



Model Auditing Process

Version 3.5

Overview



Management System Document - Procedure

Model Auditing Process (MAP) Overview – Traffic Schemes in London Urban Networks

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I Introduction to the Model Auditing Process

Clients of traffic schemes will usually commission an external expert to undertake traffic modelling. There is therefore a need for the client to audit such models to confirm they are fit for purpose. Traffic model development is a complex task that can be completed in a variety of ways, and the process of auditing a model can also therefore be challenging.

The Model Auditing Process (MAP) has been created by Transport for London (TfL) to simplify this process by providing a transparent and structured framework which leads all interested parties through model development, submission and auditing. Following this process should aid effective communications between those involved, resulting in efficient and streamlined progress towards model approval.

The purpose of this document is to explain MAP to all the parties involved and provide them with the necessary documents and guidance for submitting traffic modelling to TfL, at the detailed design stage, for auditing.

1.1 Traffic Management Act

The Traffic Management Act (TMA) was introduced in 2004 to control congestion and disruption on the road network. The Act places a duty on local traffic authorities to ensure the expeditious movement of traffic on their or adjacent road networks through the appointment of a Traffic Manager.

Transport for London has traffic management responsibilities for the Transport for London Road Network (TLRN) and the Strategic Road Network (SRN). Other parts of London's road network are managed by the London Boroughs and Highways England.

Under the TMA, the Traffic Manager has a Network Management Duty (NMD). Within TfL, the Road Space Management Operations Team (RSM-Operations) work on behalf of the Traffic Manager to ensure that the NMD has been fully complied with in the development, design and implementation of highway and traffic proposals impacting on London's major roads - the SRN and TLRN.

Part of the NMD is to ensure the best possible movement of all modes of transport at signal-controlled junctions in the network. The modes of transport that need to be considered are, in alphabetical order: cyclists, pedestrians, private vehicles (including freight) and public vehicles (including taxis).

Modelling can be a powerful tool in understanding the potential traffic impacts of proposals if used in an appropriate way. It can also enable strategies to be developed to mitigate adverse impacts.

TfL provides independent technical support to scheme promoters, in the form of a Scheme Impact Assessment Report (SIAR), previously the Traffic Scheme Supplementary Report (TSSR), to enable Surface Transport to make informed decisions when executing this part of the NMD. Paramount in any decision is whether the

scheme has a detrimental impact on average pedestrian maximum wait times or bus journey times.

1.2 MAP Applicability

MAP applies in all circumstances where RSM-Operations require traffic modelling to assess impact on the TLRN or SRN. However, where a Borough is the promoter of a scheme that does not impact on the TLRN or the SRN the use of MAP is advisory. All traffic models commissioned by and submitted to TfL are audited in accordance with MAP.

1.3 MAP and the TfL Traffic Modelling Guidelines

The TfL Traffic Modelling Guidelines and MAP are complementary. As illustrated within Figure 1 they provide a framework to deliver the modelling quality required by TfL for both base and proposed models from scheme consideration through to a detailed design.

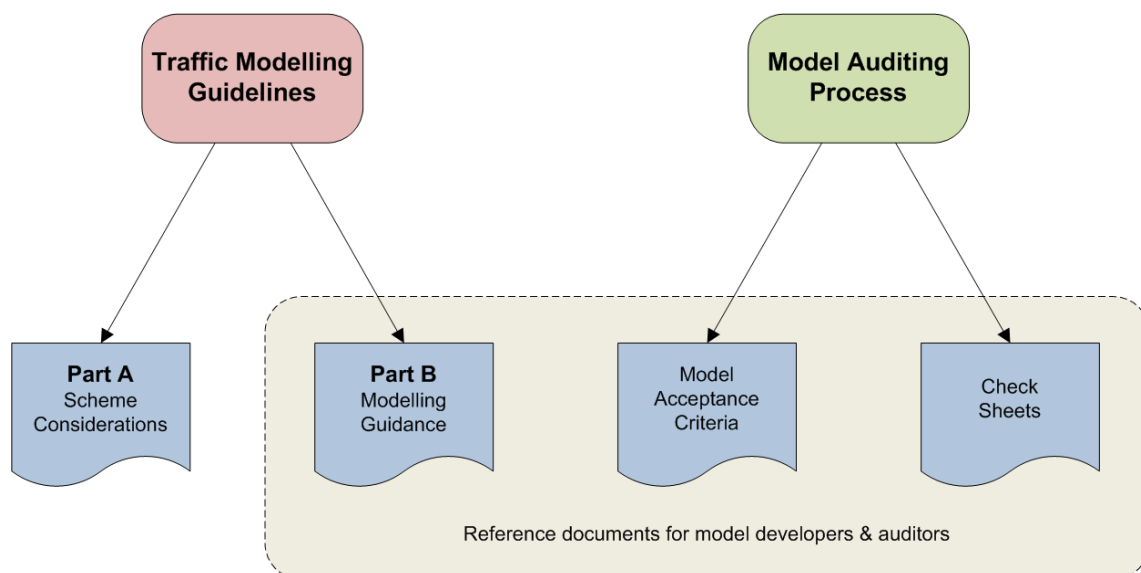


Figure 1: The traffic modelling support provided by TfL through MAP.

MAP defines the standards expected for all modelling submitted for TfL-sponsored schemes. The TfL Traffic Modelling Guidelines indicate recommended 'Best Practice' relating to the approach and methodology of model development in order to reach those standards. In this context MAP provides a structural procedure for auditing models against software-specific modelling standards prior to further phases of development. The TfL Traffic Modelling Guidelines provide overarching guidance on approaches which may be adopted to efficiently meet the standards defined by MAP.

MAP requires modellers and auditors to communicate at early stages of model development, to ensure a positive outcome within the modelling process. While TfL will audit the final scheme models and prepare the SIAR, scheme sponsors and their

agents have a responsibility to ensure that all scheme models meet the requirements set out within MAP. For this reason the Traffic Modelling Guidelines work alongside MAP to provide practical advice on the choice of modelling software and how to maximise the efficiency of the scheme design process for each tool (see Figure 2).

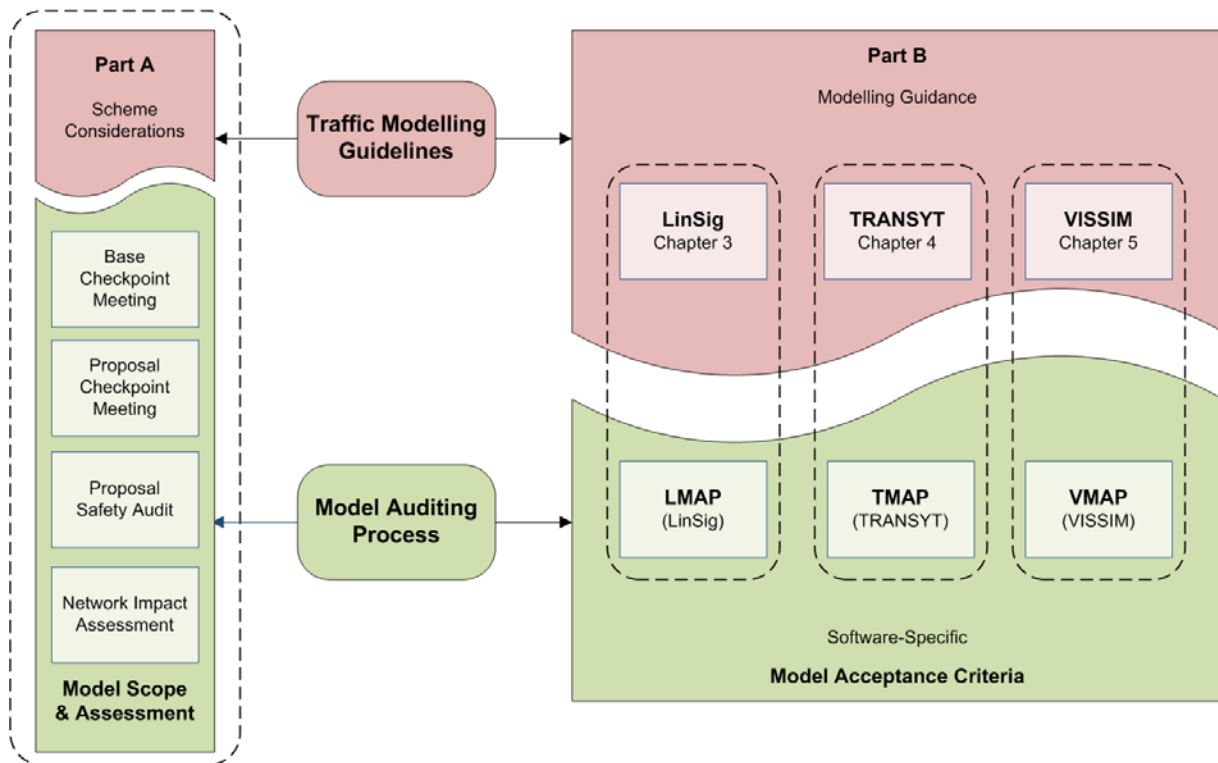


Figure 2: The detailed association between the guidance provided within the TfL Traffic Modelling Guidelines and MAP¹.

1.4 Fit for Purpose Modelling

The level of detail and the accuracy of a model must reflect the purpose for which the model is intended. The objectives of a scheme will directly influence the type and purpose of any prerequisite modelling and what software will provide the most appropriate comparative data. These will be agreed during MAP Stage 1 to define what modelling will be deemed 'fit for purpose' to assess the proposed design.

For a specific scheme a model may pass through a number of development phases, and at each subsequent stage the required level of detail and modelling accuracy increases. Common stages of development can be expressed as; study phase, business case support, option testing, developing preferred option and scheme approval. MAP formally applies to the final approval stage of the process but TfL may be engaged during previous design phases within MAP Stage 1 as described in section 2.3.

¹ Guidance for Aimsun will be included in TfL Traffic Modelling Guidelines version 4.

1.5 Reference Documents

Document Number	Title
SQA-0507	Guidance Note: Traffic Modelling Guidelines – TfL Traffic Manager and Outcome Delivery Best Practice
SQA-0685	MAP Engineer Guide for DE, CE & MAE
SQA-0544	Model Auditing Process – Stage 1 Check Sheet
SQA-8670	Aimsun Model Auditing Process – Stage 2a Check Sheet
SQA-8671	Aimsun Model Auditing Process – Stage 2b Check Sheet
SQA-8672	Aimsun Model Auditing Process – Stage 3 Check Sheet
SQA-8673	Aimsun Model Auditing Process – Stage 4 Check Sheet
SQA-8674	Aimsun Model Auditing Process – Stage 5 Check Sheet
SQA-0545	LinSig Model Auditing Process – Stage 2 Check Sheet
SQA-0546	LinSig Model Auditing Process – Stage 3 Check Sheet
SQA-8675	LinSig Model Auditing Process – Stage 4 Check Sheet
SQA-0547	LinSig Model Auditing Process – Stage 5 Check Sheet
SQA-0523	TRANSYT Model Auditing Process – Stage 2 Check Sheet
SQA-0524	TRANSYT Model Auditing Process – Stage 3 Check Sheet
SQA-8676	TRANSYT Model Auditing Process – Stage 4 Check Sheet
SQA-0525	TRANSYT Model Auditing Process – Stage 5 Check Sheet
SQA-0526	Vissim Model Auditing Process – Stage 2a Check Sheet
SQA-0527	Vissim Model Auditing Process – Stage 2b Check Sheet
SQA-0528	Vissim Model Auditing Process – Stage 3 Check Sheet
SQA-8677	Vissim Model Auditing Process – Stage 4 Check Sheet
SQA-0529	Vissim Model Auditing Process – Stage 5 Check Sheet
SQA-0530	MAP Stage 5 SQA-0640 Compliance Check Sheet
SQA-0448	TfL Signal Design Review Sheet
SQA-0640	Policy, Standards and Guidance to Procedures for the Design of Traffic Signals
SQA-8569	Scheme Impact Assessment Report

2 MAP Overview and Involved Parties

There are six stages to a MAP submission:

- Stage 1: Scheme & Network Scope Meeting (Base Models);
- Stage 2: Calibrated Base Model Submission;
- Stage 3: Validated Base Models Submission;
- Stage 4: Proposed Models Checkpoint Meeting;
- Stage 5: Proposed Models Submission; and
- Stage 6: Submission of Scheme Impact Assessment Report (SIAR).

The parties involved in these MAP Stages are described in Table I along with a basic description of the role.

Table I: Task description for the different parties involved in MAP.

Role	Title	Description
Promoter	<i>P</i>	The person responsible for delivering and project managing the proposal.
Design Engineer	<i>DE</i>	The engineer responsible for creating the modelling for the Promoter.
Checking Engineer	<i>CE</i>	The engineer responsible for checking and signing off the Design Engineer's work as fit-for-purpose for the Promoter.
TfL Signals Auditing Engineer	<i>SAE</i>	The engineer responsible for checking and safety approving the Proposal.
TfL Model Auditing Engineer	<i>MAE</i>	The engineer responsible for auditing the modelling and assessing the network impact of the scheme.
TfL Network Assurance Engineer	<i>NAE</i>	The RSM-Operations engineer responsible for assessment, then approval/rejection of the Promoter's proposal (under the TMA).

Lack of experience on behalf of the Design Engineer (DE) is a common reason for modelling to not successfully pass through scheme audit. The scheme Promoter (P) is advised to ensure that the person(s) engaged to develop the modelling related to any scheme meet the following requirements:

- Considerable modelling experience with relevant software;
- Considerable experience in on-site data collection of traffic control parameters identified in the TfL Traffic Modelling Guidelines, including saturation flows, degrees of saturation, lane utilisation identification and measurement of Underutilised Green Time;
- A good understanding of the capabilities of microprocessor-based controllers, particularly with respect to interstage design and phase delays; and
- Experience of modelling microprocessor-based controllers using modelling products such as LinSig.

The skills outlined above should also exist at a senior (i.e. Checking Engineer) level for preliminary auditing prior to delivery of any traffic modelling within MAP.

2.1 Software-Specific MAP

MAP is designed to give a common structure for all model submissions. However, for different software types an auditor will apply distinct criteria during MAP Stages 2, 3 and 5 when assessing the quality of the traffic modelling. MAP is therefore currently available for the four most common traffic modelling packages used for scheme appraisal within TfL:

- Aimsun Model Auditing Process (AMAP) – see section 4.
- LinSig Model Auditing Process (LMAP) – see section 5.
- TRANSYT Model Auditing Process (TMAP) – see section 6.
- Vissim Model Auditing Process (VMAP) – see section 7.

2.2 Scheme Progression through MAP

The following section contains an idealised representation of each party's involvement during the progression of MAP.

In summary, the P engages a DE to develop traffic modelling for their proposed scheme. The traffic modelling is internally assessed by a Checking Engineer (CE), before being submitted to the Model Auditing Engineer (MAE) for auditing.

Standardised check sheets are used for communication between the DE, MAE and SAE during MAP Stages 1 to 5.

2.3 MAP Stage 1

On initiation of the modelling works for a scheme, the P or his/her representative sets up a Scheme & Network Scope Meeting with all parties listed in Table 1. This meeting discusses the scheme, and the modelling work that is required for both base and proposed modelling stages.

It is recommended that Stage 1 meetings occur prior to the scheme detailed design being developed. This is to ensure that all TfL knowledge and requirements are known

to the P and DE prior to development of the scheme. It provides an opportunity for the DE to record details for future submission and to ensure all parties understand their roles and responsibilities within MAP.

Agreed details of the modelling works and notes from the Stage 1 meeting are to be compiled by the DE and distributed to all parties. The MAE will then verify the contents to ensure all relevant information has been placed on record for future reference. If there are incomplete checks the MAE will contact the DE, as a representative of the P, for further information.

A Modelling Expectations Document (MED), which summarises the agreed modelling requirements, is to be produced by the MAE with contributions from the P, DE and SAE. A template to assist the MAE in producing an MED is available if required. A submission cannot progress onto the software-specific MAP Stage 2 without a completed MAP Stage 1 check sheet (SQA-0544) and MED.

2.4 MAP Stage 2

For LMAP and TMAP, a single calibrated base model is prepared by the DE. For AMAP and VMAP, the DE prepares a single, non time-specific skeleton base model submission for Stage 2a, and a calibrated Aimsun/Vissim base model submission for all time periods for Stage 2b. For AMAP, LMAP, TMAP and VMAP the modelling should be assessed by the CE, and signed off as fit for purpose by both the DE and CE prior to submission to TfL.

The fit for purpose modelling is then submitted to TfL for audit by the MAE. The MAE will then accept or reject the submission based upon known criteria. If a submission is rejected it will be returned to both the P and DE, with MAP Stage 2 check sheets indicating required areas of further development. In instances where models are rejected at this stage, the DE and MAE will liaise to ensure the MAE is satisfied with the standard of resubmitted models.

2.5 MAP Stage 3

Validated base models for each time period under consideration should be prepared by the DE, authorised by the CE and signed off by both using the MAP Stage 3 check sheet. A check sheet should be provided for each base model during MAP Stage 3.

The models and check sheets are then submitted to TfL for audit by the MAE. The MAE will then accept or reject the models. In instances where models are rejected at this stage, the DE and MAE should liaise to ensure the MAE can become satisfied with the standard of the model development in order to accept the modelling as validated and thus fit for purpose.

2.6 MAP Stage 4

Following approval of the base models within MAP Stage 3, the P, or his/her representative, should set up a meeting with all parties listed in Table 1 on page 8. The meeting should continue from details documented in Stage 1, and shall discuss the scheme proposals and accordingly, the requirements for the proposed models (if different to those identified in Stage 1). At this stage the proposed model outputs should be discussed with specific reference to an agreed strategy for signal timing optimisation, and the optional provision of usable controller signal timing plans. The DE and CE can reference the TfL Traffic Modelling Guidelines for further information on proposed model optimisation.

Minutes of the Stage 4 meeting, and agreed details of the modelling works, are to be compiled by the DE and distributed to all parties listed in Table 1. The MED is to be updated where necessary and the Stage 4 check sheet completed by the DE and MAE.

2.7 MAP Stage 5

The DE will submit proposed method of control changes that are compliant with SQA-0640². These will be accompanied by a MAP Stage 5 SQA-0640 Compliance check sheet (SQA-0530) to the TfL Signal Auditing Engineer (SAE) for all junctions affected within the scheme.

The SAE will assess changes to junction design using information contained within SQA-0448³. Where the proposals meet TfL standards the SAE will submit the MAP Stage 5 SQA-0640 Compliance check sheet to the P/DE and MAE, thus authorising the design and allowing progression into MAP Stage 5. The MAE cannot undertake a MAP Stage 5 audit without a completed SQA-0640 Compliance check sheet.

Proposed models (based on the validated base models approved during MAP Stage 3) for each time period under consideration are prepared by the DE, endorsed by the CE, and signed off by both parties as fit for purpose. These models and accompanying MAP Stage 5 check sheets are then submitted to TfL for audit by the MAE. A software-specific check sheet should be used for each proposed model.

In instances where models are rejected at this stage, the DE and MAE will liaise to encourage development of fit for purpose modelling. This will ensure the MAE is satisfied with the standard of the models and can accept them for assessment.

2.8 MAP Stage 6

The P will prepare a partially completed SIAR with help from the DE, and submit this to TfL. The MAE and SAE will complete their respective components of the SIAR and return it to the P.

² *Policy, Standards and Guidance to Procedures for the Design of Traffic Signals*, Specification SQA-0640, Issue 1, Asset Management Directorate, Transport for London, 2016.

³ *TfL Signal Design Review Sheet*, Specification SQA-0448, Issue 6, Transport for London, 2013.

The P can respond to both TfL auditors to discuss any issues they may have with the content of the SIAR and, at the auditors' discretion, amendments can be made prior to closure.

The MAP is completed when the P submits the SIAR to RSM-Operations.

It is possible, but not common, that the P will choose not to submit the proposal to RSM-Operations. If this is the case, it is recommended that the P or DE provides written confirmation to the MAE and SAE stating that the proposal has completed MAP Stage 6 and that no further work is required.

If the proposals are to be submitted at a later date, this date should be no later than two years after the completion of the initial MAP. If a submission is delayed the road network should be reviewed by the DE and MAE to ensure that the network has not undergone major changes prior to submission of the SIAR.

2.9 Communication

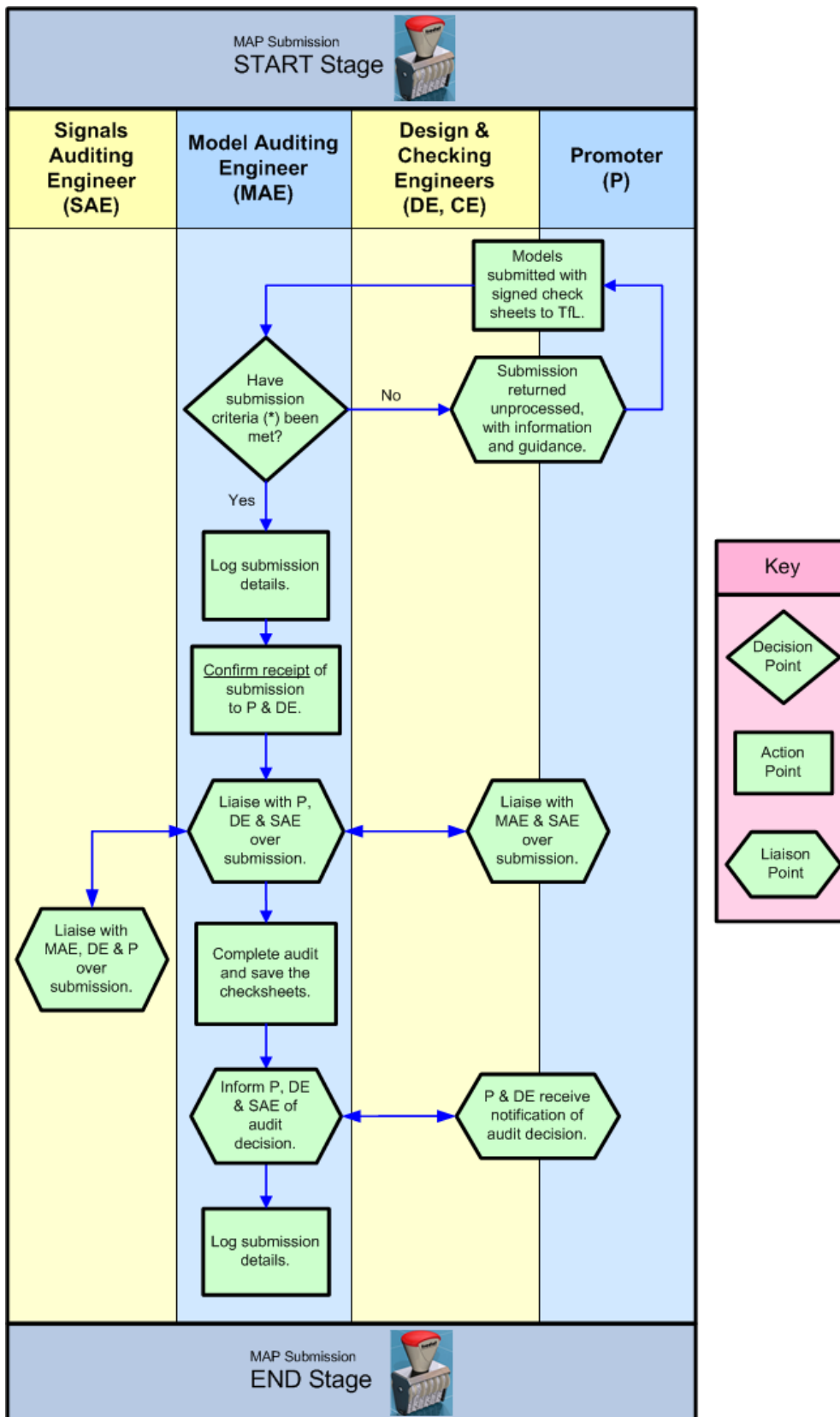
Formal submissions at all MAP stages should be sent to the following email address: RSMSchemeAssessments@tfl.gov.uk. Formal responses from the MAE and SAE will also be copied to this address. Failure to formally submit modelling works at all stages of MAP may result in delays in progress of the model audit.

The P, DE and CE are positively encouraged to contact the MAE to clarify any issues relating to MAP, their role responsibilities, stage submission requirements or check sheets (as detailed in section 4 for AMAP, section 5 for LMAP, section 6 for TMAP and section 7 for VMAP).

2.10 Submission Process

Information and traffic model submissions are required during three of the six MAP stages outlined in section 2.2.

Whilst each MAP stage has individual auditing requirements, a uniform administration process is used to handle the information submissions associated with each stage, as illustrated in Figure 3. This outlines key points for decision, liaison and action for all interested parties following a complete MAP. Figure 4 shows the acceptance criteria which determine whether a TfL auditor will complete a MAP stage for the submission.



(*) – Submission criteria shown in Figure 4

Figure 3: Submission process associated with MAP.

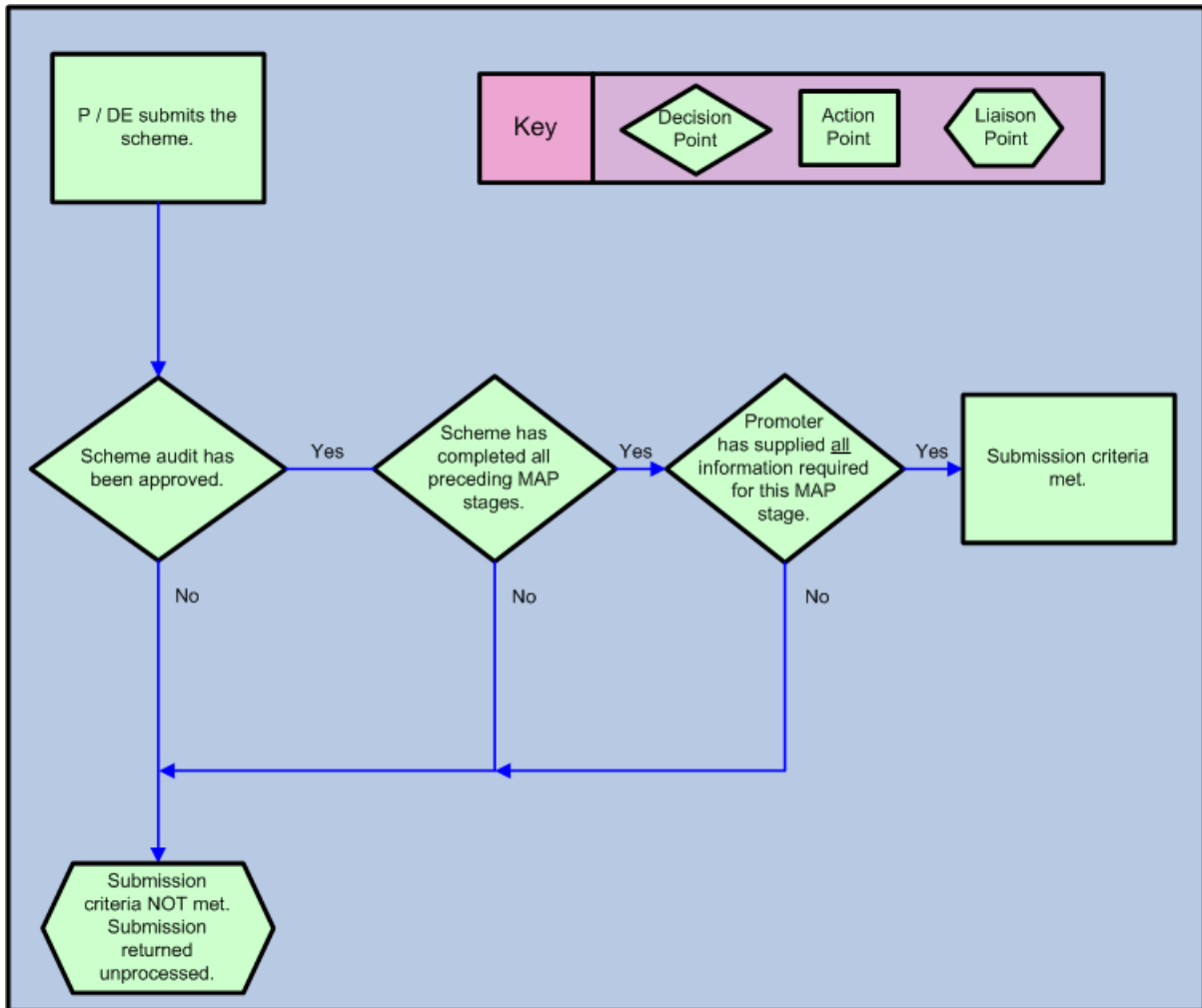


Figure 4: Criteria for accepting MAP submissions.

3 Generic MAP Stages

MAP is structured to include non-software-specific stages at the onset (Stage 1) and completion (Stage 6) of the scheme design and approval process (see Figure 5).

These stages are software independent because they collate information from several streams to both determine the overall purpose of the scheme and finally to assess whether that purpose has been satisfied within the proposed design.

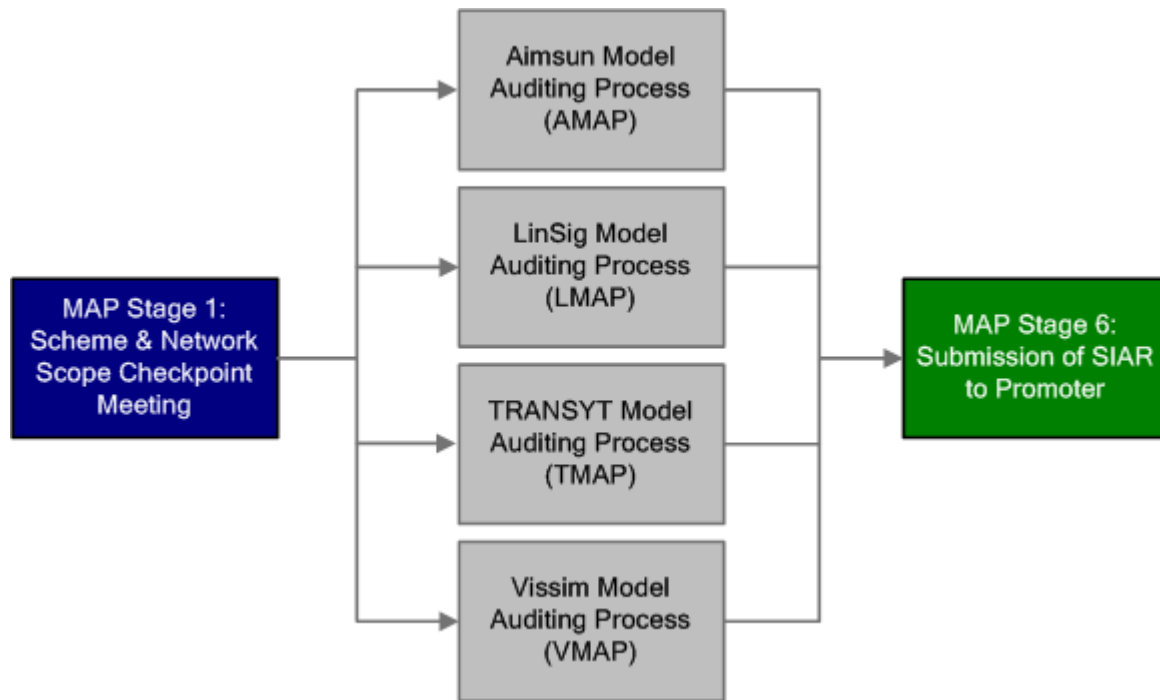


Figure 5: Software-independent stages within MAP.

The roles and responsibilities of MAP participants within these software-independent stages are summarised in Table 2 and Table 3. A formal check sheet (SQA-0544) and the MED are retained after the completion of MAP Stage 1 to provide a benchmark for discussions during MAP Stage 4. An SIAR is produced during MAP Stage 6 and the process is declared complete when the P submits the SIAR to RSM-Operations.

Table 2: TfL Model Auditing Process (MAP) Summary Sheet - Stage 1.

MAP Stage 1 - Scheme & Network Scope Meeting		
Roles	Key Responsibilities	
Promoter Representatives	P	<ol style="list-style-type: none"> 1. Attend meeting to understand the process, roles, and responsibilities under MAP. 2. Agree MED content with the MAE.
	DE	<ol style="list-style-type: none"> 1. In conjunction and with agreement of P/SAE/MAE, compile a Baseline List of all TfL-referenced junctions for which there are proposals affecting the Method of Control and/or the road layout. 2. In conjunction and with agreement of the P/SAE/MAE, compose a Baseline List of all TfL-referenced junctions which are to be included in the Network as the 'Study Area'. 3. In conjunction and with agreement of the P/SAE/MAE, document the software version to be used for modelling and whether controller-compliant timings are a required output. 4. Formally submit the 'Fit for Purpose Statement' for each Base Model and the agreed details of the scheme/modelling, as set out above, to P/SAE/MAE. 5. Agree MED content with the MAE. 6. Formally submit the DE-signed MAP Stage 1 check sheet (SQA-0544) to the P/MAE.
	CE	None.
TfL Representatives	SAE	<ol style="list-style-type: none"> 1. Agree and obtain the DE-created Baseline List of all TfL-referenced junctions for which there are proposals affecting the Method of Control and/or the road layout. 2. Agree MED content with the MAE.
	MAE	<ol style="list-style-type: none"> 1. In conjunction and with agreement of P/SAE/DE, compile a Baseline List of all TfL-referenced junctions for which there are proposals affecting the Method of Control and/or the road layout. 2. In conjunction and with agreement of the P/SAE/DE, compose a Baseline List of all TfL-referenced junctions which are to be included in the Network as the 'Study Area'. 3. In conjunction and with agreement of the P/SAE/DE, document the software version to be used for modelling and whether controller compliant timings are a required output. 4. In conjunction and with agreement of the P/SAE/DE write the 'Purpose Statement' for each Base Model and the agreed details of the scheme/modelling. 5. Produce the MED with input and agreement from the P/SAE/DE. 6. Complete the MAE section of the MAP Stage 1 check sheet (SQA-0544).
	NAE	Attend meeting to understand the process, roles, and responsibilities under MAP.

Table 3: TfL Model Auditing Process (MAP) Summary Sheet - Stage 6.

MAP Stage 6 – Submission of SIAR		
Roles		Key Responsibilities
Promoter Representatives	P	<ol style="list-style-type: none"> 1. Complete relevant sections within the SIAR with help from the DE. 2. Formally submit the partially completed SIAR to SAE/MAE. 3. Liaise with the SAE/MAE to receive the completed SIAR. 4. Decide whether to submit the Proposal to RSM-Operations.
	DE	<ol style="list-style-type: none"> 1. Assist P in development of partially completed SIAR. Include all model output tables required. 2. Contact the SAE and/or MAE if you have any queries, need further clarification or disagree with the contents of the completed SIAR received from the SAE/MAE (NB these issues are ideally resolved through discussion prior to the writing of the report).
	CE	None.
TfL Representatives	SAE	<ol style="list-style-type: none"> 1. Complete the relevant sections of the SIAR. 2. Agree SIAR content with the MAE. 3. Liaise with the P/DE/MAE should they have any queries, need clarification or disagree with the contents of the SIAR.
	MAE	<ol style="list-style-type: none"> 1. Complete the relevant sections of the SIAR. 2. Agree SIAR content with the SAE. 3. Liaise with the P/DE/SAE should they have any queries, need clarification or disagree with the contents of the SIAR. 4. Submit the completed SIAR back to P/DE/SAE.
	NAE	None.

4 Aimsun MODEL AUDITING PROCESS (AMAP)

An overview of AMAP is given in Figure 6, identifying the seven AMAP stages and the intermediate sequence of events that occur during the auditing process. This includes when formal meetings between MAP parties should occur, when model submissions should be made and what criteria need to be met before proceeding to the next MAP stage.

The roles and responsibilities of all AMAP participants are summarised in Table 4 to Table 7.

Formal check sheets are submitted at the end of all MAP Stages. Stages 1 and 4 are considered complete when the P and DE have received a signed and dated check sheet from the MAE. Stages 2a, 2b, 3 and 5 are considered complete when the relevant check sheets are signed as “Accepted” by the MAE. The version of the model to which an “Accepted” sheet applies is the only one admissible as part of AMAP. If for any reason modelling for a particular stage has to be amended, it will have to be fully re-submitted at that stage of the process and a new check sheet signed as “Accepted”.

Signed copies of the completed check sheets and the “MAP Stage 5 SQA-0640 Compliance Sheet(s)” (SQA-0530) will be scanned and archived by TfL for Quality Assurance (QA) purposes. This provides a reference for the MAE when auditing the signal control data in the DE’s models.

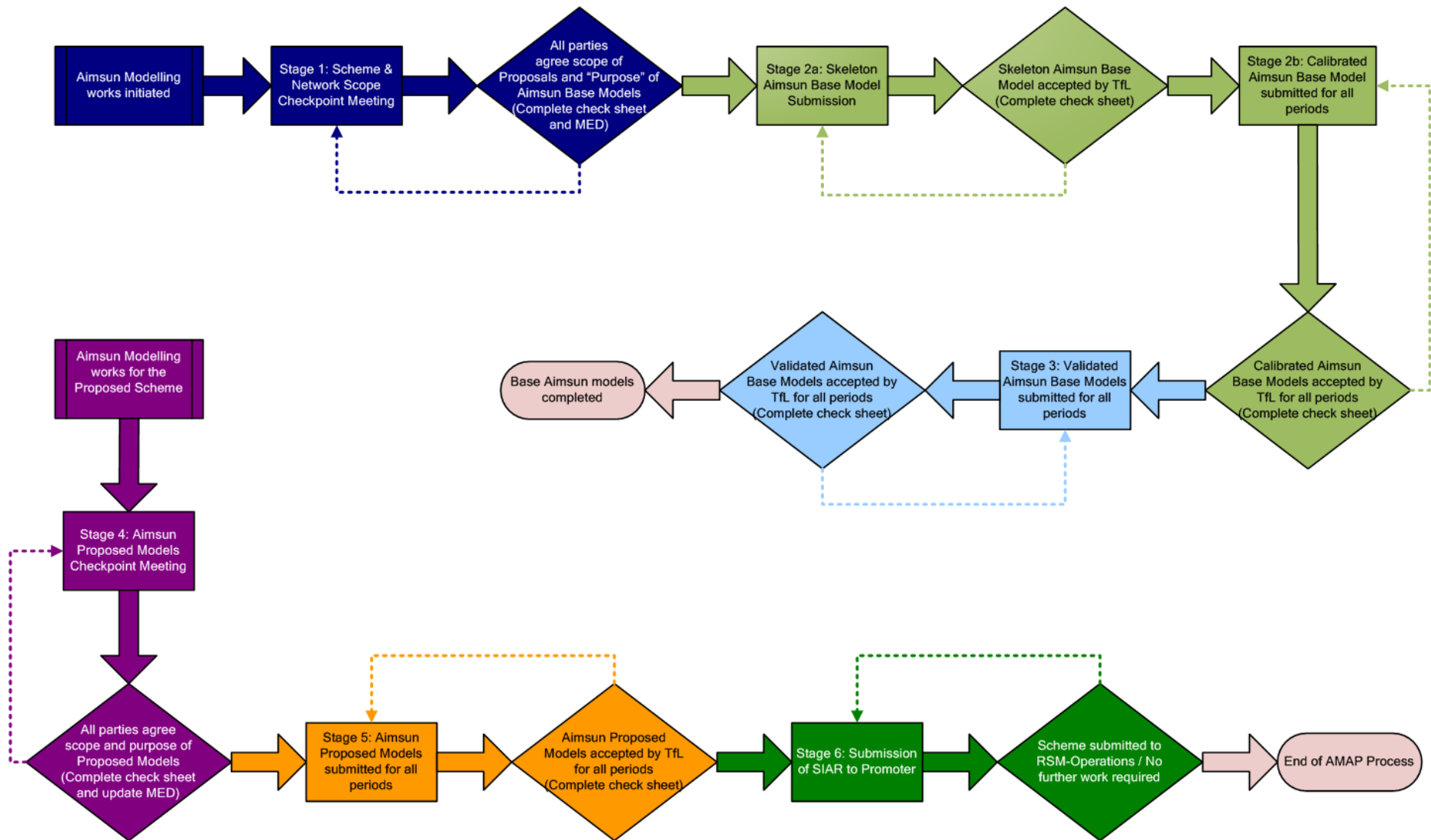


Figure 6: TfL Aimsun Model Auditing Process (AMAP) Flow Chart.

Table 4: TfL Aimsun Model Auditing Process (AMAP) Summary Sheet - Stage 2a (Skeleton Model) & Stage 2b (Calibrated Model).

AMAP Stage 2a Skeleton & 2b Calibrated Aimsun Base Model Submission		
Roles	Key Responsibilities	
Promoter Representatives	P	<i>When the DE submits Aimsun modelling, confirm with the MAE that it is of an appropriate standard and will not require multiple re-submissions to pass this stage. Resubmission will consume total time allocated for the audit.</i>
	DE	<ol style="list-style-type: none"> 1. <i>Build Skeleton Aimsun Base Model.</i> 2. <i>Complete the DE section of the AMAP Stage 2a check sheet (SQA-8670) and provide to the CE.</i> 1. <i>Formally submit the Skeleton Aimsun Base Model (with the DE & CE-signed AMAP Stage 2a check sheet) to the P/MAE.</i> 3. <i>Carry out all further work required by the MAE in the event of the submission being rejected until it is accepted, as documented in the AMAP Stage 2a check sheet.</i> 4. <i>Develop Calibrated Aimsun Base Models for all time periods based on the "Accepted" Skeleton Model.</i> 5. <i>Complete the DE section of the AMAP Stage 2b check sheet (SQA-8671, one for each time period under consideration) and provide to the CE.</i> 6. <i>Formally submit the Calibrated Aimsun Base Models (with the DE & CE-signed AMAP Stage 2b check sheet) to the P/MAE.</i> 7. <i>Carry out all further work required by the MAE in the event of the submission being rejected until it is accepted, as documented in the AMAP Stage 2b check sheet.</i>
	CE	<ol style="list-style-type: none"> 1. <i>Audit the Skeleton/Calibrated Aimsun Base Models submitted by the DE.</i> 2. <i>Complete, sign and return the AMAP Stage 2a Skeleton (SQA-8670) or 2b Calibrated Aimsun Base Model (SQA-8671) submission check sheets to the DE.</i> 3. <i>Audit any further models in the event of the original submissions being "Rejected" by the MAE.</i>
TfL Representatives	SAE	<i>None.</i>
	MAE	<ol style="list-style-type: none"> 1. <i>Audit DE-submitted Skeleton and Calibrated Aimsun Base Models.</i> 2. <i>Complete the MAE's part of the "AMAP Stage 2a (SQA-8670) and AMAP Stage 2b (SQA-8671) check sheets".</i> 3. <i>Send completed check sheet to P/DE with an "Accepted" or "Rejected".</i> 4. <i>Carry out any further auditing work in the event of a "Rejected" model, until you can return an "Accepted" Check Sheet.</i>
	NAE	<i>None.</i>

NB: The P has a limited amount of the MAE's auditing time. The P should therefore check that modelling is of an appropriate standard and will not require multiple resubmissions to pass this stage.

Table 5: TfL Aimsun Model Auditing Process (AMAP) Summary Sheet - Stage 3.

AMAP Stage 3 – Validated Aimsun Base Model Submission		
Roles		Key Responsibilities
Promoter Representatives	P	<i>When the DE submits Aimsun modelling, confirm with the MAE that it is of an appropriate standard and will not require multiple re-submissions to pass this stage. Resubmission will consume total time allocated for the audit.</i>
	DE	<ol style="list-style-type: none"> 1. <i>Develop Validated Aimsun Base Models for all time periods derived from the accepted AMAP Stage 2b Calibrated Aimsun Base Model.</i> 2. <i>Complete the DE section of the AMAP Stage 3 check sheet (SQA-8672, one for each time period under consideration) and provide to the CE.</i> 3. <i>Formally submit the Validated Aimsun Base Models (with the DE & CE-signed AMAP Stage 3 check sheet) to the P/MAE.</i> 4. <i>Carry out all further work required by the MAE in the event of the submission being rejected until it is accepted, as documented in the AMAP Stage 3 check sheets.</i>
	CE	<ol style="list-style-type: none"> 1. <i>Audit the Validated Aimsun Base Model for each time period prior to submission by the DE.</i> 2. <i>Complete, sign and return the AMAP Stage 3 check sheet (SQA-8672) to the DE.</i> 3. <i>Assess any further iterations of the model in the event of the submission being “Rejected” by the MAE.</i>
TfL Representatives	SAE	<i>None.</i>
	MAE	<ol style="list-style-type: none"> 1. <i>Audit DE-submitted Validated Aimsun Base Model for each time period.</i> 2. <i>Complete the MAE section of the AMAP stage 3 check sheet (SQA-8672).</i> 3. <i>Send completed Check Sheet to P/DE with an “Accepted” or “Rejected”.</i> 4. <i>Conduct further audits on a rejected model, proceed until you can return an accepted AMAP Stage 3 check sheet.</i> 5. <i>Upload the approved base models to the TfL Model Library.</i>
	NAE	<i>None.</i>

NB: The P has a limited amount of the MAE's auditing time. The P should therefore check that modelling is of an appropriate standard and will not require multiple resubmissions to pass this stage.

Table 6: TfL Aimsun Model Auditing Process (AMAP) Summary Sheet - Stage 4.

AMAP Stage 4 – Aimsun Proposed Model Meeting		
	Roles	Key Responsibilities
Promoter Representatives	P	<i>Attend meeting to confirm the scope of the proposals as discussed during MAP Stage 1. Confirm understanding that the MAE will not begin any audit until the SAE has completed a Signal Safety Audit of the proposals.</i>
	DE	<ol style="list-style-type: none"> 1. <i>In conjunction with and agreement of the P/SAE/MAE, produce a statement detailing the scope for each of the Aimsun Proposed Models.</i> 2. <i>In conjunction with and agreement of the P/SAE/MAE, supply a record of the work requiring completion prior to submission of the Aimsun Proposed Models.</i> 3. <i>In conjunction and agreement with the P/SAE, agree when proposals will be submitted for SAE Signal Safety Audit. Confirm understanding that the MAE will not begin an audit until completion of the SAE Signal Safety Audit.</i> 4. <i>Formally submit the final 'Purpose Statement' derived from MAP Stage 1 and the agreed details of the scheme/modelling, as set out above, to P/SAE/MAE.</i> 5. <i>Complete the DE's section of the AMAP Stage 4 check sheet (SQA-8673).</i>
	CE	<i>None.</i>
TfL Representatives	SAE	<i>Obtain the DE-created submission dates for all junctions in the Baseline List agreed in MAP Stage 1 in order to conduct Signals Safety Audit.</i>
	MAE	<ol style="list-style-type: none"> 1. <i>Obtain and agree the DE-created statement detailing the 'Purpose' for each of the Aimsun Proposed Models.</i> 2. <i>Obtain and agree the DE-created record of the work required, prior to submission of the Aimsun Proposed Models.</i> 3. <i>Confirm that the P/DE understand an audit will not begin until the SAE has completed a Signal Safety Audit of the proposals.</i> 4. <i>Review/update the MED.</i> 5. <i>Complete the MAE section of the AMAP Stage 4 check sheet (SQA-8673).</i>
	NAE	<i>Attend meeting to agree the scope of the proposals as previously discussed during MAP Stage 1.</i>

Table 7: TfL Aimsun Model Auditing Process (AMAP) Summary Sheet - Stage 5.

AMAP Stage 5 – Aimsun Proposed Models Submission		
Roles	Key Responsibilities	
Promoter Representatives	P	<i>When the DE submits Aimsun modelling, confirm with the MAE that it is of an appropriate standard and will not require multiple re-submissions.</i>
	DE	<ol style="list-style-type: none"> 1. <i>Formally submit the proposed Method of Control changes to the P/SAE for auditing and approval, using the MAP Stage 5 SQA-0640 Compliance Check Sheet (SQA-0530).</i> 2. <i>Obtain the approved MAP Stage 5 SQA-0640 Compliance Check Sheet sheets from the SAE.</i> 3. <i>Develop Aimsun Proposed Models for all periods based on “Accepted” AMAP Stage 3 Validated Aimsun Base Models.</i> 4. <i>Complete the DE’s section of the AMAP Stage 5 check sheet (SQA-8674, one for each time period under consideration) and provide to CE.</i> 5. <i>Formally submit the DE & CE-signed AMAP Stage 5 check sheet to the P/MAE.</i> 6. <i>Complete modelling work as required by the MAE in the event of the submission being rejected until it is accepted, as documented in the AMAP Stage 5 check sheet.</i>
	CE	<ol style="list-style-type: none"> 1. <i>Audit the Aimsun Proposed Model for each time period prior to submission by the DE.</i> 2. <i>Complete, sign and return the AMAP Stage 5 check sheet (SQA-8674) to the DE.</i> 3. <i>Assess any further iterations of the model in the event of the submission being rejected by the MAE.</i>
TfL Representatives	SAE	<ol style="list-style-type: none"> 1. <i>Audit SQA-0640 compliance for each method of control change within the scheme.</i> 2. <i>Complete, sign and return a MAP Stage 5 SQA-0640 Compliance Check Sheet (SQA-0530) for each method of control change within the scheme to the DE/MAE.</i> 3. <i>Indicate to the MAE that the proposals are SQA-0640 compliant and submitted modelling may be audited within AMAP Stage 5.</i>
	MAE	<ol style="list-style-type: none"> 1. <i>Obtain a SAE-signed MAP Stage 5 SQA-0640 Compliance Check Sheet (SQA-0530) for each scheme method of control change.</i> 2. <i>Audit DE-submitted Aimsun Proposed Models.</i> 3. <i>Complete the MAE section of the AMAP Stage 5 check sheet (SQA-8674, one for each time period under consideration).</i> 4. <i>Send completed AMAP Stage 5 check sheet to P/DE.</i> 5. <i>Conduct further audits on a rejected model and proceed until you can return an accepted AMAP Stage 5 check sheet.</i> 6. <i>Upload the approved proposed models to the TfL Model Library.</i>
	NAE	<i>None.</i>

NB: The P has a limited amount of the MAE’s auditing time. The P should therefore check that modelling is of an appropriate standard and will not require multiple resubmissions to pass this stage.

5 LinSig MODEL AUDITING PROCESS (LMAP)

An overview of LMAP is provided within Figure 7, which identifies the six MAP stages and the intermediate sequence of events that occur during the auditing process.

LMAP will only be applied to models where LinSig has been applied to simulate networks using multiple traffic signal controllers.

Figure 7 illustrates when formal meetings between MAP parties should occur, when model submissions should be made and what criteria should be met before proceeding to the next LMAP stage.

The roles and responsibilities of LMAP participants are summarised below in Table 8 to Table 11.

Formal check sheets are submitted at the end of all MAP Stages. Stages 1 and 4 are considered complete when the P and DE have received a signed and dated check sheet from the MAE. Stages 2, 3 and 5 are considered complete when the relevant check sheets are signed as “Accepted” by the MAE. The version of the model to which an “Accepted” sheet applies is the only one admissible as part of LMAP. If for any reason modelling for a particular stage has to be amended, it will have to be fully re-submitted at that stage of the process and a new check sheet signed as “Accepted” by the MAE.

Signed copies of the completed check sheets and the MAP Stage 5 SQA-0640 Compliance Sheet(s) (SQA-0530) will be scanned and archived by TfL for quality assurance purposes. This provides a reference for the MAE when auditing the signal control data in any accompanying traffic models.

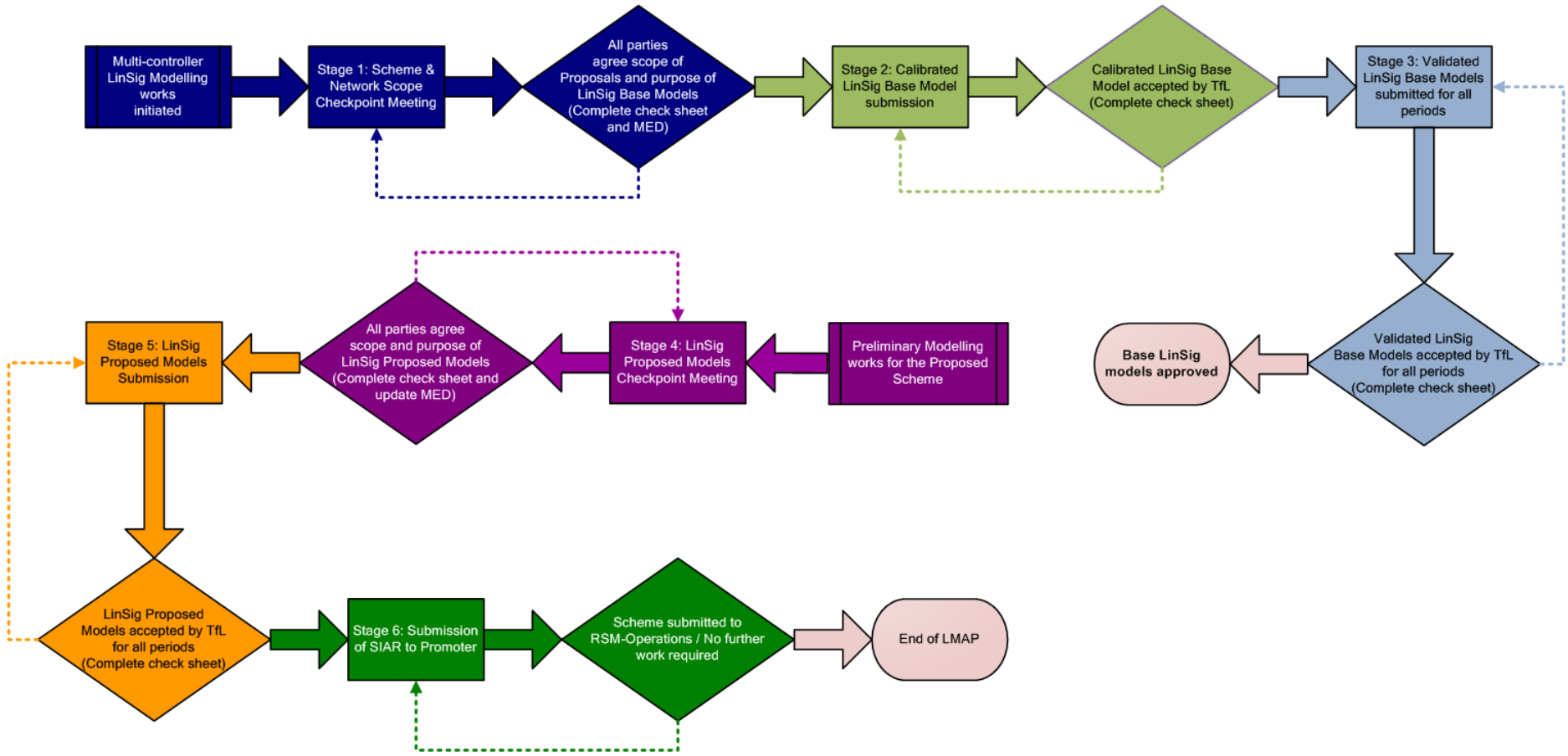


Figure 7: TfL LinSig Model Auditing Process (LMAP) Flow Chart.

Table 8: TfL LinSig Model Auditing Process (LMAP) Summary Sheet - Stage 2.

LMAP Stage 2 - Calibrated LinSig Base Model Submission		
	Roles	Key Responsibilities
Promoter Representatives	P	<i>When the DE submits LinSig modelling, confirm with the MAE that it is of an appropriate standard and will not require multiple re-submissions to pass this stage. Resubmission will consume total time allocated for the audit.</i>
	DE	<ol style="list-style-type: none"> 1. <i>Build Calibrated LinSig Base Model.</i> 2. <i>Complete the DE section of the LMAP Stage 2 check sheet (SQA-0545) and provide to the CE.</i> 3. <i>Formally submit the Calibrated LinSig Base Model (with the DE & CE-signed LMAP Stage 2 check sheet) to the P/MAE.</i> 4. <i>Complete all further work required by the MAE in the event of the submission being rejected until it is accepted, as documented in the LMAP Stage 2 check sheet.</i>
	CE	<ol style="list-style-type: none"> 1. <i>Audit the Calibrated LinSig Base Model prior to submission by the DE.</i> 2. <i>Complete, sign and return the LMAP Stage 2 check sheet (SQA-0545) to the DE.</i> 3. <i>Assess any further iterations of the model in the event of the submission being "Rejected" by the MAE.</i>
TfL Representatives	SAE	<i>None.</i>
	MAE	<ol style="list-style-type: none"> 1. <i>Audit DE-submitted Calibrated LinSig Base Model.</i> 2. <i>Complete the MAE section of the LMAP Stage 2 check sheet (SQA-0545).</i> 3. <i>Send completed check sheet to P/DE with an "Accepted" or "Rejected".</i> 4. <i>Conduct further audits on a rejected model, proceed until you can return an accepted LMAP Stage 2 check sheet.</i>
	NAE	<i>None.</i>

NB: The P has a limited amount of the MAE's auditing time. The P should therefore check that modelling is of an appropriate standard and will not require multiple resubmissions to pass this stage.

Table 9: TfL LinSig Model Auditing Process (LMAP) Summary Sheet - Stage 3.

LMAP Stage 3 – Validated LinSig Base Model Submission		
Roles		Key Responsibilities
Promoter Representatives	P	<i>When the DE submits LinSig modelling, confirm with the MAE that it is of an appropriate standard and will not require multiple re-submissions to pass this stage. Resubmission will consume total time allocated for the audit.</i>
	DE	<ol style="list-style-type: none"> 1. <i>Develop Validated LinSig Base Models for all time periods derived from the accepted LMAP Stage 2 Calibrated LinSig Base Model.</i> 2. <i>Complete the DE section of the LMAP Stage 3 check sheet (SQA-0546, one for each time period under consideration) and provide to the CE.</i> 3. <i>Formally submit the Validated LinSig Base Models (with the DE & CE-signed LMAP Stage 3 check sheet) to the P/MAE.</i> 4. <i>Carry out all further work required by the MAE in the event of the submission being rejected until it is accepted, as documented in the LMAP Stage 3 check sheets.</i>
	CE	<ol style="list-style-type: none"> 1. <i>Audit the Validated LinSig Base Model prior to submission by the DE.</i> 2. <i>Complete, sign and return the LMAP Stage 3 check sheet (SQA-0546) to the DE.</i> 3. <i>Assess any further iterations of the model in the event of the submission being “Rejected” by the MAE.</i>
TfL Representatives	SAE	<i>None.</i>
	MAE	<ol style="list-style-type: none"> 1. <i>Audit DE-submitted Validated LinSig Base Model.</i> 2. <i>Complete the MAE section of the LMAP stage 3 check sheet (SQA-0546).</i> 3. <i>Send completed Check Sheet to P/DE with an “Accepted” or “Rejected”.</i> 4. <i>Conduct further audits on a rejected model, proceed until you can return an accepted LMAP Stage 3 check sheet.</i> 5. <i>Upload the approved base models to the TfL Model Library.</i>
	NAE	<i>None.</i>

NB: The P has a limited amount of the MAE's auditing time. The P should therefore check that modelling is of an appropriate standard and will not require multiple resubmissions to pass this stage.

Table 10: TfL LinSig Model Auditing Process (LMAP) Summary Sheet - Stage 4.

LMAP Stage 4 – LinSig Proposed Model Meeting		
	Roles	Key Responsibilities
Promoter Representatives	P	<i>Attend meeting to confirm the scope of the proposals as discussed during MAP Stage 1. Confirm understanding that the MAE will not begin any audit until the SAE has completed a Signal Safety Audit of the proposals.</i>
	DE	<ol style="list-style-type: none"> 1. <i>In conjunction with and agreement of the P/SAE/MAE, produce a statement detailing the scope for each of the LinSig Proposed Models.</i> 2. <i>In conjunction with and agreement of the P/SAE/MAE, supply a record of the work requiring completion prior to submission of the LinSig Proposed Models.</i> 3. <i>In conjunction and agreement with the P/SAE, agree when proposals will be submitted for SAE Signal Safety Audit. Confirm understanding that the MAE will not begin an audit until completion of the SAE Signal Safety Audit.</i> 4. <i>Formally submit the final 'Purpose Statement' derived from MAP Stage 1 and the agreed details of the scheme/modelling, as set out above, to the P/SAE/MAE.</i> 5. <i>Complete the DE's section of the LMAP Stage 4 check sheet (SQA-8675).</i>
	CE	<i>None.</i>
TfL Representatives	SAE	<i>Obtain the DE-created submission dates for all junctions in the Baseline List agreed in MAP Stage 1 in order to conduct Signals Safety Audit.</i>
	MAE	<ol style="list-style-type: none"> 1. <i>Obtain and agree the DE-created statement detailing the 'Purpose' for each of the LinSig Proposed Models.</i> 2. <i>Obtain and agree the DE-created record of the work required, prior to submission of the LinSig Proposed Models.</i> 3. <i>Confirm that the P/DE understand an audit will not begin until the SAE has completed a Signal Safety Audit of the proposals.</i> 4. <i>Review/update the MED.</i> 5. <i>Complete the MAE section of the LMAP Stage 4 check sheet (SQA-8675).</i>
	NAE	<i>Attend meeting to agree the scope of the proposals as previously discussed during MAP Stage 1.</i>

Table 11: TfL LinSig Model Auditing Process (LMAP) Summary Sheet - Stage 5.

LMAP Stage 5 – LinSig Proposed Models Submission		
Roles	Key Responsibilities	
Promoter Representatives	P	<i>When the DE submits LinSig modelling, confirm with the MAE that it is of an appropriate standard and will not require multiple re-submissions.</i>
	DE	<ol style="list-style-type: none"> 1. <i>Formally submit the proposed Method of Control changes to the P/SAE for auditing and approval, using the MAP Stage 5 SQA-0640 Compliance Check Sheet (SQA-0530).</i> 2. <i>Obtain the approved MAP Stage 5 SQA-0640 Compliance Check Sheet from the SAE.</i> 3. <i>Develop LinSig Proposed Models for all periods based on “Accepted” LMAP Stage 3 Validated LinSig Base Models.</i> 4. <i>Complete the DE’s section of the LMAP Stage 5 check sheet (SQA-0547, one for each time period under consideration) and provide to the CE.</i> 5. <i>Formally submit the DE & CE-signed LMAP Stage 5 check sheet to the P/MAE.</i> 6. <i>Complete modelling work as required by the MAE in the event of the submission being rejected until it is accepted, as documented in the LMAP Stage 5 check sheet.</i>
	CE	<ol style="list-style-type: none"> 1. <i>Audit the LinSig Proposed Model for each time period prior to submission by the DE. Complete, sign and return the LMAP Stage 5 check sheet (SQA-0547) to the DE.</i> 2. <i>Assess any further iterations of the model in the event of the submission being rejected by the MAE.</i>
TfL Representatives	SAE	<ol style="list-style-type: none"> 1. <i>Audit SQA-0640 compliance for each method of control change within the scheme.</i> 2. <i>Complete, sign and return a MAP Stage 5 SQA-0640 Compliance Check Sheet (SQA-0530) for each method of control change within the scheme to the DE/MAE.</i> 3. <i>Indicate to the MAE that the proposals are SQA-0640 compliant and submitted modelling may be audited within LMAP Stage 5.</i>
	MAE	<ol style="list-style-type: none"> 1. <i>Obtain a SAE-signed MAP Stage 5 SQA-0640 Compliance Check Sheet (SQA-0530) for each method of control change within the scheme.</i> 2. <i>Audit DE-submitted LinSig Proposed Models.</i> 3. <i>Complete the MAE section of the LMAP Stage 5 check sheet (SQA-0547, one for each time period under consideration) and provide to P/DE.</i> 4. <i>Conduct further audits on a rejected model until you can return an accepted LMAP Stage 5 check sheet.</i> 5. <i>Upload the approved proposed models to the TfL Model Library.</i>
	NAE	<i>None.</i>

NB: The P has a limited amount of the MAE’s auditing time. The P should therefore check that modelling is of an appropriate standard and will not require multiple resubmissions to pass this stage.

6 TRANSYT MODEL AUDITING PROCESS (TMAP)

An overview of TMAP is given in Figure 8, identifying the six MAP stages and the intermediate sequence of events that occur during the auditing process. This includes when formal meetings between MAP parties should occur, when model submissions should be made and what criteria need to be met before proceeding to the next MAP stage.

The roles and responsibilities of all TMAP participants are summarised in Table 12 to Table 15.

Formal check sheets are submitted at the end of all MAP Stages. Stages 1 and 4 are considered complete when the P and DE have received a signed and dated check sheet from the MAE. Stages 2, 3 and 5 are considered complete when the relevant check sheets are signed as “Accepted” by the MAE. The version of the model to which an “Accepted” sheet applies is the only one admissible as part of MAP. If for any reason modelling for a particular stage has to be amended, it will have to be fully re-submitted at that stage of the process and a new check sheet signed as “Accepted”.

Signed copies of the completed check sheets and the “MAP Stage 5 SQA-0640 Compliance Sheet(s)” (SQA-0530) will be scanned and archived by TfL for Quality Assurance (QA) purposes. This provides a reference for the auditor when appraising the signal control data in the DE’s models.

Model Auditing Process (MAP) Overview

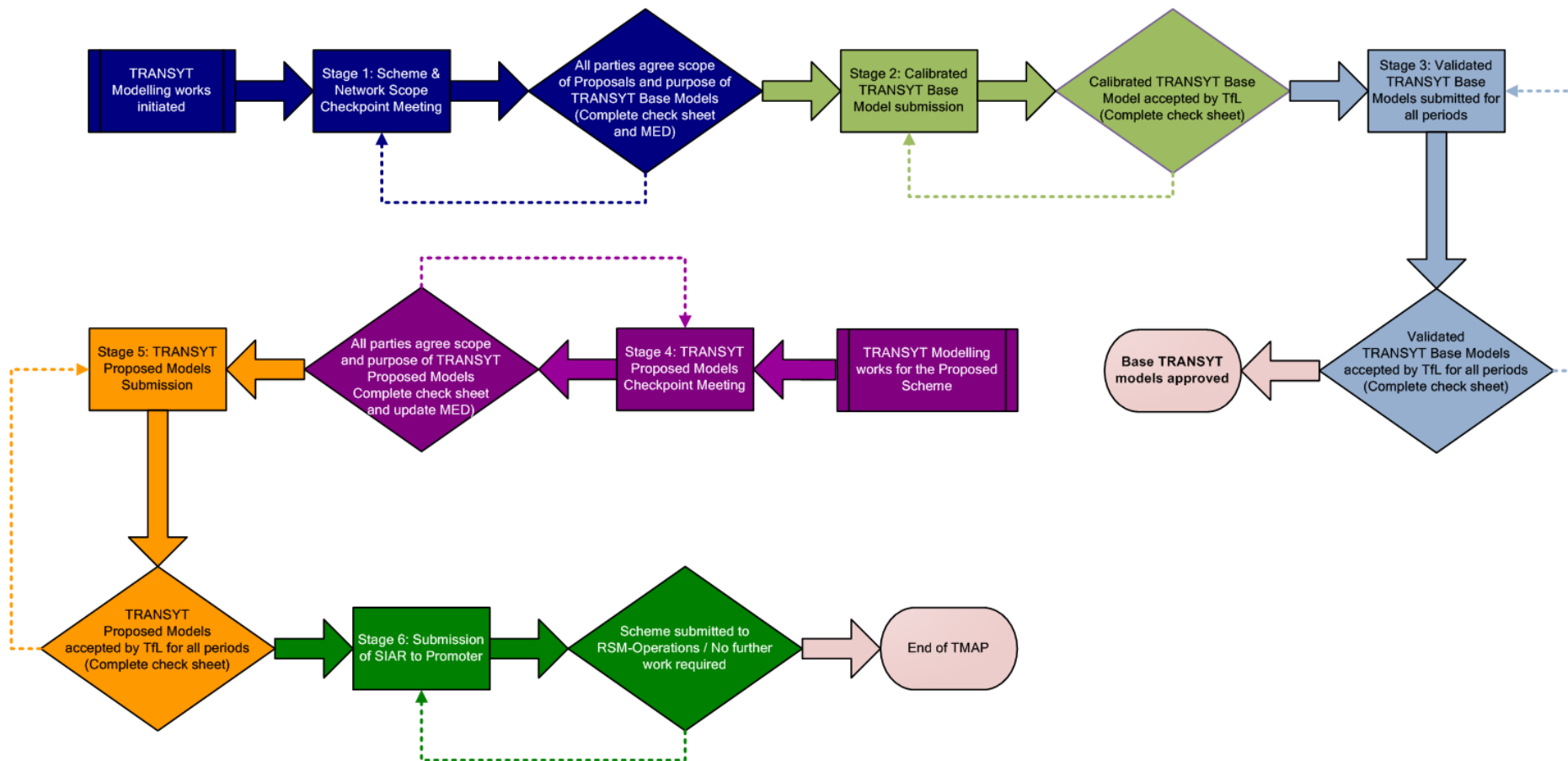


Figure 8: TfL TRANSYT Model Auditing Process (TMAP) Flow Chart.

Table 12: TfL TRANSYT Model Auditing Process (TMAP) Summary Sheet - Stage 2.

TMAP Stage 2 - Calibrated TRANSYT Base Model Submission		
Roles	Key Responsibilities	
Promoter Representatives	P	<i>When the DE submits TRANSYT modelling, confirm with the MAE that it is of an appropriate standard and will not require multiple re-submissions to pass this stage. Resubmission will consume total time allocated for the audit.</i>
	DE	<ol style="list-style-type: none"> 1. <i>Build Calibrated TRANSYT Base Model.</i> 2. <i>Complete the DE section of the TMAP stage 2 check sheet (SQA-0523) and provide to the CE.</i> 3. <i>Formally submit the Calibrated TRANSYT Base Model (with the DE & CE-signed TMAP Stage 2 check sheet) to the P/MAE.</i> 4. <i>Complete all further work required by the MAE in the event of the submission being rejected until it is accepted, as documented in the TMAP Stage 2 check sheet.</i>
	CE	<ol style="list-style-type: none"> 1. <i>Audit the Calibrated TRANSYT Base Model prior to submission by the DE.</i> 2. <i>Complete, sign and return the TMAP stage 2 check sheet (SQA-0523) to the DE.</i> 3. <i>Assess any further iterations of the model in the event of the submission being "Rejected" by the MAE.</i>
TfL Representatives	SAE	<i>None.</i>
	MAE	<ol style="list-style-type: none"> 1. <i>Audit DE-submitted Calibrated TRANSYT Base Model.</i> 2. <i>Complete the MAE's section of the TMAP stage 2 check sheet (SQA-0523).</i> 3. <i>Send completed check sheet to P/DE with an "Accepted" or "Rejected".</i> 4. <i>Conduct further audits on a rejected model, proceed until you can return an accepted TMAP Stage 2 check sheet.</i>
	NAE	<i>None.</i>

NB: The P has a limited amount of the MAE's auditing time. The P should therefore check that modelling is of an appropriate standard and will not require multiple resubmissions to pass this stage.

Table 13: TfL TRANSYT Model Auditing Process (TMAP) Summary Sheet - Stage 3

TMAP Stage 3 – Validated TRANSYT Base Model Submission		
Roles		Key Responsibilities
Promoter Representatives	P	<i>When the DE submits TRANSYT modelling, confirm with the MAE that it is of an appropriate standard and will not require multiple re-submissions to pass this stage. Resubmission will consume total time allocated for the audit.</i>
	DE	<ol style="list-style-type: none"> 1. <i>Develop Validated TRANSYT Base Models for all time periods derived from the accepted TMAP Stage 2 Calibrated TRANSYT Base Model.</i> 2. <i>Complete the DE section of the TMAP Stage 3 check sheet (SQA-0524, one for each time period under consideration) and provide to the CE.</i> 3. <i>Formally submit the Validated TRANSYT Base Models (with the DE & CE-signed TMAP Stage 3 check sheet) to the P/MAE.</i> 4. <i>Carry out all further work required by the MAE in the event of the submission being rejected until it is accepted, as documented in the TMAP Stage 3 check sheets.</i>
	CE	<ol style="list-style-type: none"> 1. <i>Audit the Validated TRANSYT Base Model for each time period prior to submission by the DE.</i> 2. <i>Complete, sign and return the TMAP Stage 3 check sheet (SQA-0524) to the DE.</i> 3. <i>Assess any further iterations of the model in the event of the submission being “Rejected” by the MAE.</i>
TfL Representatives	SAE	<i>None.</i>
	MAE	<ol style="list-style-type: none"> 1. <i>Audit DE-submitted Validated TRANSYT Base Model for each time period.</i> 2. <i>Complete the MAE section of the TMAP Stage 3 check sheet (SQA-0524).</i> 3. <i>Send completed check sheet to P/DE with an “Accepted” or “Rejected”.</i> 4. <i>Conduct further audits on a rejected model, proceed until you can return an accepted TMAP Stage 3 check sheet.</i> 5. <i>Upload the approved base models to the TfL Model Library.</i>
	NAE	<i>None.</i>

NB: The P has a limited amount of the MAE's auditing time. The P should therefore check that modelling is of an appropriate standard and will not require multiple resubmissions to pass this stage.

Table 14: TfL TRANSYT Model Auditing Process (TMAP) Summary Sheet - Stage 4.

TMAP Stage 4 – TRANSYT Proposed Model Meeting		
	Roles	Key Responsibilities
Promoter Representatives	P	<i>Attend meeting to confirm the scope of the proposals as discussed during MAP Stage 1. Confirm understanding that the MAE will not begin any audit until the SAE has completed a Signal Safety Audit of the proposals.</i>
	DE	<ol style="list-style-type: none"> <i>1. In conjunction with and agreement of the P/SAE/MAE, produce a statement detailing the scope for each of the TRANSYT Proposed Models.</i> <i>2. In conjunction with and agreement of the P/SAE/MAE, supply a record of the work requiring completion prior to submission of the TRANSYT Proposed Models.</i> <i>3. In conjunction and agreement with the P/SAE, agree when proposals will be submitted for SAE Signal Safety Audit. Confirm understanding that the MAE will not begin an audit until completion of the SAE Signal Safety Audit.</i> <i>4. Formally submit the final 'Purpose Statement' derived from MAP Stage 1 and the agreed details of the scheme/modelling, as set out above, to P/SAE/MAE.</i> <i>5. Complete the DE's section of the TMAP Stage 4 check sheet (SQA-8676).</i>
	CE	<i>None.</i>
TfL Representatives	SAE	<i>Obtain the DE-created submission dates for all junctions in the Baseline List agreed in MAP Stage 1 in order to conduct Signals Safety Audit.</i>
	MAE	<ol style="list-style-type: none"> <i>1. Obtain and agree the DE-created statement detailing the 'Purpose' for each of the TRANSYT Proposed Models.</i> <i>2. Obtain and agree the DE-created record of the work required, prior to submission of the TRANSYT Proposed Models.</i> <i>3. Confirm that the P/DE understand an audit will not begin until the SAE has completed a Signal Safety Audit of the proposals.</i> <i>4. Review/update the MED.</i> <i>5. Complete the MAE section of the TMAP Stage 4 check sheet (SQA-8676).</i>
	NAE	<i>Attend meeting to agree the scope of the proposals as previously discussed during MAP Stage 1.</i>

Table 15: TfL TRANSYT Model Auditing Process (TMAP) Summary Sheet - Stage 5.

TMAP Stage 5 – TRANSYT Proposed Model Submission		
Roles	Key Responsibilities	
Promoter Representatives	P	<i>When the DE submits TRANSYT modelling, confirm with the MAE that it is of an appropriate standard and will not require multiple re-submissions.</i>
	DE	<ol style="list-style-type: none"> 1. <i>Formally submit the proposed Method of Control changes to the P/SAE for auditing and approval, using the MAP Stage 5 SQA-0640 Compliance Check Sheet (SQA-0530).</i> 2. <i>Obtain the approved MAP Stage 5 SQA-0640 Compliance Check Sheet sheets from the SAE.</i> 3. <i>Develop TRANSYT Proposed Models for all periods based on “Accepted” TMAP Stage 3 Validated TRANSYT Base Models.</i> 4. <i>Complete the DE’s section of the TMAP Stage 5 check sheet (SQA-0525, one for each time period under consideration) and provide to the CE.</i> 5. <i>Formally submit the DE & CE-signed TMAP Stage 5 check sheet to the P/MAE.</i> 6. <i>Complete modelling work as required by the MAE in the event of the submission being rejected until it is accepted, as documented in the TMAP Stage 5 check sheet.</i>
	CE	<ol style="list-style-type: none"> 1. <i>Audit the TRANSYT Proposed Model for each time period prior to submission by the DE.</i> 2. <i>Complete, sign and return the TMAP Stage 5 check sheet (SQA-0525) to the DE.</i> 3. <i>Assess any further iterations of the model in the event of the submission being rejected by the MAE.</i>
TfL Representatives	SAE	<ol style="list-style-type: none"> 1. <i>Audit SQA-0640 compliance for each method of control change within the scheme.</i> 2. <i>Complete, sign and return a MAP Stage 5 SQA-0640 Compliance Check Sheet (SQA-0530) for each method of control change within the scheme to the DE/MAE.</i> 3. <i>Indicate to the MAE that the proposals are SQA-0640 compliant and submitted modelling may be audited within TMAP Stage 5.</i>
	MAE	<ol style="list-style-type: none"> 1. <i>Obtain a SAE-signed MAP Stage 5 SQA-0640 Compliance Check Sheet (SQA-0530) for each TRANSYT Proposed Models.</i> 2. <i>Complete the MAE section of the TMAP Stage 5 check sheet (SQA-0525, one for each time period under consideration).</i> 3. <i>Send completed TMAP Stage 5 check sheet to P/DE.</i> 4. <i>Conduct further audits on a rejected model, proceed until you can return an accepted TMAP Stage 5 check sheet.</i> 5. <i>Upload the approved proposed models to the TfL Model Library.</i>
	NAE	<i>None.</i>

NB: The P has a limited amount of the MAE’s auditing time. The P should therefore check that modelling is of an appropriate standard and will not require multiple resubmissions to pass this stage.

7 Vissim MODEL AUDITING PROCESS (VMAP)

An overview of VMAP is given in Figure 9, identifying the seven VMAP stages and the intermediate sequence of events that occur during the auditing process. This includes when formal meetings between MAP parties should occur, when model submissions should be made and what criteria need to be met before proceeding to the next MAP stage.

The roles and responsibilities of all VMAP participants are summarised in Table 16 to Table 19.

Formal check sheets are submitted at the end of all MAP Stages. Stages 1 and 4 are considered complete when the P and DE have received a signed and dated check sheet from the MAE. Stages 2a, 2b, 3 and 5 are considered complete when the relevant check sheets are signed as “Accepted” by the MAE. The version of the model to which an “Accepted” sheet applies is the only one admissible as part of VMAP. If for any reason modelling for a particular stage has to be amended, it will have to be fully re-submitted at that stage of the process and a new check sheet signed as “Accepted”.

Signed copies of the completed check sheets and the “MAP Stage 5 SQA-0640 Compliance Sheet(s)” (SQA-0530) will be scanned and archived by TfL for Quality Assurance (QA) purposes. This provides a reference for the MAE when auditing the signal control data in the DE’s models.

Model Auditing Process (MAP) Overview

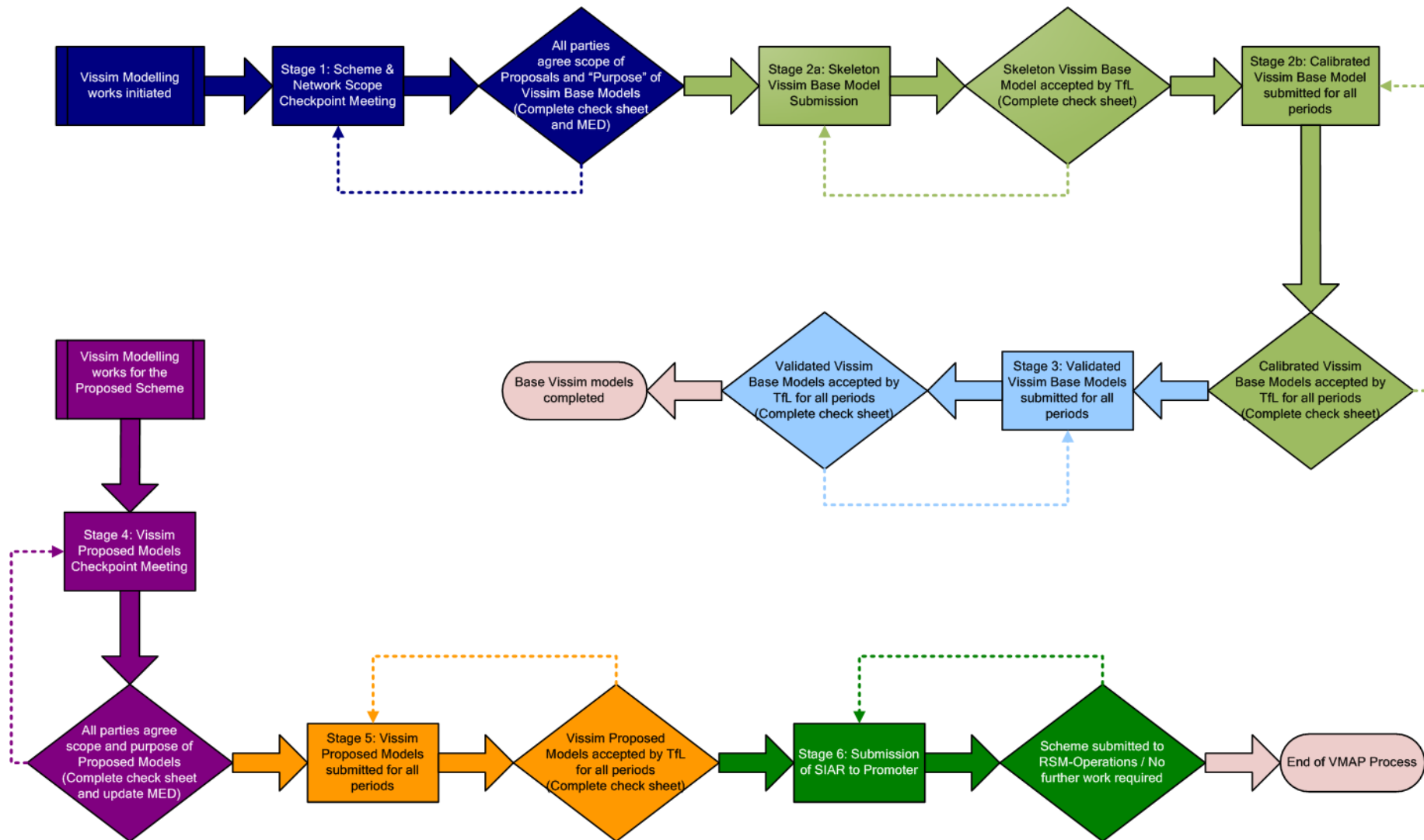


Figure 9: TfL Vissim Model Auditing Process (VMAP) Flow Chart.

Table 16: TfL Vissim Model Auditing Process (VMAP) Summary Sheet - Stage 2a (Skeleton Model) & Stage 2b (Calibrated Model).

VMAP Stage 2a Skeleton & 2b Calibrated VISSIM Base Model Submission		
Roles	Key Responsibilities	
Promoter Representatives	P	<i>When the DE submits Vissim modelling, confirm with the MAE that it is of an appropriate standard and will not require multiple re-submissions to pass this stage. Resubmission will consume total time allocated for the audit.</i>
	DE	<ol style="list-style-type: none"> 2. Build Skeleton Vissim Base Model. 3. Complete the DE section of the VMAP Stage 2a check sheet (SQA-0526) and provide to the CE. 4. Formally submit the Skeleton Vissim Base Model (with the DE & CE-signed VMAP Stage 2a check sheet) to the P/MAE. 5. Carry out all further work required by the MAE in the event of the submission being rejected until it is accepted, as documented in the VMAP Stage 2a check sheet. 6. Develop Calibrated Vissim Base Models for all time periods based on the "Accepted" Skeleton Model. 7. Complete the DE section of the VMAP Stage 2b check sheet (SQA-0527, one for each time period under consideration) and provide to the CE. 8. Formally submit the Calibrated Vissim Base Models (with the DE & CE-signed VMAP Stage 2b check sheet) to the P/MAE. 9. Carry out all further work required by the MAE in the event of the submission being rejected until it is accepted, as documented in the VMAP Stage 2b check sheet.
	CE	<ol style="list-style-type: none"> 1. Audit the Skeleton/Calibrated Vissim Base Models submitted by the DE. 2. Complete, sign and return the VMAP Stage 2a Skeleton (SQA-0526) or 2b Calibrated Vissim Base Model (SQA-0527) submission check sheets to the DE. 3. Audit any further models in the event of the original submissions being "Rejected" by the MAE.
TfL Representatives	SAE	None.
	MAE	<ol style="list-style-type: none"> 1. Audit DE-submitted Skeleton and Calibrated Vissim Base Models. 2. Complete the MAE's part of the "VMAP Stage 2a (SQA-0526) and VMAP Stage 2b (SQA-0527) check sheets". 3. Send completed check sheet to P/DE with an "Accepted" or "Rejected". 4. Carry out any further auditing work in the event of a "Rejected" model, until you can return an "Accepted" Check Sheet.
	NAE	None.

NB: The P has a limited amount of the MAE's auditing time. The P should therefore check that modelling is of an appropriate standard and will not require multiple resubmissions to pass this stage.

Table 17: TfL Vissim Model Auditing Process (VMAP) Summary Sheet - Stage 3.

VMAP Stage 3 – Validated Vissim Base Model Submission		
Roles		Key Responsibilities
Promoter Representatives	P	<i>When the DE submits Vissim modelling, confirm with the MAE that it is of an appropriate standard and will not require multiple re-submissions to pass this stage. Resubmission will consume total time allocated for the audit.</i>
	DE	<ol style="list-style-type: none"> 1. <i>Develop Validated Vissim Base Models for all time periods derived from the accepted VMAP Stage 2b Calibrated Vissim Base Model.</i> 2. <i>Complete the DE section of the VMAP Stage 3 check sheet (SQA-0528, one for each time period under consideration) and provide to the CE.</i> 3. <i>Formally submit the Validated Vissim Base Models (with the DE & CE-signed VMAP Stage 3 check sheet) to the P/MAE.</i> 4. <i>Carry out all further work required by the MAE in the event of the submission being rejected until it is accepted, as documented in the VMAP Stage 3 check sheets.</i>
	CE	<ol style="list-style-type: none"> 1. <i>Audit the Validated Vissim Base Model for each time period prior to submission by the DE.</i> 2. <i>Complete, sign and return the VMAP Stage 3 check sheet (SQA-0528) for the DE.</i> 3. <i>Assess any further iterations of the model in the event of the submission being “Rejected” by the MAE.</i>
TfL Representatives	SAE	<i>None.</i>
	MAE	<ol style="list-style-type: none"> 1. <i>Audit DE-submitted Validated Vissim Base Model for each time period.</i> 2. <i>Complete the MAE section of the VMAP stage 3 check sheet (SQA-0528).</i> 3. <i>Send completed Check Sheet to P/DE with an “Accepted” or “Rejected”.</i> 4. <i>Conduct further audits on a rejected model, proceed until you can return an accepted VMAP Stage 3 check sheet.</i> 5. <i>Upload the approved base models to the TfL Model Library.</i>
	NAE	<i>None.</i>

NB: The P has a limited amount of the MAE's auditing time. The P should therefore check that modelling is of an appropriate standard and will not require multiple resubmissions to pass this stage.

Table 18: TfL Vissim Model Auditing Process (VMAP) Summary Sheet - Stage 4.

VMAP Stage 4 – Vissim Proposed Model Meeting		
	Roles	Key Responsibilities
Promoter Representatives	P	<i>Attend meeting to confirm the scope of the proposals as discussed during MAP Stage 1. Confirm understanding that the MAE will not begin any audit until the SAE has completed a Signal Safety Audit of the proposals.</i>
	DE	<ol style="list-style-type: none"> <i>1. In conjunction with and agreement of the P/SAE/MAE, produce a statement detailing the scope for each of the Vissim Proposed Models.</i> <i>2. In conjunction with and agreement of the P/SAE/MAE, supply a record of the work requiring completion prior to submission of the Vissim Proposed Models.</i> <i>3. In conjunction and agreement with the P/SAE, agree when proposals will be submitted for SAE Signal Safety Audit. Confirm understanding that the MAE will not begin an audit until completion of the SAE Signal Safety Audit.</i> <i>4. Formally submit the final 'Purpose Statement' derived from MAP Stage 1 and the agreed details of the scheme/modelling, as set out above, to P/SAE/MAE.</i> <i>5. Complete the DE's section of the VMAP Stage 4 check sheet (SQA-8677).</i>
	CE	<i>None.</i>
TfL Representatives	SAE	<i>Obtain the DE-created submission dates for all junctions in the Baseline List agreed in MAP Stage 1 in order to conduct Signals Safety Audit.</i>
	MAE	<ol style="list-style-type: none"> <i>1. Obtain and agree the DE-created statement detailing the 'Purpose' for each of the Vissim Proposed Models.</i> <i>2. Obtain and agree the DE-created record of the work required, prior to submission of the Vissim Proposed Models.</i> <i>3. Confirm that the P/DE understand an audit will not begin until the SAE has completed a Signal Safety Audit of the proposals.</i> <i>4. Review/update the MED.</i> <i>5. Complete the MAE section of the VMAP Stage 4 check sheet (SQA-8677).</i>
	NAE	<i>Attend meeting to agree the scope of the proposals as previously discussed during MAP Stage 1.</i>

Table 19: TfL Vissim Model Auditing Process (VMAP) Summary Sheet - Stage 5.

VMAP Stage 5 – Vissim Proposed Models Submission		
Roles	Key Responsibilities	
Promoter Representatives	P	<i>When the DE submits Vissim modelling, confirm with the MAE that it is of an appropriate standard and will not require multiple re-submissions.</i>
	DE	<ol style="list-style-type: none"> 1. <i>Formally submit the proposed Method of Control changes to the P/SAE for auditing and approval, using the MAP Stage 5 SQA-0640 Compliance Check Sheet (SQA-0530).</i> 2. <i>Obtain the approved MAP Stage 5 SQA-0640 Compliance Check Sheet sheets from the SAE.</i> 3. <i>Develop Vissim Proposed Models for all periods based on “Accepted” VMAP Stage 3 Validated Vissim Base Models.</i> 4. <i>Complete the DE’s section of the VMAP Stage 5 check sheet (SQA-0529, one for each time period under consideration) and provide to CE.</i> 5. <i>Formally submit the DE & CE-signed VMAP Stage 5 check sheet to the P/MAE.</i> 6. <i>Complete modelling work as required by the MAE in the event of the submission being rejected until it is accepted, as documented in the VMAP Stage 5 check sheet.</i>
	CE	<ol style="list-style-type: none"> 1. <i>Audit the Vissim Proposed Model for each time period prior to submission by the DE.</i> 2. <i>Complete, sign and return the VMAP Stage 5 check sheet (SQA-0529) to the DE.</i> 3. <i>Assess any further iterations of the model in the event of the submission being rejected by the MAE.</i>
TfL Representatives	SAE	<ol style="list-style-type: none"> 1. <i>Audit SQA-0640 compliance for each method of control change within the scheme.</i> 2. <i>Complete, sign and return a MAP Stage 5 SQA-0640 Compliance Check Sheet (SQA-0530) for each method of control change within the scheme to the DE/MAE.</i> 3. <i>Indicate to the MAE that the proposals are SQA-0640 compliant and submitted modelling may be audited within VMAP Stage 5.</i>
	MAE	<ol style="list-style-type: none"> 1. <i>Obtain a SAE-signed MAP Stage 5 SQA-0640 Compliance Check Sheet (SQA-0530) for each scheme method of control change.</i> 2. <i>Audit DE-submitted Vissim Proposed Models.</i> 3. <i>Complete the MAE section of the VMAP Stage 5 check sheet (SQA-0529, one for each time period under consideration).</i> 4. <i>Send completed VMAP Stage 5 check sheet to P/DE.</i> 5. <i>Conduct further audits on a rejected model and proceed until you can return an accepted VMAP Stage 5 check sheet.</i> 6. <i>Upload the approved proposed models to the TfL Model Library.</i>
	NAE	<i>None.</i>

NB: The P has a limited amount of the MAE’s auditing time. The P should therefore check that modelling is of an appropriate standard and will not require multiple resubmissions to pass this stage.

8 Glossary

Aimsun	Micro, meso and macroscopic modelling software developed by TSS-Transport Simulation Systems
AMAP	Aimsun Model Auditing Process
CE	Checking Engineer, the engineer responsible for checking and signing off the Design Engineer's work as fit-for-purpose for the Promoter
DE	Design Engineer, the engineer responsible for creating the modelling for the Promoter
DoS	Degree of Saturation, measure of capacity utilisation at a stopline
LinSig	Modelling software, developed by JCT Consultancy Ltd, used for detailed junction design, assessment of scheme proposals and the creation of skeleton models for checking against junction Controller Specification
LMAP	LinSig Model Auditing Process
MAE	Model Auditing Engineer, the engineer responsible for auditing the modelling and assessing the network impact of the scheme on behalf of TfL
MAP	Model Auditing Process
MED	Modelling Expectations Document, document created by the MAE in MAP Stage 1, and updated in MAP Stage 4, which summarises the agreed modelling requirements
NAE	Network Assurance Engineer, the RSM-Operations engineer responsible for assessment, then approval/rejection of the Promoter's proposal (under the TMA)
NMD	Network Management Duty, duty to manage roads under the TMA
RSM-Operations	Road Space Management Operations, team within TfL which ensures compliance with the TMA
SAE	Signals Auditing Engineer, the engineer responsible for checking and safety approving the Proposal on behalf of TfL
SIAR	Scheme Impact Assessment Report, formerly known as TSSR, a document which identifies the impact of implementing a scheme on the network to provide the Promoter and RSM-Operations with all of the required information to make an informed decision on the project

SRN	Strategic Road Network, road network in London where TfL has a strategic interest and must be consulted over any changes which impact it
TfL	Transport for London
TfL Traffic Modelling Guidelines	TfL's overarching framework, in conjunction with MAP, to deliver modelling quality and indicate recommended 'Best Practice' relating to the approach and methodology of model development
TfL Traffic Manager	TfL's representative responsible for meeting TfL's Network Management Duty under the TMA
TLRN	Transport for London Road Network, 580km of London's roads which are managed by TfL and for which TfL is the highway authority
TMA	The Traffic Management Act (2004), which places a duty on local traffic authorities to ensure the expeditious movement of traffic on their or adjacent road networks
TMAP	TRANSYT Model Auditing Process
TranEd	Software developed by JCT Consultancy Ltd to provide an improved graphical user interface for TRANSYT versions 12 and earlier
TRANSYT	Modelling software, produced by TRL Ltd, used for modelling and optimising signalised networks for representative traffic conditions
TSSR	Traffic Signal Supplementary Report, has been replaced by the SIAR
Vissim	Micro-simulation software developed by PTV AG
VMAP	Vissim Model Auditing Process

9 Document Control

Issue	Date	Purpose	Author	Checker	Approver
3	Mar 11	For Issue	J Smith	V Vorotović	J Robinson
4	Mar 12	Annual review completed, no change required. Email from James Smith dated 12/3/12 refers. Metadata updated – up-issue to version 4	J Smith	V Vorotović	J Robinson
5	Dec 13	Reference to TD amended to RSM	R Pierson	J Fraser	J Fraser
6	Dec 14	Full review. Network Performance update to Outcome Delivery team	V Vorotović	R Pierson	J Robinson
7	Jun 16	Review completed no change required. Next review set for Mar 17 by owner	V Vorotović	J Robinson	J Robinson
8	Mar 17	Review completed. References to Aimsun and AMAP added. Also MAP Stage 4 check sheets and Modelling Expectations Document. References to RSM amended to TfL where possible.	S Bulmer	J Green	M Pooke