors to be used.

2.4 Development of Trip Matrices

Key to the development of the traffic model will be a set of robust trip matrices. Tasks proposed include the review and development of:

- The zoning system, especially disaggregation of zones to census output area and ward level;
- Zone centroid connectors (number and location) and distances;
- The derivation of trip matrices by trip purpose and vehicle type;
- User classes in the assignment (at least commuter, non commuter and employers business trips);
- Generalised cost parameters, by user class and vehicle type based on WebTAG advice;

- Time periods modelled (peaks, inter-peak and all day); and

- The inclusion of traffic model zones for "special traffic generators", e.g. Liverpool Airport and other sites that are relatively local and have the potential to significantly affect forecast traffic volumes for the MG, including economic development zones and regeneration areas.

After the model review it is expected that the development of the trip matrices would be by trip purpose and vehicle type for the time periods previously mentioned. The following is proposed as it is consistent with the National Trip End Model (NTEM) and variable demand modelling advice (TAG Unit 3.10.3). It is understood from discussions with the DfT that further advice, in draft form at the time of writing, in relation to travel market segmentation for toll roads, will be forthcoming and may affect this specification.

The following trip matrices are proposed to meet the DfT advice that discretionary and non-discretionary trips be maintained separately through to variable demand assignment.

For car, taxi and light goods vehicles:

1. Home based work (HBW);
2. Home based other (HBO);
3. Home based shopping (HBS);
4. Home based education (HBE); and
5. Non home based other (NHBO).

For car only

6. Home based employers business (HBEB); and
7. Non home based employers business (NHBEB)

For light goods vehicles

8. Employers business (EB)

Other goods vehicles

9. All purposes combined

These would be aggregated into the following assignment user classes:

User Class	Description
1	Cars and lights – Commuting
2	Cars and lights – Employers Business
3	Cars and lights – Shopping
4	Cars and lights – Education
5	Cars and lights – Other
6	Other goods vehicles

Table 2-1: Assignment User Classes

At the time of writing, it is understood that a discount may be given to users of each tolled facility if they are considered to be residents of the area administered by Halton Borough Council or if they are expected to be frequent users of the Mersey Gateway. If this requirement is retained, then consideration would need to be given to assigning the above user classes for residents, frequent users and non residents.

Trip matrices are expected to be assembled from a variety of data sources, which include:

- New and existing Roadside Interview Surveys (RSIs);
- Household Travel Survey (HTS) for Merseyside;
- Census Journey to Work data; and
- Other strategic traffic models such as the MidMan traffic model.

These are discussed in further detail in Sections 2.4.1 to 2.4.5 below.

2.4.1 Trip Matrices

It is generally considered desirable to include as much observed information as possible in a traffic model to reduce uncertainty.

In order to include observed information as the basis of the trip matrices, it is proposed that additional observed information be obtained. These surveys would be undertaken in locations to complement existing data.

In general modelling terms, the following are the types of trip that need to be observed:

A. Internal to internal trips (depending on the definition of internal);

B. Internal to external and the reverse; and

C. External to external.

2.4.2 Roadside Interview Surveys

Whilst analysis of the Merseyside County Household Travel Survey (HTS) data is proposed, other observed data from a series of roadside interview surveys is also considered necessary to capture

traffic movements that have the potential to affect forecast traffic volumes for the MG that are not obtained in a HTS.

Traditionally, personal trips that are internal to internal are captured in household travel surveys as these are often short-distance and not easily captured by a limited number of roadside interviews.

A series of roadside interview surveys (RSIs) are proposed as they are the best means available to intercept travellers and obtain details of journeys made, including trip purposes. These are proposed at a series of 19 such sites, as well as the collation of data from roadside interviews collected for other traffic models, such as the Merseytram traffic model, Warrington traffic model, the Birkenhead traffic model and the south Liverpool traffic model. Other data may be available from Cheshire county Council and the Omega project in Warrington and this would be sought.

2.4.3 Household Travel Survey

Given that there is only likely to be limited observed information that can be used for the internal to internal trip making there is a case for developing parts of the internal component of the overall trip matrix from household travel survey data.

Analysis of the Merseyside HTS is proposed but it is expected only to provide traffic movements to infill those parts of the trip matrix not observed at the RSI locations.

The area over which the data is to be used is likely to be extensive and the results of the analysis applied over a wide area within the traffic model although providing only a relatively small proportion of the total number of trips in the matrix.

It may be feasible that information on other types of trips (i.e. not wholly internal trips) could be obtained from census journey to work (JTW) information. This could be used for model calibration purposes. Other types of data such as ITIS data are not considered appropriate for deriving trip patterns due to the problem of determining vehicle type and trip purpose splits by time of day. The latter is required due to the needs of toll demand modelling and DfT requirements in relation to variable demand modelling.

2.4.4 Other Traffic Surveys

(i) Heavy Goods Vehicle Trips

Whilst the HTS and the RSIs should be able to capture the vast majority of trip making in the study area, other surveys could also be required to obtain information on the trip making characteristics of goods vehicles making trips within the internal modelled area.

Specific areas of development, in particular the industrial areas that lie within close proximity to the SJB and those that are located at Ellesmere Port, may need to be surveyed to obtain additional information for the traffic model matrices.

These additional HGV surveys will only be required if it becomes apparent that the roadside interview surveys have not captured the vast majority of heavy goods vehicle trips that could potentially use the Mersey Gateway.

These surveys are not proposed as part of the current scope but are mentioned here as there may be a requirement to collect such data if the roadside interview surveys do not collect sufficient adequate data on such trips. The budget proposal does not include these.

(ii) Motorway Traffic

For the model to be able to replicate drivers' route choice in a consistent and realistic manner it will be necessary for the forecast traffic volumes on various motorways to be as completely representative as possible in the traffic model. This is proposed as a high proportion of the drivers on these roads are travelling longer distances and it would be unlikely that either the RSIs or the HTS would have captured many of these. Interviewing on the approaches to Motorways is not permitted and in any case a considerable number of such interview sites would be required given the number of motorways in the study area.

There may be a need for some limited registration plate matching to estimate the number of vehicles that are through-travelling on the M6 (say between J19 and J26) and perhaps on other motorway routes. However, we propose to obtain RSI data from other sources (such as the MidMan traffic model) before embarking on such a data collection exercise.

The budget proposal does not include these registration plate surveys.

Whilst it is desirable for traffic movements between various motorways to be captured, this is difficult to achieve whilst retaining the trip purpose level information, so a mechanism will be required to estimate this if such data is used in the traffic model. Whilst this might seem unsuitable, it should be remembered that the data is required mainly for the purposes of assigning sufficient trips to the motorways to obtain robust route choice in the model (including between motorways) and hence model validation.

(iii) Liverpool Airport

Whilst the surveys proposed should obtain information on trip making for the majority of trips, other surveys may be required relating to significant traffic generators. In this context, the largest traffic generator that would warrant special consideration is Liverpool John Lennon Airport. The airport is located approximately 10 kilometres from the MG.

According to "The Future of Air Transport", White Paper, published on 16th December 2003, Liverpool John Lennon Airport has seen rapid recent growth. Passenger numbers have quadrupled in the last five years, and in 2005 were 4.4mppa. Forecasts suggest that by 2030 throughput could be two or three times current levels, and the airport's master plan caters for up to 12mppa.

As traffic models are not able to easily replicate the type and number of journeys to complex transport interchanges such as airports, it is proposed that information about trips to the airport, including those made by passengers and visitors as well as workers, be obtained to estimate the number of trips to the airport by mode.

This would then be used as the basis of forecasts of future use to determine growth factors by trip purpose and mode. Existing information for highway trips is available from the South Liverpool traffic model surveys and these would be reviewed for adequacy and incorporation into the traffic model. Other information on mode would be sought from Liverpool Airport, particularly origin-destination and mode split data, which is to be incorporated if appropriate.

It is understood that the DfT has its own airport data and independent estimates of forecast growth for Liverpool Airport and it may be necessary for these to be used as the basis of the forecasts for appraisal purposes.

2.4.5 Matrix Building

The building of the base year trip matrices is expected to be based on a hierarchy of the data sources. Generally, this would be based on the most statistically robust data that has been collected. In this sense the matrices would be built based on:

- Roadside interview data (2006);
- Roadside interview data (historic);
- Household Travel Survey (2005/06);
- Census journey to work data; and
- MidMan and M60 Box traffic model cordon matrices (by purpose if available).

In relation to the household travel survey, once made available, the data would be reviewed for robustness and used for the derivation of trip generation (and attraction) rates by trip purpose and trip distribution by purpose. Once estimated, these data would be combined with other analysis of the HTS, JTW data and land use information (census workplace data) to provide trip productions and attractions for the internal traffic model zones to feed into the trip distribution process. The analysis is proposed within Access, SPSS and ERICA or CUBE/Voyager. The output would be a series of synthetic highway trip matrices by time period and trip purpose to be merged with other datasets.

2.5 Toll Choice Modelling

The value of travel time savings (VTTS) is a critical parameter in toll road appraisals and, through its application, produces the dominating user benefit.

In order that robust toll choice modelling is undertaken it is important that the underlying trip matrices be developed at a disaggregate level to allow segmentation of the willingness-to-pay market. This disaggregation is expected to be at a level similar to that used for the assessment of variable demand (based on DfT guidance) and is to include trip purpose and vehicle classes as per Table 2-1: Assignment User Classes above. Whilst these are similar to those used for appraisal, we believe that these would also form a robust basis for financial appraisal. These would be reviewed as part of the stated preference survey specification.

The inclusion of an increased number of user classes to represent different income groups by purpose would be considered. The travel market, as defined above, could be split into (say) three based on a distribution of average values of travel time by segment and variations either side of this based on the calculated standard deviation from the mean. Alternatively, a weighted average value of travel time could be used. It is understood that differential tolls by trip purpose and vehicle type by time of day may be proposed and hence the Stated Preference (SP) survey would need to be designed to capture this (see 3.5.1 below).

The form of toll choice modelling proposed is a link penalty approach as opposed to the development of a logit toll choice model. The latter would require implementation within software that can deal with such toll choice modelling and is outside the capabilities of SATURN in its current form.

There is a desire to use SATURN as the existing model runs within SATURN and it is compatible with the software that has been developed to date by the DfT for variable demand modelling (Diadem).

In order to identify and quantify willingness to pay and potentially perceived values of tolls, the derivation of values of travel time, based on stated preference (SP) surveys, is proposed. This is expected to be undertaken by expert third parties based on either Computer Aided Telephone Interviews (CATI) or CAPI (personal) surveys. These would be specified and reviewed by Mott MacDonald as appropriate. In order to specify the surveys we propose to engage the services of a specialist Stated Preference consultant to understand the likelihood of the SP being able to provide values of travel time for different components such as travel time reliability and discount effects of electronic toll payment methods.

The exact nature of the toll choice modelling has to be decided but is expected to include user classes as defined above, i.e. a minimum of three user classes for commuters, non-commuters and employers business trips split by income group and by time of day.

The precise detail of the approach to be adopted would be determined during sensitivity testing of the values derived from the SP and their effect on forecast traffic volumes.

In developing values of time for potential users of the Mersey Gateway, consideration would also be given to deriving values for those on employers business trips, especially commercial vehicle traffic, that have the potential to use it. These are not generally captured in SP surveys and specific freight and commercial vehicle operators could be identified and interviewed to determine their value of time as it relates to the potential travel time benefits offered by the MG. Alternatively, values of time that have been developed for the DfT could be adopted.

Consideration would also be given to the future escalation of the values of time derived from the SP based on forecast changes in income (GDP), but this may depend on assumptions made in relation to real increases in toll levels proposed over time (if any).

Although it has been agreed to date that the proposed toll would be collected through manual collection at toll booths, it is suggested that in the future electronic (free flow) payment could be considered (given an opening year of 2014) and hence there may be a need for this to be considered and included in the SP surveys.

2.5.1 Stated Preference Surveys

In order to derive robust estimates of demand for the proposed MG it would be necessary for stated preference surveys to be carried out to determine the values of time (VoT) for the travel market segments to be modelled. This is expected to include commuters, non commuters and business travellers. The surveys would also be expected to cover different times of day for each segment of the travel market as VoT can vary by time period as well as by travel market segment. Those in scope would be identified from a select link in the current model on the SJB; this is expected to reveal that users are a mix of both local short distance and more remote long distance travellers.

It will be important for the SP to capture the VoT not only for those travelling for different reasons and times of day but also for freight traffic. The latter are not easily interviewed using the same criteria as commuters and will need to be identified and interviews carried out to determine how a sample of these potential users value travel time. This is because freight companies have to consider a wide range of criteria when assessing the benefits of using a toll road. It is worth noting that the DfT has published value of time for freight vehicles and there may be a requirement for such values to be used at least for economic appraisal.

It is proposed that an expert in SP be engaged in advance of the main SP survey to consider what component of willingness to pay can be accurately and reliably estimated, i.e. to determine the state of the art in the UK. This would form the basis of a tender document to be procured through the market Once tendered and a preferred supplier appointed, a pilot survey is expected to be carried out, after which some changes to the SP would be made and then the full survey would follow. It will be important for quotas within each segment to be set to enable the collection of an even spread of trip purposes (i.e. work, shopping, education, social / recreational trips etc.).

The results of the surveys would be a set of values of time and potentially other parameters for incorporation in the traffic model.

Once perceived values of time have been estimated for the various market segments these would be compared with the default (resource) values suggested by the DfT for economic assessment as provided in TAG Unit 3.5.6. There may be a requirement for two sets of forecasts to be provided based on DfT values of time and those determined from the SP. The set based on DfT guidance may be required for scheme appraisal. The views of the DfT would need to be sought on a range of issues in relation to the willingness to pay surveys and analysis.

2.6 Traffic Count and Journey Time Surveys

In terms of the validation of the traffic model, there would be traffic data requirements in relation to:

- journey time surveys;
- traffic counts; and
- other surveys, such as that of large traffic generators in the vicinity of the scheme as discussed above but also potentially including other significant traffic generators such as industry at Ellesmere Port.

For the assessment of the demand for a toll road, the need for model validation in terms of the modelled travel times becomes very important as this is essentially the basis of the decision to use the toll road. Hence a series of journey time survey analyses is proposed. These would be based on using ITIS data (from in-vehicle GIS units in the vehicle fleet).

Survey routes would be defined to capture routes where there is potential for route choice in competition with the MG as well as other routes (including the SJB itself).

Traffic counts would be required for validation screenlines and for “check” counts and could be a combination of both manual classified traffic (including turning) counts as well as automatic traffic counts. These would include at least a river screenline and others would be defined to allow the validation of the model to be illustrated locally. We would seek to use existing data as much as possible but have allowed for some new surveys to be undertaken.

2.7 Model Calibration and Validation

It is proposed that the traffic model be built and validated to 2006 data. The traffic model unit is expected to be an average weekday in June 2006 in Passenger Car Unit (PCU) equivalents.

As part of the development of a revised traffic model, it would be necessary for the model’s performance to be reported. This is normally undertaken against the criteria within DMRB (Volume

12A, Section 4.2.9, 4.4.34, and Table 4.2) for traffic count validation screenlines and journey times by time period modelled.

Trip distribution modelling is proposed due to the requirements of variable demand modelling and the estimation of local parameter values. Hence, a check is proposed of the trip distribution within the model, between modelled and observed travel patterns. This would be based on aggregated sector to sector traffic movements over a 12-hour period. The area of the model to be covered by this depends on the extent of observed information incorporated into the model.

Whilst validation of each of the time period models is proposed against the DMRB criteria, it should be noted that not all criteria are expected to be met in full in all cases for all screenlines and counts in all time periods.

2.8 Model Convergence

The levels of model convergence achieved in SATURN would also be reviewed and compared with the available guidance in DMRB Volume 12a.

The convergence criteria would be based on those in DMRB Volume 12a, Section 2, Part 1, which states that the acceptable value of convergence is when either 'Delta', is less than 1%, or the percentage of links with a flow change <5% is greater than 90% for four consecutive iterations. Whilst meeting these criteria would be the objective of the modelling process it cannot be guaranteed that such criteria be met.

Convergence of the demand model would also be reported. The criteria would be based on advice in TAG Unit 3.10.4 and the same caveats related to meeting the DfT criteria as stated above apply.

2.8.1 Software

It is proposed that the trip matrices be built in software such as ERICA or CUBE / Voyager and then re-formatted for input to SATURN for assignment. The variable demand modelling would be undertaken within Diadem.

Whilst Mott MacDonald has licences to use ERICA, CUBE / Voyager, SATURN and Diadem, it may be necessary for additional licences to be purchased.

2.9 Public Transport Modelling

There is a need for a public transport model to be developed as one of the main objectives of the Mersey Gateway is to improve public transport links across the river.

There is some modal competition for local trip making with regular bus services between Widnes and Runcorn and also between these towns and Liverpool and Warrington. The latter are either by bus or rail. One of the potential benefits to be provided by the MG would be the opportunity to improve the reliability of public transport.

We are aware of various public transport models covering the area in question, in whole or part, although these tend to be rail specific. There is a requirement for the public transport model to effectively model the likely effects of public transport proposals such as improved local bus services but not light rail. It is considered desirable that such a model be developed to allow the potential for users to switch modes (from public transport to car) to be modelled within Diadem.

To model the potential improvements in public transport due to the Mersey Gateway, a relatively detailed public transport model, able to model various forms of public transport, including increases in demand for public transport services as a result of decreased travel times, is required.

The public transport model specification will require careful consideration and is not specified here. Further investigation of existing models that could be used is ongoing and once further detail about these models and their availability is known, more detail will be provided. This we propose in the form of an inception task report and as part of this we would provide an estimate of the anticipated cost to build such a model. The budget provided allows only for this inception report as the degree of uncertainty over the cost of such a public transport model is too great.

3 Future Year Model

3.1 Trip Matrices

For the future year trip matrices, it is proposed to forecast the purpose and vehicle type matrices for the opening year, design year and interim years. These are currently 2014, 2019, 2024 and 2029.

It may be necessary to review the need for the interim years (2019 and 2024). This review would seek to identify whether the interim years have a significant effect on the economic appraisal of the scheme.

Factors would be derived from the latest version of TEMPRO (Ver5, dataset version 5.1) and National Road Traffic Forecasts (Great Britain) 1997, (NRTF 1997), to derive the reference case matrices and be applied as follows:

User Class	Description	Source of Growth Factor	Aggregate User Class
1	Cars, Lgvs – Commuting	TEMPRO – Commuting	HBW Cars
2	Cars – Employers Business	TEMPRO – EB	EB Cars
3	Lgvs – Employers Business	NRTF	EB Lgvs
4	Cars, Lgvs – Other	TEMPRO – Other	Other Cars
7	OGVs	NRTF	OGVs

Table 2-1: TEMPRO and NRTF Factors

In addition to the above, trip matrices for various growth scenarios would be developed in accordance with DfT advice in relation to assessing the economic benefits of a scheme. This would include consideration of the most likely situation and optimistic and pessimistic scenarios.

Not only would assumptions be made about the likely growth in demand for the road network but also in relation to the proposed changes to the road network that will provide the “do minimum” road network used as a basis for the economic assessment of the scheme. This is discussed below.

It has been assumed that it may be necessary for adjustments to be made to the forecasts to allow for other developments such as Liverpool Airport, economic development zones and regeneration areas that may not have been assumed within TEMPRO.

Some future year sensitivity testing of the land use assumptions may be required to meet DfT requirements. These would be expected to fall within either the optimistic or pessimistic scenario referred to above.

3.2 Transport Network

The road network assumed for future years would be reviewed and the most likely road network improvements assumed. For the do minimum situation, the network for example would be based on those projects with a high degree of commitment to build.

In determining this, a review of the Highways Agency's business plan would be undertaken, to allow for consistency, as well as local transport plans etc.

We would code the proposed MG into the model with any associated network changes. We also propose to research speed / flow relationships and capacity for similar bridges (such as the Severn Bridge and the Dartford River Crossing) in practice in the UK with a view to using values derived from this for the proposed Mersey Gateway.

For the optimistic and the pessimistic scenarios, i.e. the sensitivity tests, a range of other assumptions in relation to the transport network would be made (including the public transport network) that could potentially lead to either optimistic or pessimistic outcomes for the economic assessment of the scheme. Generally, in the pessimistic scenario, assumptions could be made in relation to higher investment in the future in public transport and the reverse in the optimistic.

In addition to the above are other tasks that are toll road specific and may be included within this scope:

- Derivation of annualisation factors (for TUBA, accident analysis, the traffic model and revenue forecasting); and

- Toll road strategy testing including sensitivity and scenario testing and changes to the road network to support the scheme.

3.3 Public Transport Model

In addition to making assumptions about the future levels of growth in demand for highway users, assumptions would be made in relation to future growth in public transport supply and demand (based on TEMPRO).

The extent of this work would depend on the nature of the public transport model that has been developed for use in assessing the effects of the MG. However, it would likely include assumptions about growth in demand for public transport as well as assumptions about potential changes to routes, frequencies and network extent (including potential upgrades).

3.4 Toll Choice Modelling

Future year toll choice modelling would be based on the results of the SP surveys and the results derived from it. The values of time determined from the SP surveys would be coded into the SATURN model as penalties based on their derived value and their equivalent "cost" by user class.

At this stage the assumptions to be made in relation to discounts for local users and frequent users would be tested.

Forecasts would be produced and comparisons made between the do minimum and the do something networks to assess the effects of the scheme, including forecast traffic volumes on the Silver Jubilee Bridge and the Mersey Gateway, effects on the Mersey tunnels and across screenlines etc.

3.5 Variable Demand Modelling

As an integral part of the process, whilst considering the demand for the MG, all future year traffic demand modelling would be undertaken within Diadem and the assignments within SATURN. Diadem has been produced to allow implementation of the DfT's advice on variable demand modelling.

Inputs to the process would be the reference case trip matrices (i.e. a hypothetical forecast that does not allow for any change in travel costs) by trip purpose and vehicle type including public transport skims. Other aspects of variable demand modelling would be in accordance with DfT advice as provided in TAG Units 3.10.1 through to 3.10.4 inclusive and in summary is expected to include:

- Modelling of responses including
    - trip generation,
    - trip distribution,
    - mode choice and
    - trip re-timing;
- Travel market segmentation to include commute, non commute and business trips;
- Realism (sensitivity to changes in fuel and income) and sensitivity testing (sensitivity to changes in the parameter values adopted for trip generation, distribution, mode choice and re-timing of trips); and
- Locally calibrated parameters for trip distribution (as a minimum).

In considering the effects of variable demand modelling we propose to report changes as a result of the responses modelled. In particular, it will be important to monitor changes in the forecast number of vehicles across the Silver Jubilee Bridge and the Mersey Gateway, trip distribution and vehicle kilometres travelled between the do minimum and the do something situations and the level of convergence achieved within both SATURN and Diadem.

3.6 Sensitivity Testing and Scheme Appraisal

3.6.1 Sensitivity Testing

It is anticipated that a wide range of sensitivity testing be undertaken including:

- Use of average values of time or distributions of values of time;
- Actual values of time by market segment;
- Differential tolls by time of day;
- Toll collection methods;
- Toll discounts; and
- Toll levels.

Further text on the use of the traffic model and it's outputs is provided in Section 3.7.

3.6.2 Scheme Appraisal

Once validated and forecasts prepared, the traffic model would be used to provide the output required for:

- economic and accident appraisal (included in this scope), and the wider economic effects;
- environmental appraisal, accommodating the full scope of investigation required to complete the outline business case; and
- evidence required to support the planning application and public inquiry process.

Model output would also be used to enable operational assessments to be undertaken in selected future years to inform the final scheme reference design and level of service specifications to be used to support the planning process and procurement.

The traffic models would also be used to appraise options for re-balancing the local transport infrastructure based on the adjusted role of SJB in providing a local river crossing, to support the Council's future Local Transport Policy, including options to improve public transport

(i) Economics

It has been assumed that, once the forecasts of traffic for the Mersey Gateway have been developed, there will be a requirement for the forecasts to be appraised according to DfT advice.

Accordingly, we propose to run the forecasts of traffic through the Transport Users Benefit Appraisal (TUBA) program. This is proposed for the most likely, optimistic and pessimistic scenarios for the forecasts years. It has been assumed that the latest version of the software available at the time will be used.

Inputs to the process will be traffic model outputs, including matrices of trips, travel times and distances and travel cost charges (tolls). Other inputs would be required from others in relation to capital, maintenance and operational costs over the 60 year appraisal period.

Outputs from the process will be a series of tables summarising the Transport Economic Efficiency (TEE), Public Accounts (PA) and the Annualised Monetary Costs and Benefits (AMCB) for each run of TUBA.

TUBA is expected to be run for the most likely, optimistic and pessimistic scenarios for the main set of traffic forecasts. In addition to this, forecasts are to be provided for each of the sensitivity and realism tests in accordance with DfT advice. Also, where other model runs are undertaken, for example the testing of sensitivities to toll charge levels, TUBA would also be run to summarise the economic effects.

For the final set of traffic forecasts and the realism and sensitivity tests (as required by the DfT), a summary report will be provided.

(ii) Accidents

As above, runs of the accident analysis would be undertaken as the forecasts of traffic become available. This would draw on previous work undertaken within Mott MacDonald's own software (Macsem) using default accident rates. This software has been developed as a more user friendly equivalent of the DfT's own COBA software.

Future work would build on the network files that have already been created for earlier accident analysis of the Mersey Gateway. It may be necessary for observed values for accidents to be used in part or whole and this would be confirmed early in the process with the DfT. If this is the case, then additional time and resources would be required for this work.

There may be a need to use Safenet for accident analysis but this has not been allowed for.

(iii) Financial Appraisal

It has been assumed that traffic model outputs will be required not only for the economic assessment and accident appraisal of the scheme but also for the financial appraisal. As such, it has been assumed that traffic model outputs will be provided as required for the various time periods and forecasts years by vehicle type. Work in relation to the derivation of annualisation factors and an assessment of ramp up has been assumed to be undertaken by others. However, there will be need for consistency between the factors used for financial appraisal, economic and accident analysis.

3.7 Reporting

It is proposed that reports be provided as follows:

- Traffic survey report;
- Local Model Validation Report; and
- Forecasting Report (including realism and sensitivity testing).

These would be produced generally in accordance with DfT guidance.

4 Programme

4.1.1 Base Year Traffic Model

It has been estimated that if work begins on the development of the traffic model in May 2006 it could be developed and validated within approximately 9 months.

The LMVR has been scheduled for completion in January 2007.

A draft programme of the tasks required to update the existing model is provided below. It assumes that traffic data from the RSIs is collected in June 2006. A more detailed programme is provided as **Appendix A**.

The following provides a draft programme of activities the delivery of which is proposed at the end of each month noted.

Draft Programme

Detailed model scope and method	April 2006
Road network coded	July 2006
RSIs	Undertake in June 2006
Journey time and traffic count surveys	Undertake, where necessary, in October 2006
Report of traffic surveys	July 2006
Household Travel Survey	September / October 2006 (if required)
Goods vehicle / freight surveys	September / October 2006 (if required)
Liverpool Airport and registration plate survey	September / October 2006 (if required)
Stated Preference Surveys	September / October 2006
Assemble trip matrices and merge	October 2006
Calibrate and validate traffic model	January 2007
Reporting (LMVR)	January 2007

4.1.2 Forecast Year Traffic Model

Once the base year traffic model has been validated, it is proposed that work commence on the traffic model forecasts. This work would entail the development of future year road networks for the most likely, optimistic and pessimistic scenarios (although the naming convention for these is expected to be changed by the DfT in the near future). At the same time, work can commence on the development of the future year trip matrices based on TEMPRO and NRTF, with adjustments for other developments such as Liverpool Airport.

An allowance of approximately 3 months has been made for the development of the future year road networks and trip matrices.

After this time, it is difficult to scope the range of activities required as it would essentially consist of a range of sensitivity tests and the provision of data. Some of these are required to comply with DfT advice but others would be required to test the veracity of the traffic forecasts and to assess the implications of alternative strategies. We have assumed that 2 months is set aside for this work.

The following provides a draft programme of activities, the delivery of which is proposed at the end of each month noted.

Draft Programme

Future year road network	February 2007
Future year trip matrices (reference case)	February 2007
Initial traffic forecasts for the Mersey Gateway	April 2007
Sensitivity testing, provision of outputs	July 2007
Reporting	July 2007.

Appendix A: Programme