Department of Planning Transport and Infrastructure
Traffic Modelling Guidelines – SIDRA INTERSECTION 7
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Disclaimer

The application of this manual does not guarantee that the resulting SIDRA INTERSECTION 7 traffic analysis models shall be ‘fit-for-purpose’. This manual only provides a framework for model development, calibration and validation. Some models, particularly models to be used for financial analysis will require more stringent standards and it is the responsibility of the designer to ensure that the models they develop are fit for their intended purpose.

This document should only be considered relevant in SA and for no other purpose than as a guide for designers undertaking work for DPTI.

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The Guidelines are approved for use by DPTI staff and the departments’ agents.

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Revisions

Revisions to the document will be made from time to time. Revisions will only be published on DPTI home Page (http://www.dpti.sa.gov.au/standards).

It shall be the responsibility of the users of this document to ensure that the most current version is followed.

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# DPTI Traffic modelling guidelines - SIDRA INTERSECTION 7

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1 INTRODUCTION

The Department of Planning, Transport and Infrastructure (DPTI) is the State Government agency responsible for managing the strategic road network within South Australia. As part of this responsibility, DPTI uses a range of traffic analysis tools to assess road network performance and to plan future development of the network.

The objectives of these guidelines are to:

- Provide guidance to both DPTI staff and those submitting work to DPTI, on what are the acceptable input parameters, performance measures, calibration requirements and reporting structure in SIDRA INTERSECTION (SIDRA) modelling.
- Develop consistency in traffic modelling practice and promote high quality model outputs that will lead to high quality project design.
- Ensure that all intersections are being modelled accurately.

These guidelines are not limited to the above list of requirements and DPTI reserves the right to undertake further assessment with different criteria.

This document is designed to assist practitioners when building SIDRA models of intersections suitable for submitting development or project scenarios to DPTI, for assessment/approval by the Traffic Operations Section.

DPTI Traffic Operations Section (Norwood Office) is responsible for managing DPTI traffic signal assets and the provision of any information required for the design of traffic signals, and further references in this document to DPTI imply the oversight of this Section.

Where the SIDRA modelling is being undertaken and there is a resulting modification to existing signals or a new signal installation is to be provided the traffic signals design is required to conform to the Traffic signals design standard TS100 which require a Traffic Signal Operations Performance Report (TSOPR) to be provided.


This guideline covers the broad areas of building, calibrating, validating and documenting SIDRA models and is to be used as the primary guide for the development of ‘fit-for-purpose’ SIDRA models for use within DPTI.

SIDRA is a DPTI approved software application to be used to justify traffic signal phasing, and phase sequences for individual traffic signal sites.

Model developers and SIDRA users need to have a high level of understanding of traffic operations, including SCATS®, and SIDRA modelling in order to achieve accurate models that are ‘fit-for-purpose’ and to ensure that the behavioural parameters remain within acceptable bounds.
A summary of DPTI requirements in respect of a SIDRA model is contained in the appendices;

A. MODEL SCOPING DOCUMENT
B. DATA COLLECTION,
C. QUICK GUIDE – Traffic Signals Configuration Checks,
D. DPTI – SUPPORT SERVICES

1.1 The Role of SIDRA in Transport Modelling Analysis

SIDRA traffic analysis is used for modelling individual intersections and is not suitable for all analytical tasks requiring computer based modelling of traffic operations. For example, DPTI uses the CUBE network modelling software package for the macroscopic analysis of the complete strategic transport system, encompassing both road and public transport elements. This strategic model is referred to as the Metropolitan Adelaide Strategic Transport Evaluation Model (MASTEM). The agency also uses other software packages including AIMSUN for Microscopic-simulation and mesoscopic-simulation, TRANSYT and LINSIG both individual and linked intersections.

SIDRA is only approved by DPTI to be used to model individual intersections. Whilst recognising the network functions of SIDRA7 may improve the assessment of closely spaced intersections DPTI has not assessed this functionality and therefore has no guidelines for its use to analyse networks. Where it is necessary to model networks, other modelling software applications must be used. Where traffic signal network optimisation is required use TRANSYT or LINSIG.

The latest version/update of SIDRA should be used wherever possible. At the time of publishing this guide the latest version was SIDRA INTERSECTION VERSION 7.0.7.6759.

The advice that follows assumes that SIDRA has already been selected as a required modelling software application to use for the project or development proposal.

1.2 Model description

The SIDRA software is a micro-analytical tool for evaluation of intersection performance. The SIDRA software can be used as an aid for design and evaluation of signalised intersections, roundabouts, stop control, and give-way control, and signalised pedestrian crossings.

These guidelines have been prepared to prescribe a number of SIDRA input parameters that DPTI requires for SIDRA models prepared by or on behalf of the department. The guidelines also provide information on the requirements for checking the quality of the models.

This guide is not intended to show you how to use all the features of SIDRA. For those requiring more information on the application they should refer to the “SIDRA INTERSECTION 7 User Guide”.

The second part of these guidelines covers the general characteristics of a SIDRA model, including its data input needs.

The third part covers general requirements for setting up, calibrating and validating a base case model.

The fourth part is devoted to the requirements of a traffic signal model, including the base case and proposed scenarios.

The fifth part includes those requirements relating to roundabouts and priority intersections where the requirements differ from traffic signals.
The sixth part provides advice on reporting the model results and findings. As a general requirement all exceptions to parameters recommended for use in these guidelines should be included in design reports, model reports and the Traffic Signals Operational Performance Report (TSOPR)
2 MODEL CHARACTERISTICS

The designer shall review the project specification to determine the model purpose. A clear scoping document of the modelling requirements is required to be developed from the project specification. The suggested requirements of the scoping document are detailed in Section 3.1 and APPENDIX A – SCOPING DOCUMENT

2.1 Intersection Familiarisation

Before commencing any modelling work or collection of site data, it is important for the designer to familiarise themselves with the intersection/s to be modelled. This section details some initial steps that should be taken by the designer to familiarise themselves with the intersection/s to be modelled.

2.2 Model Periods

The periods to be modelled should be described in the project specification. For developer initiated proposals, the model periods shall be subject to prior approval of DPTI. Model Periods are to be included in the Model Scoping Document. Typical DPTI model periods are outlined below:

- AM peak;
- Business / Midday; representing that middle period of the day where flows generally are as much as half of peak hour volumes.
- PM peak;
- Site peak, where the business activity peak occurs outside conventional work peaks.

Some projects will include additional periods that might include:

- Saturday midday peak
- Late night shopping periods [Thursday in the suburbs or Friday in the City] where heavily trafficked conditions might occur.
- Events at major venues.

The above list is not exhaustive. Additional time periods may be required depending on specific traffic patterns and flow profiles. The start time and duration of each time period will vary depending on demand.

2.3 Data collection

The full data collection requirements are outlined in Section 8 APPENDIX B – DATA COLLECTION. Data available from DPTI and must be formally requested, in writing, to DPTI.RoadTrafficData@sa.gov.au, and DPTI.TrafficOpsData@sa.gov.au.

2.4 SCATS® Summaries Data

“SCATS® summaries” provide current information on SCATS® controller operations (an example is provided in APPENDIX D – DPTI SUPPORT SERVICES) The data elements include, Site details, right turn movement operation, average phase green splits, phase sequences, intergreen times, Phase skipping and double cycling, Cycle lengths, Walk time settings for pedestrians, SCATS® Picture showing phases and detectors, recent maximum flow [MF] values for each detector, Site Operation details and Phase settings including minimum green, Yellow and Red periods.

2.5 Non-Green (yellow/red) time

The time used by traffic during non-green periods can influence road capacity and adjustment for this behaviour should therefore be a requirement during model calibration. Additional road capacity created by aggressive vehicle behaviour can be reflected in a traffic model but must be reported in the Traffic Signals Operation Performance Report for
model auditing purposes. These periods must not be adjusted arbitrarily to achieve degrees of saturation less than 100%.

Non-green periods should be accounted for if vehicles are observed on-site to behave aggressively at the stopline, e.g. by crossing a stopline near the start of red. Site observations should record the total time (in seconds) utilised by traffic during non-green periods for each peak period.

### 2.6 Saturation Flow and SCATS® Maximum Flow [MF]

Saturation flow is an expression of the maximum flow that can be discharged from a traffic lane when there is a continuous green indication and a continuous queue on the lane approach. Saturation flow is normally expressed in passenger car units (Pcu's/hour). (Sometimes referred to as through car units (TCU’s), or passenger car equivalents (PCE’s).

Incorrect saturation flows represent a common source of modelling error. It is important that measured saturation flows are used for calibration of traffic models of existing intersections. It is therefore important that saturation flows are measured accurately. The conventional method of measuring saturation flows is by manual sampling. It is recommended that a minimum of ten typical readings are taken to obtain a mean average, and that the minimum length of each measurement should be 12 seconds (approximately 6 vehicles).

The method for surveying and calibrating saturation flows in SIDRA models is described in The SIDRA INTERSECTION 7 User Guide, Section 3.3.1 Calibration, page 15 and section 4.1.13 Lane Data, page 39.

To aid with the collection of saturation flows, JCT Consultancy has a free Android application that is available from the Google Play Store. Instructions for its use are located at: [http://www.jctconsultancy.co.uk/Software/JCTTrafficTools/guide.php](http://www.jctconsultancy.co.uk/Software/JCTTrafficTools/guide.php) This JCT Traffic Tools application is approved for use by Transport for London and was created to meet that agencies requirements.

An alternative to the manual method of saturation flow surveys is use of the SCATS® MF (maximum flow) values. SCATS® MF values are derived from sampling the traffic signal detector inputs and represent measured saturation flows in pcu’s/h. MF values for each detected lane are included in the SCATS® Summaries.

Designers need to be aware that not all MF values are reliable. Detectors in shared lanes are known to provide unreliable MF values. Also SCATS® detectors are not installed for every lane at an intersection.

For proposed scenarios e.g. where new geometry is required, the basic saturation flows should be representative of the geographical location of the intersection or similar operational environment, e.g. City / Suburbs.

### 2.7 SCATS® Signal Timing data

Traffic modelling relies heavily on the accuracy of signal timings to correctly represent capacity at signalised intersections. Much of this information will be made available from DPTI.TrafficOpsData@sa.gov.au, in the form of SCATS® Summaries. The designer is however responsible for ensuring that this information is configured appropriately in their model.

For calibration of the base case model signal timing data should be compatible with the same model periods as other traffic data including traffic volumes. If the SCATS® Summaries do not match all the model periods required in the design specification additional data can be readily obtained on request.
Fixed pedestrian time settings for walk and clearance in the base case models may create processing problems in SIDRA where the actual green time allocated to the parallel vehicle movements is less than these settings; in this case the effect of the fixed pedestrian times in the model need to be reduced to reflect the average phase splits.

The means of reducing this effect is described in Section 4.1.21 Pedestrians<Pedestrian Timing Data<Pedestrian Activation settings by deselecting “Program”, selecting “% Ped Call” (percentage of Pedestrian phase Calls) and entering an appropriate value.

In future scenarios, unless the designer has reason to know that the pedestrian demands are expected to change, where “% Ped Call” has been used to effectively reduce the pedestrian time settings in the base case, the same %age should also be used to reflect the same level of pedestrian demand in the scenarios.

2.8 Queue Lengths

Queue length data can be a useful check for model validation at locations where queues persist from one signal cycle to the next. Surveyed measurements are normally taken at a consistent point in the signal cycle (e.g. at the start of green), specified for each traffic lane and measured in metres.

The level of accuracy in queue measurement surveys can often be lower than for other surveys as the definition of a queue can be ambiguous as well as difficult to identify. At some locations the maximum length of queues has been found to be inconsistent and therefore is be unreliable for validation purposes. Despite this it remains important to identify on which approaches the maximum queue lengths are occurring for each model period.

For a single intersection the queue prediction model in SIDRA does not take account of downstream queues which impact a site. The downstream queue effect invalidates the observed queues for use as a validation measure.

2.9 Traffic volume data and classification data

Intersection Vehicle Turning Movement Surveys of traffic volumes with vehicle classification data, in “Cars” and “commercial vehicle” (CV) types, is available on request from DPTI, Integrated Transport Intelligence and Mapping System (iTIMS) Traffic Information Map Browser where it may be downloaded in the format of PDF files. Data is sometimes also available in an Excell spreadsheet and java script formats. (Request from DPTI.RoadTrafficData@sa.gov.au) A typical example of the PDF format report is shown in Section 8.1 Traffic Count Data, page 75.

This intersection Vehicle Turning Movement Survey data is not seasonally corrected and may not be sufficiently recent to represent current circumstances. The designer will therefore need to determine if this data needs to be supplemented by additional traffic surveys.

Turning movement data from detector counts is also available in the form of SCATS® Volume Store (VS) data on request from DPTI.TrafficOpsData@sa.gov.au. This data is recorded as a daily record in “vehicle” numbers at 5 minute intervals and is available from a large database which enables representative data to be extracted for a selected period.

A combination of the manual turning movement data and SCATS® VS data will normally provide a sufficiently rich source of information to enable validation of base case models for existing intersections with traffic signal operational data for each of the model periods.

Austroads standard 13 vehicle type classification data from automatic field devices is also available from the Traffic Information Map Brower but this data is normally reported over a weekly period and the sites have a limited geographical distribution. Care needs to be
taken that the information is temporarily and spatially relevant to the intersection site being analysed.

3 MODEL DEVELOPMENT

3.1 Model scoping document

A model scoping document shall be prepared by the designer on the basis of a client brief or contract specification and be submitted to DPTI for approval before modelling commences. The model scoping document will clarify the requirements of the brief in greater detail. It will outline the purpose for the model, e.g. for capacity assessment, delay evaluation, optimised green spits for model inputs, etc., the type of project for which the model is being created, the location of the intersections, the traffic flows being used and their sources, traffic control data sources and the model time periods, and the stages of model development to be considered.

3.2 Stages of model development

The stages shall include:

- A “base case” which comprises a representation of the existing situation, fully calibrated and validated. The existing situation shall comprise existing geometry, traffic signal control phasing and green times, traffic volumes and saturation flows.
- An “interim model”, shall comprise the base case model with optimised traffic signals phasing but with the same cycle length and minimum green time/pedestrian time constraints. This may be required to provide a suitable model to compare with optimised scenario models.
- A “base case for comparison” which represents a future year projection of the base case or the “interim model” to represent the start of the project year. This may include future year projected traffic volumes and the influence of recently completed or committed adjacent projects and developments.
- A “future year” model shall represent a worst case scenario for comparison for with and without completion of a project. A “future year” model shall use the “base case for comparison” model but include a projection of the traffic volumes to a “future year” when the project is expected to be completed. The future year model will include an increase in traffic through growth projections and include the influence of adjacent projects or developments anticipated to be completed by the future year.
- Project “Scenario” models shall represent each of the proposed project or development options including future year traffic projections, proposed geometric changes, proposed traffic control changes including traffic signal phasing optimisation, and including new or modified intersections.

3.3 Base case model

Every SIDRA project prepared for DPTI must have a base case model built to compare with the project options.

The base case for the purposes of these guidelines is a representation of the existing operational condition of the existing intersection without any proposed modifications. (Note: For an economic assessment a “base case” may represent a future year which might also include projected improvements to the intersection and if it is a requirement to model this situation it will be referred to a “base case for comparison” in these guidelines)

The base case model must be fully calibrated and validated for each time period being considered for the project options. Usually the time periods would be AM peak hour, a representative Business hour and the PM peak hour. (Refer to Section 2.2 Model Periods for a full description of period options)

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The basic data for a base case model for existing intersections shall be representative of existing traffic signal phasing, geometry, and saturation flows and traffic volumes. The sources of data available from DPTI is outlined in Section 2.3 Data collection. Plans of the existing geometry are also available from the department, however it is the designer’s responsibility to ensure that all the information provided by DPTI is an accurate representation of the current site conditions.

### 3.3.1 Calibration

For SIDRA models calibration shall comprise checks of the input data to ensure that the base case (i.e. the latest valid data representing the existing intersection) data is adequately represented in the model.

The calibration process should be based on various traffic data, including surveys and site observations. This data, for traffic signals shall principally include traffic flow, saturation flow, traffic signal phase sequences, phase green time splits, traffic signal timing settings for yellow, all red and pedestrian phases, and geometric parameters.

The SIDRA INTERSECTION 7 User Guide, has some advice on calibration methods in Sections 2.6 “Model Calibration” and 5.4.3 “Lane data”.

In the SIDRA INTERSECTION 7 User Guide it recommends saturation flow rates are calibrated not by modifying the “Basic Saturation Flow” in the approach lane data parameter, but instead modifying the other lane factors that will influence the SIDRA estimation of the saturation flow so it equals the measured saturation flow. This will maintain the lane variability provided by the data input into the Lane Geometry dialogue for any project scenarios.

Measured saturation flow values should therefore not be input directly, lane by lane into the Lane Geometry<Lane data “Basic Saturation Flow” field (section 4.1.13). The saturation flow calibration shall comprise a comparison of measured and adjusted saturation flows post initial processing of the model. It is most important that differences in the saturation flows are identified in the report and the adjustments made also reported. Measured saturation flows for through lanes are assumed to be more reliable than turning lanes.

Only after the appropriate adjustments to reflect the intersection geometry, where the through lane measured saturation flows for all approaches of an intersection are found to be different than the adjusted processed values from SIDRA should the designer consider selecting a more appropriate “Basic Saturation Flow” for all lanes in the intersection.

Before calibrating saturation flows in SIDRA ensure that all the global factors are set to unity, including the Area Type Factors (ATF) (section 4.1.3 Site input data) and “saturation flow scaling”. To eliminate saturation flow scaling for calibrating the model ensure that the Demand and Sensitivity is set to “none” (section 4.1.7).

On-site measured saturation flows in units of pcu’s per hour may be compared with values for individual lanes shown in column 4 of two SIDRA Detailed Output tables (illustrated below). One table is in the “SCATS Parameters” table. The “SCATS Satn Flow” output is adjusted for lane width, approach grade, ATF, saturation flow scaling, and turning vehicles using the turn adjustment factors from the VEHICLE MOVEMENT DATA.

The second output is the LANE FLOW AND CAPACITY INFORMATION table. The data is headed “Saturation Flow Adj. Basic (tcu)” and is adjusted for the effects of lane width, approach grade, parking, buses stopping, ATF and saturation flow scaling.
Common errors in models can be attributed to imbalanced Lane utilisation. For calibration the Lane utilisation (Section 4.1.12 Lane Geometry<Lane Data Tab) should be checked and adjusted.

On-site observations of relative queues in adjacent lanes will provide this information. For traffic signal controlled intersections detector counts in adjacent lanes from the SCATS® Vehicle Store (VS) will also provide sufficient guidance on relative lane utilisation, for each of the model periods.

For existing priority intersections, including roundabouts, the gap acceptance and follow-up headways shall be calibrated (See section 5.2.6 Field Measurements and Calibration of Gap Acceptance).

All changes required in order to calibrate the model should be fully documented with an explanation and justification of the change.

### 3.3.2 Validation

Validation shall provide an additional check, independent of the calibration. Validation shall use the calculated values in the base case model to check that the results are representative of the observed situation. The principal values to be used shall be the Degree of Saturation (DoS) and the calculated 95%ile queue length on the approaches.

Where approaches are known to be over-saturated in peak periods and the models reflect this by calculating values above 95% DoS, it should not be necessary to undertake site surveys to establish the measured DoS values. At unsaturated sites, on-site measurements of degrees of saturation may be necessary in order to validate the model.

The same JCT Traffic Tools application (see page 12) will also calculate DoS values from on-site measurements having established a valid saturation flow from measured data.
It is also important that low values of DoS produced by SIDRA are explained, where high levels had been expected, as these may be because of “underutilised green time” (UGT). Underutilised green time for through movements is most likely to occur where there is upstream queuing blocking the approach. The JCT Traffic Tools application is also capable of measuring on-site the effect of underutilised green time (see Section 2.6 Saturation Flow and SCATS® Maximum Flow [MF]).

It may be necessary to create additional pseudo traffic signal phases in SIDRA to cater for underutilised green time by creating a late start or early cut-off effect for the affected approach.

The effects of walk-with-traffic parallel pedestrian phases may also need consideration where DoS is unexpectedly low. This usually occurs where there is Underutilised Green Time because of large numbers of pedestrians which restrict turning vehicles.

All changes required in order to validate the model should be documented.

3.4 Interim model processing- traffic signals

Before creating proposed “scenario” models, in order to properly identify the effects of future network and/or demand changes on the existing operation of signalised intersections, the timings obtained from a calibrated and validated base case model of existing conditions (i.e. based on observed signal times) should be compared with those obtained from SIDRA optimised timings. Except for changing, in the Timing Options, the “User-Given Phase Times” to “User-Given Cycle Time” the geometry traffic volumes and other control parameters should remain unchanged. In this way differences between SCATS settings and optimised green times can be compared, and an explanation provided as to why differences may exist. This comparison is useful in identifying:

- Incorrect model assumptions in respect of traffic behaviour (saturation flows, delays due to pedestrians, queue storage space etc.).
- Incorrect model assumptions in respect of signal operation assumptions (i.e. alternative phase calls, phase skipping, offset, cycle times, minimum greens, clearance times, pedestrian clearance periods, etc.).
- Inefficient SCATS® setup
- Operational constraints which have the effect of restricting phase green time.

In reviewing this process the designer will need to consider whether the logical features of SCATS® set-up for facilitating co-ordination need to be retained. These features might include: the cycle length limits, green time restrictions (minimum or maximum), pedestrian time settings (walk and Clearance), VK/VO limits, stretch phase to gain all bonus times, or VK/VO tests for wasted green time and gating strategies, and %age phase demands.

Table 1 provides a summary of the steps necessary to properly distinguish between an optimised existing model and SCATS® operations to avoid future scenario assumptions being erroneously attributed to “improving” SCATS® operations. These steps also ensure that the real value of infrastructure works or signal operation changes are identified.
### Table 1 Suggested method for distinguishing optimiser effects

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Establish base case calibrated/validated model that reflects existing SCATS® operations and observed saturation flows.</td>
<td>Calibrated/validated base case model</td>
</tr>
<tr>
<td>2</td>
<td>Re-run base case model from step 1 with appropriate optimiser settings (1)</td>
<td>Optimised model (2)</td>
</tr>
<tr>
<td>3</td>
<td>Compare base case and optimised models and provide description and explanation of differences.</td>
<td>Summary of differences make decision to amend &amp; re-run (or not)</td>
</tr>
<tr>
<td>4</td>
<td>As required under Step 3, make changes to the optimised model, re-run and compare to the base case.</td>
<td>Provide discussion on differences.</td>
</tr>
<tr>
<td>5</td>
<td>Compare the model output from step 4, the optimised model with the outputs from the proposed model options.</td>
<td>Direct comparison with base SIDRA optimised model and future optimised model.</td>
</tr>
</tbody>
</table>

**Notes:**

1. The optimisation process should be based on intersection delay with a “User given cycle time”, but allowing green time selection for the base case and the proposed options.

2. It may be appropriate to use the optimised base case existing model (the INTERIM model) as the base for comparison purposes with your proposed scenarios. Seek DPTI advice on this process.

### 3.5 Base Case for Comparison

A “base case for comparison” model may be required where an assessment of a project scenario/s is to be made with a “do something” projection. The features and requirements of a “base case for comparison” model will vary for different projects. This model may include a combination of future year traffic flow projection, geometric changes and traffic control changes. Generally the changes will only include the influence of projects and developments for which there is a known commitment. The scope of the “base case for comparison” should be clearly identified in the scoping document for the project.

The “base case for comparison” shall be developed from the already calibrated and validated base case model, or the “interim model” where this has been created, to ensure that the Scenario models can be properly evaluated.

### 3.6 Future Year Model

Where it is necessary to compare the existing network performance with future project scenarios in a do nothing worst case scenario, a “Future Year Model” may be required. This model shall comprise the “base case for comparison” without any geometric changes but with traffic flow projections to the future year projection of when the project is expected to be completed. The model may also include the completion of anticipated adjacent projects or developments.

The designer shall consider that for some future year models this might provide unrealistic results, especially if the traffic demand far exceeds the available intersection capacity.
3.7 Projected Scenarios

The base case, calibrated and validated model shall be used as the skeleton model for the creation of projected scenarios; and the tested parameters should not be changed. Only the minimum changes necessary to reflect the new configuration should be made. (See Sections 3.4 and 3.5 regarding the “interim model” and “base case for comparison”)

Before commencing modelling the designer shall discuss with DPTI, how it is proposed to incorporate the effects of future year projected traffic growth with trips generated by proposed developments into the SIDRA models. (See section 3.1 Model scoping document). The approval of projected traffic flows is required by the Department prior to model commencement.

In addition to traffic analysis representing future year projections the designer may be required to provide a “day of opening” traffic impact assessment, to demonstrate that on completion of the development it will have no detrimental effect on current road and traffic operations.

3.7.1 Development Applications and Traffic Generation

For new trip generating developments adjacent to an existing road managed by DPTI the designer shall demonstrate the likely trip generation and route choice, to and from the development, and how this will affect adjacent intersections, as well as direct accesses to the development.

Where recent trip generation rates are available from South Australian site surveys, this trip data should be used for the model analysis. The source of the data is to be included in reports.

To determine trip generation rates, where recent survey data is not available, the designer should refer to the DPTI guideline “Trip Generation Rates for Assessment of Development Proposals, January 2014”

The designer may also use the trip rates in the report by the Director General of Transport, South Australia (1987) “Land Use Trip Generation Stage 2 Report” (by Shane P Foley and Travers Morgan Pty. Ltd.)

Where South Australian data is not readily available it is acceptable to use the trip generation rates from the TfNSW RMS Guide to Traffic Generating Developments and updated surveys (see references).² ³

Where the traffic generation rates are not provided or available from other sources, appropriate rates should be determined by undertaking surveys of similar land use types within South Australia. The survey data should be included in the design report.

Trip generation rates should be applied to the various land use types and components of the development to determine the overall traffic generation rates. It is not appropriate to use gross trip rates where these are likely to predict lower traffic generation rates.

Given the likely variation of trip rates from similar types of developments over time and location it is essential that trip rates are approved by DPTI before model development commences.

Predicted trip rates from the development and future year traffic growth projections are applied to the model for the assessment of the developments overall traffic impact.

3.7.2 Future year traffic projections

For all projects or development proposals affecting the strategic road network, future year traffic projections are to be based on turning movement outputs from MASTEM, DPTI's strategic transport model. As MASTEM is a strategic model which does not necessarily reflect the level of local detail required to accurately represent individual turning movements for use in SIDRA, these turning movement outputs are to be adjusted in accordance with DPTI's requirements. Future year adjusted turning movements are calculated from base year observed values, factored by the ratio of values for the future year and base year models.

For new project scenarios, where the designer does not have access to MASTEM, future year traffic predictions will be provided to the designer by DPTI. It is the designers’ responsibility to formally request this information.

Before modelling commences projected traffic volumes of a projected development shall be agreed by the designer with representative sections of DPTI. (Currently including both the People and Business Division, Infrastructure and Services Planning Section, and the Safety and Service Division, Traffic Operations Section.)

3.7.3 DPTI Standard Traffic Signal conventions.

The standard conventions for labelling traffic signals are shown in DPTI Standard Drawing 6841 Sheets 1 and 2, “Traffic Signals Design Guide Detectors Signal Groups Phasing and Pole Numbering Standards”. These drawings can be found at the traffic signals section of the master specification web page (see the hyperlink on page 8).

These drawings also show the naming conventions for signal Groups and detectors.

Wherever practical these naming conventions shall be used in models.

The drawings also show the DPTI standard phasing arrangements in the following forms:

- Conventional phases.
- Conventional phases with turning leading, trailing or repeat right turn phases.
- Diamond Phase.
- Split approach phases.
- Tee intersections
- Pedestrian Activated Crossings

These phase arrangements and labelling conventions should be used in all types of proposed intersection modelling.

3.7.4 Design of minimum phase times and intergreen periods

Modifications to intersection design or method of control may typically require recalculation of the phase minimum and phase intergreens. To determine appropriate values of yellow and red time refer to the DPTI Yellow Red Template (see Appendix D – DPTI Support Services), which details phase minimum and intergreen times and pedestrian phase times i.e. walk and clearance.

For all new intersections use the Yellow Red template spreadsheet to design intergreens.
A copy of the Yellow/Red output should be included in the Traffic Signal Operational Performance Report (See Section 3.9 Model reporting requirements).

3.8 Measures of performance

SIDRA offers a variety of output features that can help in the analysis and reporting of model performance, which are detailed in this section. The core performance elements that should be assessed for any intersection modelling using SIDRA are:

- Degree of Saturation (DoS).
- 95 per cent Back of queue distance.
- Level of Service (LoS).
- Vehicle delays (veh/h) or (pcu/h)
- Number of vehicle stops.

The performance assessment of the first 3 items needs to be considered on a lane by lane basis.

3.8.1 Degree of Saturation (DoS)

The maximum acceptable degree of saturation for traffic signal lanes in the final future design year is 90%. On saturated approaches in the base case model values of between 90% and 100% can be expected.

Any change in these values should be justified and evidence provided as to why the value should be changed.

For various types of new intersections the maximum degree of saturation shown in table 2 shall apply.

<table>
<thead>
<tr>
<th>Intersection type</th>
<th>Maximum practical degree of saturation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Signals</td>
<td>0.90</td>
</tr>
<tr>
<td>Roundabouts</td>
<td>0.85</td>
</tr>
<tr>
<td>Sign-controlled</td>
<td>0.80</td>
</tr>
</tbody>
</table>

Reference AUSTROADS GTM part 3 section 3.2.4 Degree of Saturation

3.8.2 95th percentile back of queue distance

The standard SIDRA default method uses the 95th percentile value of the back of queue. This is a statistical value which represents the actual queuing experienced at the approach. It can therefore be used to validate the base case model against measured queues. For proposed or modified intersections it will be used to determine the storage length requirement of a short lane. (Note taper lengths are additional to storage)

3.8.3 Level of Service (LoS)

SIDRA output includes LoS results based on the concept described in the US Highway Capacity Manual (HCM) and various other publications. The HCM 2000 (TRB 2000) uses the average control delay (overall delay with geometric delay) as the LoS measure for signalised and unsignalised intersections.

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The HCM (2000) LoS is the standard applied to models by DPTI. Use the parameter setting “Delay (SIDRA)” (see Section 4.1.6 Parameter Settings dialogue)

Level of service is primarily used as a limit control for proposed scenarios to ensure that the scenario represents a practical proposal. As a performance measure the minimum level of service is Level D for intersections in project scenarios at future year projections.

Level of service can however also be used to demonstrate a coarse comparison between the base case and the scenarios. It is not useful for verifying base case models.

3.8.4 Delays and Stops

The main measure of comparative performance output from SIDRA models is the overall vehicle delay or travel time (vehicles hours per hour) and the number of vehicle stops (vehicles per hour). These measures are only comparative if intersections are treated equally as isolated controls. Adjustment factors are therefore not to be used, these include; co-ordination factors, bunching factors, green split priority, etc.

3.9 Model Reporting requirements

Detailed advice on reporting requirements is also to be found in Section 6 Model Reports, of these guidelines.

Where there is an exception to these guidelines the exception and the justification for the change shall be included in the model report, any design reports and the TSOPR (see below)

In addition to any other modelling reporting requirements, where there is a resulting modification to existing signals or a new signal installation is to be provided the traffic signals design is required to conform to the Traffic signals design specification TS100 which requires a Traffic Signal Operations Performance Report (TSOPR) to be provided (a link to the specification is provided on page 8).
4 MODEL CONSTRUCTION - TRAFFIC SIGNALS

4.1 Getting Started – Configuration for the Base Case

This section enables a user to develop a traffic signal model in a logical and systematic way and it is recommended that users work through the input screens in the sequence shown.

Some configuration parameters can be entered and modified in more than one dialogue window in SIDRA and therefore care needs to be exercised to ensure that the original model configuration selection is not modified inadvertently during the model creation.

Figure 2 Main Screen < Site tab dialogue

It is essential that configuration parameters are entered and checked before setting up a model and for those experienced SIDRA users a quick guide to setting up parameters is given in the flow chart in Appendix C Quick Guide – Traffic Signals Configuration Checks.

4.1.1 Site tab

After opening the SIDRA application the Main Screen will default to the Site tab and the designer shall make a selection from one of the intersection icons in the tool bar: “signals”, “roundabout”, “sign control”, or “pedestrians” to display the appropriate side menu bar.

Signals, “At-Grade Intersection” has been selected from the tool bar in the example above.

The “File” tab offers menu selections similar to any Microsoft application.
4.1.2 Settings

To ensure that your model layout is depicted for driving on the left side of the road ensure that “Standard Left” has been displayed for the “Current Setup” in the Settings tab.

Parameters shown as “Program” in the input dialogue windows will use the default parameters from the “Standard Left” configuration. For the most part no changes will need to be made. Those needing to be changed are indicated in this guide. Where the “Program” value is changed, by the user, this will remain “fixed” during processing the data. Some Items left as “Program” may change to suit other model influences.

Where the “Program” item is required to be changed, opening the drop down panel will reveal the input options. Be careful that the correct option is selected. For some fields the “Quick Input” option should be used to ensure that the configuration parameter is distributed throughout the model elements, e.g. for all approaches or all lanes.
The Volume Display Options dialogue should be viewed to ensure the following options are selected.

Uncheck the tick box the “Same as Volume dialog” box. This is in order to prevent unexpected changes to the volume reporting.

Click the radio button for “Separate”. Traffic Volumes shall be entered separately for light vehicles and heavy vehicles as whole numbers in the volume data dialogue. The setting for light and heavy vehicles to be shown separately will ensure vehicle types are reported separately in absolute numbers even if the volumes are entered in a different format.

The tick boxes for the display of Pedestrian Volumes and Movement Order are optional.

### 4.1.3 Site Input Data

Before being able to define many other configuration parameters the intersection site data shall be defined.
4.1.4 Intersection dialogue

The following is required as a minimum in the intersection dialogue (but not limited to):

- Site name shall include a description title of the intersection location. (use only the names of two intersecting streets)
- The Site ID shall comprise the TS number of a signalised intersection.
- A description of the modelling purpose including the modelling period, e.g. AM and the traffic flow year
- For auditing purposes include the model creators name at the bottom of the site title description. Note the name of the auditor should be included in the Calibration notes in the Model Settings-Options tab Dialogue.
- Site geometry shall be set up as simply as possible (avoid NE, SE etc.) where applicable, i.e. set up as north-south, East West approaches instead of NW-SE approaches, and avoid using approaches at acute angles.
- Use existing road names to label the approaches and include a suffix to show the compass orientation of the approach.
- For all signal sites, the approach distance shall be measured to the next upstream intersection to aid in queue length reporting. Where intersections are closely spaced the “Approach distance” parameter shall be equal to the measured storage space between intersections in order to accurately reflect upstream blocking effects.
- Extra bunching should only be applied to non-signal controlled intersections, (See section 4.)
- The Area Type Factor (ATF) shall always remain as 1.0
4.1.5 Project File Naming Conventions

It is essential that the project file is saved after entering the first model description in the intersection dialogue.

The file shall include a date code, TS number project name and a version number, in the form yyyymmddTSxxxxprojectnameV2 e.g. 20160526TS1234unley supermarketV2.sip7.

SIDRA does not include a mechanism to lock individual “sites” within the project file, after completion of the data entry project scenarios, including the base case may be inadvertently changed or reprocessed.

Tip: Save a copy the base case models and interim models in separate *.sip7 files to ensure that they are not inadvertently modified when creating the scenario models.

4.1.6 Parameter setting dialogue

The Parameter Settings input dialogue can be used to select various model options and specify some model parameters.

Some of the settings in the Parameter Settings input dialogue are common for all intersection types and some are unique. For instance the Roundabout parameters will be shown only if the site type is a roundabout.

![Figure 6 PARAMETER SETTINGS - Options tab dialogue](image)

The parameters in the Options tab apply to the intersection as a whole and are relevant to all SIDRA models. These are important parameters that affect the results significantly. They should read as follows:

- Level of Service Method should be set to “Delay (SIDRA)”.
- Level of Service Target should be set to “LOS D”.
- Percentile Queue should use 95th percentile.
- Hours per year may be left at the default value (480 h) as DPTI does not use this data element for annual projections.

Do not tick the box for “include short lanes in determining Approach Queue Storage Ratio”.

Use of the calibration notes should generally be confined to use by the designer and 3rd party model validator where independent validation is a contract requirement. The designer should note here any issues that needed to be addressed to achieve the
calibrated/validated model. The 3rd party validator should include their name and date in the “Calibration notes” of the validated soft copy of the model.

The SIDRA default values can be used for most parameters shown in the Model Parameters dialogue tab.

The Heavy Vehicle factor may be adjusted using AUSTROADS vehicle type classification data. For some locations this information may be available from DPTI, Integrated Transport Intelligence and Mapping System (ITIMS). Requests for information from ITIMS should be made to DPTI.RoadTrafficData@sa.gov.au. Where the information is not available additional surveys may be required.

The PCU values to use are based on the following equivalents in Table 3 overleaf.
### Table 3 PCU values for AUSTROADS classes

<table>
<thead>
<tr>
<th>AUSTROADS VEHICLE TYPE</th>
<th>AUSTROADS Class</th>
<th>PCU VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medium (short + trailer or Rigid) 5.5m – 14.5m</td>
<td>2-5</td>
<td>2</td>
</tr>
<tr>
<td>Long (articulated) 11.5m – 19m</td>
<td>6-9</td>
<td>3</td>
</tr>
<tr>
<td>Medium Combination 17.5m - 36.5m</td>
<td>10-11</td>
<td>4</td>
</tr>
<tr>
<td>Road Trains &gt; 33m</td>
<td>12</td>
<td>5</td>
</tr>
<tr>
<td>Tram (Bombardier Flexity)</td>
<td></td>
<td>4</td>
</tr>
</tbody>
</table>


The delay and queue boxes should remain unchecked.

The Platoon Dispersion Model parameters are only used in network models and should remain at the default values. (Note DPTI does not currently accept SIDRA network models)

The default values of the downstream short lane model parameters should be used. It is emphasised that although these defaults can be expected to provide sensible results, the values are not well calibrated against real-life data. As these parameters affect the lane utilisation of the upstream approaches, the lane utilisation on the approach lanes must be calibrated after processing the intersection with the exit lane geometry. Initial lane utilisation values should be recorded in the written report. See the notes on LANE DATA dialogue.

**Figure 8** PARAMETER SETTINGS cost tab dialogue

For the cost factors use the default values. These values are not used in DPTI economic analysis which is carried out using the basic vehicle delay output parameters measured in seconds.
The Fuel and Emissions parameters are to remain as the default values.

4.1.7 Demand and sensitivity dialogue

The Demand and Sensitivity dialogue includes the Design Life, Flow Scale and Sensitivity options and are specific to the Site.

The default is “None”, and should be used for analysing the performance of the base case and project scenarios.

The specification of another option in this dialogue will override the “Cycle Time” option chosen in the Phasing & Timing<Timing Option tab dialogue (See Section 4.1.26, Page 50)
4.1.8 Movement definitions

There are two tabs in the movement definitions – Movement classes’ dialogue and Origin destination movement’s dialogue.

**Figure 11 MOVEMENT DEFINITIONS < Movement Classes tab dialogue**

Use the default “standard” configuration to use light and heavy vehicles as previously defined in the Main Screen<Settings tab dialogue screen, Volume Display Options field (page 25).

**Figure 12 MOVEMENT DEFINITIONS < Origin-Destination tab dialogue**

The designer shall change the Origin-Destinations to suit the circumstances e.g. tick the box if ‘U’ turns are permitted.

To ensure that the output is easily interpreted the “OD Movement ID” should be changed to match DPTI naming conventions for signal group numbering shown on Drawings S-6841 sheets 1 and 2, which are included in the traffic signals specification (see page 8 for the hyper link to the website).

Where there are uncontrolled movements, i.e. there are no signal groups separately controlling these movements the movement ID shall be taken in the next order of sequence from the highest numbered signal group.

Where there are lanes with different movements e.g. left and through, but sharing the same signal group, use the signal group number for both but provide an alpha suffix to provide a unique number for the movements, e.g. 4,4a,4b,4c etc.
4.1.9 Vehicle movement data

**Movement path data** – The Approach Cruise Speed and Exit Cruise Speed for existing intersections should reflect the present intersection conditions.

The Negotiation Speed and Negotiation Distance and Negotiation Radius should remain as “Program” but may be changed to indicate the physical parameters for intersections that have unusual geometry features.

The Downstream Travel Distance should be changed to reflect the distance to the next nearest intersection where it is less than 500m (the default value).

If different parameters are required for different vehicle classes select the appropriate radio button for each class.

Justification should be provided in the written report for changed values.
Use the default parameters for light vehicles. Revise the heavy vehicle parameters as described below.

The gap acceptance factor and opposed vehicle factors must remain as 1.0 for light vehicles.

The gap acceptance factor is used to adjust the gap acceptance and follow-up headway parameters that are set in the GAP ACCEPTANCE dialogue. The Opposing flow factor is designed to simulate the opposing vehicle effects of large vehicles compared with passenger cars, so here should remain at “1”.

The Practical degree of saturation should remain as “Program”. The Practical degree of saturation default is 0.9 (Representing 90% DoS). This value should not be changed in this dialogue screen.
The Heavy Vehicle (HV) movement data may be changed from the default values. This should be based on the latest available Austroads vehicle type classification counts to reflect accurately the mix of commercial vehicles. For some locations this information may be available from DPTI, Integrated Transport Intelligence and Mapping System (ITIMS). DPTI.RoadTrafficData@sa.gov.au. Where the information is not available additional surveys may be required.

SIDRA defaults for Queue space and vehicle length data for heavy Vehicles (HV) are: Queue space 13m, and Vehicle length 10m. Adjust these to better reflect Austroads vehicle classes.

The length values to use are based on the following equivalents in Table 4 below.

### Table 4 Vehicle length for AUSTROADS classes

<table>
<thead>
<tr>
<th>AUSTROADS VEHICLE TYPE</th>
<th>AUSTROADS Class</th>
<th>Average vehicle length (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medium (short + trailer or Rigid) 5.5m – 14.5m</td>
<td>2-5</td>
<td>12</td>
</tr>
<tr>
<td>Long (articulated) 11.5m – 19m</td>
<td>6-9</td>
<td>19</td>
</tr>
<tr>
<td>Medium Combination 17.5m - 36.5m</td>
<td>10-11</td>
<td>26</td>
</tr>
<tr>
<td>Tram (Bombardier Flexity)</td>
<td>11-20</td>
<td>30</td>
</tr>
</tbody>
</table>

Reference Austroads GTM Part 3 Traffic Studies and Analysis Appendix A.5 Table A8 for Austroads vehicle classification For Average classification lengths refer GTRD Part 4 Intersections and Crossings Appendix B Table B1, Examples of vehicle length.

Add 2m to the average vehicle length to produce the Queue space value,

The vehicle occupancy and turning vehicle effects, defaults should remain extant.

The Gap Acceptance Factor is used to adjust the critical gap and follow up headway parameters for the entry stream. This information is used at signal controlled intersections primarily for filter turns and may not therefore be relevant where this feature is not used. The Gap Acceptance factor should be assessed from on-site measurements using the method recommended in SIDRA INTERSECTION 7 User Guide Section 5.10.5 Gap.
Acceptance Survey Method, for each vehicle type and the heavy vehicle value compared to that of a passenger car.

The Opposing Vehicle Factor parameter represents the passenger car equivalent (pcu) value of the Heavy vehicle movement Class in the opposing stream and should be changed to represent the calculated HV Pcu factor.

Where an on-site assessment of the gap acceptance factor for heavy vehicles is not possible the value should be set from the SIDRA INTERSECTION 7 User Guide, Section 5.11.2, Figure 5.11.4, Simple method to specify the gap acceptance factor and Opposing vehicle factor parameter for large vehicles. The factor is based on a straight line relationship to the average vehicle length of heavy vehicles.

Use the Quick input to ensure that the same “Gap Acceptance Factor” parameter is used consistently:

![Quick Input - Gap Acceptance Factor](image)

**Figure 16 Quick input - Gap Acceptance Factor**

Use Quick input for similarly changing the “Opposing Vehicle Factor” so it is the same for all legs of the intersection.

The Practical Degree of Saturation should remain as “Program”. The Practical degree of saturation default is 0.9 (Representing 90% DoS). This value should not be changed in this dialogue screen.
The vehicle movement data “Signals” data shall generally remain as the “Program” default values for: “signals co-ordination”, Minimum green, and Maximum Green, (subject to a check of the SCATS® summary data or the Yellow Red sheet calculations for future scenarios)

For base case models no allowance is to be made for signal co-ordination; the default arrival pattern shall remain at “Program” [the default is numbered “3” or “isolated”]. In the base case any time gained by the SCATS stretch Phase, i.e. the co-ordinated phase is included in the average green times in the SCATS summaries. For the purposes of a comparative capacity assessment this parameter shall remain at “Program” for project scenarios.

The start loss and end gain shall be set at 3 seconds and 3 seconds respectively. (Note: the values here relate only to vehicles, those for pedestrians can be set independently)

Where there are overlapping signal groups or where a green time is necessary to be fixed for project scenarios you may need to adjust the minimum and maximum time settings from the default options. On freight routes the minimum green may need to be changed reflect NTC standards. (Enter the appropriate transport class in the Yellow/Red sheet)

Phase actuation shall normally remain at “None”. Where the average phase time proportion of the cycle length results in an impractically short phase duration e.g. less than the phase minimum green time, and the traffic volume is low it may be appropriate to use the “%age Phase call” feature. Where the phase is called infrequently the number of times called should be included in the SCATS® summary. For projected scenarios the designer will need to consider if the %age phase call model settings remain realistic and justify these in the model report.
4.1.10 Lane Geometry dialogue

The Lane Geometry is described in the Lane Configuration tab, Lane discipline tab and Lane Data tab of this dialogue.

Approach and exit lane data are to be entered to represent as closely as possible the existing geometry for existing intersections and/or for “Construction Plans” for proposed intersections.

![Figure 18 LANE GEOMETRY < lane configuration tab dialogue](image)

4.1.11 Lane configuration

If short lanes, slip lanes or continuous lanes exist or are to be provided in the proposals then the appropriate selection is required from the drop down boxes.

The lane length applying to continuous lanes will be as defined in the intersection dialogue. Check that where intersections are closely spaced, the “Full length lane”, “Lane Length” parameter is equal to the measured storage space between intersections in order to accurately reflect upstream blocking effects.

Where short lanes are selected there is provision to define the short lane length in the short lane data area.

The “Lane Width” and “Grade” influence the Saturation flow adjustments made by the model. The lane width parameter is the most significant value used in adjusting the “Basic Saturation Flow” value for a specific lane. When calibrating the model, the designer may need to consider whether the actual marked lane width reflects the effective width for modelling purposes.

The “Grade” value is to be changed from the default (0%) if it is greater than 5% incline or 5% decline or if grade has a clear influence on the measured saturation flows.

The length of short turn lanes shall be measured between the Stop Line and where the lane width on the taper is greater than or equal to 2.5m.

Parking restrictions should be reflected in the length of lanes specified. A site survey should be conducted to justify the use of long lanes where parking is permitted. This should be checked according to current site conditions for each of the model periods. To show parking in the diagram you should select a “Short Lane with Parking” in the first drop down box.
Median widths shall be entered as surveyed, or as dimensioned on the drawing.

Exit Lanes shall be fully configured. Continuous lane lengths shall normally be the same as approach distances entered in the Intersection dialogue. The upstream storage effects of continuous left lanes needs to be considered, and may need alternative configuration as Slip/Bypass (High Angle) <Giveaway/Yield control if this is more representative of driver behaviour.

Short lanes will require the entry of the lane width, grade, and short lane length. The lane length will be measured from the intersection to the start of the merge taper. Note the downstream merge influences the lane utilisation in upstream adjacent approach lanes and therefore it is important to initially process the model before making manual adjustments to the lane utilisation of the traffic count values entered in the Lane Data tab.

![LANE GEOMETRY Dialogue](image)

**Figure 19** LANE GEOMETRY Dialogue < Lane Disciplines Tab dialogue

### 4.1.12 Lane Disciplines

The Lane Discipline should generally be appropriately configured from the automatic selections made in the tick boxes by SIDRA for each vehicle type. These should be reviewed especially if there are banned movements or buses are included separately in the model.

Where the queue length of the lane is restricted the designer shall measure the “free queue distance” from on-site measurements or measure an approximation from an aerial photograph or plan.
4.1.13 Lane data

Initially for the **Basic Saturation Flow** use the default value of 1950 tcu/h or an alternative value reflecting more closely the site environment, e.g. a value equal to the highest measured through lane saturation flow for an existing site. Ensure that the same “Basic Saturation flow” value is used for all lanes using the “Quick Input” capability see below.

The adjusted **Basic Saturation Flow** value needs to be calibrated against the measured saturation flow values. The method of measuring saturation flow values is outlined in Section 2.6. Calibrated saturation flows should be retained in project scenarios where changes do not affect approach lanes.

The “Lane Utilisation Ratio” also needs to be entered for each lane following examination of the relative use of adjacent lanes. It is essential that uneven lane utilisation is modelled correctly for the real capacity of the intersection is to be reflected in the model.

The approach lane flow is adjusted by SIDRA during processing to reflect the geometric configuration of the exit lanes configured in the LANE GEOMETRY dialogue. So for approach lane flow utilisation to be calibrated, the model must be initially processed to check the lane utilisation influence of the exit lanes before the ratio can be adjusted in this dialogue.

It is important to enter the correct “Lane Utilisation Ratio” for existing intersections. This ratio is to be based on the distribution of traffic volumes on the approach lanes. On-site measurement of queue lengths in adjacent lanes will provide this ratio as will count information for each lane is available from SCATS® VS data. The lane utilisation ratio for the lane with the most traffic in a movement is always set to 100%.

The lane utilisation ratios used must be shown in the written report and should not be changed in the project scenarios from those used in the base case models unless there is adequate justification for doing so, e.g. where the approach or exit geometry is modified.
At conventional intersections default “Program” values for the other Approach lane data items and the Signals data items should be used i.e. Saturation Speed and Capacity Adjustment, Buses Stopping and Parking Manoeuvres.

In the signals data the presence of bus stops, and on-street parking should be correctly accounted for. If this data are likely to have significant impact on the performance of the intersection, the data should be collected from site observations and included in the model.

![Quick Input Dialogue](image)

**Figure 21** QUICK INPUT dialogue for Basic Saturation flow multiple entries

To apply the Basic Saturation Flow to all approaches, after entering the basic value in the input box, leave the cursor in the box and choose “Quick Input” in the top right hand corner of the Lane data applet. In the Quick input choose the radio button on the “site (all legs)”, and “OK”.

### 4.1.14 Lane Movements

The lane movements’ data is entered in two dialogue boxes: Flow proportions and Blockage calibration.

![Lane Movements Dialogue](image)

**Figure 22** LANE MOVEMENTS < Flow Proportions tab dialogue
The Lane Movement Flow proportions information is only required for “networked” SIDRA models. It is unnecessary for isolated intersections and therefore the program defaults can be accepted.

**Figure 23** LANE MOVEMENT < Blockage Calibration tab dialogue

The Lane Blockage Calibration information is only required for “networked” SIDRA models. It is unnecessary for isolated intersections and therefore the program defaults can be accepted.

### 4.1.15 Volumes Dialogue

The Volumes dialogue has two data groups, “Vehicle Volumes” tab and “Volume Factors” tab. Before using the Volumes dialogue it is important to have selected, from the Settings Tab, the Separate Volume Displays for light and heavy vehicles. (See section 4.1.2 Settings). This will ensure that light and heavy vehicles are reported separately.

For vehicle entry DPTI normally uses the default, separate light vehicles (LV) and heavy vehicles (HV). For this default light vehicles and heavy vehicles are entered in the Volumes<vehicle volume dialogue as count numbers.

**Figure 24** VOLUMES < Vehicle Volumes tab dialogue
4.1.16 Vehicle Volumes

The “Unit Time for Volumes” should always be 60 minutes; the default value in SIDRA. The “Peak Flow Period” (PFP) is to be set at 30 minutes for assessments; the default value

DPTI has determined that using the peak effect over a 30mins period will provide an adequate assessment for any peak hour; with a peak flow factor (PFF) of 95%. The PFF is entered in the “Volume Factors” tab. The designer should however check that these values are representative of the peak period profile before validating the model.

(WARNING: If you change the “Volume Data Setting for Site” settings in this dialogue SIDRA will apply the same settings to the pedestrian volumes.)

The “Volume Data Method” should be changed to “Separate” to enable entry of separate volumes of light and heavy vehicles. A change to this setting will apply to all approaches.

Vehicle volumes for base case analysis are to be based on recent data, shall be representative of the model periods, and compiled from data sources described in Section 2.9, Traffic Volume Data and Classification Data.

The designer shall use counts of light and heavy vehicles in the Volumes fields for each movement. The Heavy vehicle proportion will be based on the latest available vehicle type classification counts.

![Figure 25 VOLUMES < Vehicle Factors tab dialogue](image)

4.1.17 Volume factors

The Peak Flow Factor (PFF), should be “95%” (the default value) representing the peaking effect of 60 minutes (hourly) input volumes and 30 minutes peak flow period (see above). The flow scale (constant) default should remain at 100%.
The growth rate factor should normally be set at 0%. This will need to be set to the same for each movement using the quick input method. For new Scenarios projected traffic volumes will be supplied by DPTI and/or developed in accordance with projected trip generation from a development proposal. The projected volumes should be applied in a separate scenario model file.

Note AUSTROADS GTM Part 3 Traffic Studies and Analysis Appendix A4.4 states that “On urban roads that are subject to pronounced peaks, it may not be appropriate to establish capacity analysis or design on a full peak-hour flow. This is because higher flows for shorter periods (e.g. 15 minutes) may result in unacceptable congestion for even a short period. The peak 15 minutes flow rate, converted to an equivalent hourly rate, may be used in such situations. Alternatively, a peak-hour factor (PHF) can be specified for the site and the full hour flow is divided by PHF to give a higher design volume to cater for possible heavier congestion.” (Note: Where the 15 minute factored up flows method is chosen the PFP and PFF will need to be changed to 60 and 100% respectively.)

4.1.18 Pedestrians

4.1.19 Pedestrian Movement

The Pedestrians input dialogue applies to all types of signals, including signalised pedestrian crossings, and Roundabouts. This dialogue does not appear for Priority (sign-controlled) intersections.

The “Main crossing description” shall describe the physical characteristics of the crossing, either “Full” or “Staged Crossing”. If “None” is used the graphics of a pedestrian crossing will be removed from the layout diagram and will affect the clearance times and intergreen times calculated by SIDRA. Where pedestrian phases are not used frequently an
adjustment can be made to “Pedestrian Actuation” as described in Section 4.1.21 Pedestrian Timing Data.

The “Volume Data Settings for Site” shall remain at 60 minutes for “Unit Time for Volumes” and 30 minutes for the “Peak Flow Period”.

(WARNING: If you change the “Volume Data Setting for Site” it will apply to Vehicle volumes as well as pedestrian volumes.)

The “Volume” of pedestrians should be altered to suit the intersection counts obtained.

The “Peak Flow Factor” will remain at the default value of 95.0%.

The Flow Scale shall remain at 100% and the Growth rate should remain zero, i.e. the same value as used for vehicle growth (see Section 4.1.17).

4.1.20 Pedestrian Movement Data

The pedestrian “Movement ID” must correspond with the Pedestrian phase information contained in the SCATS® Summaries and on the intersection drawings for existing intersections.

For proposed intersections use DPTI naming conventions for signal group numbering shown on Drawings S-6841 sheets 1 and 2: These are available from the traffic signals specification website. A link to this web page is provided on page 8.

Data for Crossing Distance, Approach Travel Distance, and Downstream Distance should be changed to reflect the geometry of the existing intersection measured on site. The model may be constructed from plans or an aerial photograph but the details should always be checked on site. Models for new projects may be constructed from the drawings.

[Figure 27 PEDESTRIANS < pedestrian movements data tab dialogue]
Default values should be used for all other parameters in this dialogue.

Notes: The “Program” “crossing distance” is constructed from the geometric details provided by the user and other parameters will be automatically modified to reflect any changes made. If the crossing is of unusual geometry the distance may need to be manually input.

The “Walking Speed (Average)” here relates to the speed of pedestrians on the approach to and departure from the crossing; not the speed when on the crosswalk.

The “Queue Space” is used to define the width of footpath used by the first row of pedestrians waiting to cross the road.

---

**Figure 28 PEDESTRIANS < Pedestrian Timing Data tab dialogue**

### 4.1.21 Pedestrian timing data

The timing in this dialogue is critical to the calibration of the base case model and to the effectiveness of Project models.

The Pedestrian times shall be entered to accord with the pedestrian demand reflected in the average phase times shown in the SCATS® Summaries.

Where pedestrian phases do not run in every cycle and the average phase times set as User given Phase times, are less than the pedestrian time settings i.e. the combined walk and clearance settings, SIDRA will not process the model.
To enable processing of the project the designer shall modify the “Pedestrian Activation” drop down box which reads “Program” by default; select the “% Ped Call” and enter a value below 100% to represent the number of currently “called” pedestrian phases.

It is important that the same “% Ped Call” value is retained in the future scenarios models unless there is an expected change in pedestrian demand.

Use of this “Pedestrian Activation” drop down has the advantage of enabling retention of the depiction of the crossing in the SIDRA layout diagram. The value can also be used to represent pedestrian demand in projected scenarios where the pedestrian demands are expected to be unchanged.

The “Walk Time Extension” check box shall be unticked.

The SIDRA default for the Crossing speed is 1.2 m/sec; this value should be used for all pedestrian modelling.

“Minimum Walk Time” shall use the settings provided in the SCATS® Summaries. For new intersections use 5 seconds.

“Minimum Clearance time" shall represent the Clearance 1 controller time setting and “Clearance Time Overlap” represents Clearance 2 controller time setting from the SCATS® summary or yellow/red sheet output (see appendix D- DPTI SUPPORT SERVICES).

The default settings for Start Loss and End Gain are 2 and 3 respectively and can remain unchanged. Note changing these Pedestrian values will not affect vehicle start and end gains entered in the VEHICLE MOVEMENT DATA.
4.1.22 Phasing and timing dialogue

When modelling the base case for an existing intersection, the phasing and timing should be representative of current Phasing and Timing of that intersection. Use DPTI standard conventions for labelling.

SCATS® Summaries will provide all the content necessary to construct the phasing for an existing intersection.

In the base case model, when setting the phasing sequence, the observed phasing should be included. This is particularly relevant for low demand overlap phases which may be little used.

![Figure 30 PHASING & TIMING < sequences tab dialogue](image)

4.1.23 Phase Sequences

The Signal analysis method for signalised intersection analysis should always be configured for “Fixed Timed /Pretimed” operation.

The radio button in the Select column of the table denotes the phase sequence the designer will edit in the Sequence Editor.
4.1.24 Phase sequence editor

As the phase sequence is fixed only configure phases that actually operate in SCATS®. Where SCATS® operates optional phasing e.g. G followed by G1, in the AM peak and G to G2 in the PM peak it will be necessary to create two separate sequences to cater for this.

Normally the movements will apply to both classes of vehicles and therefore the radio button should indicate "All Movement Classes".

Click on the movements arrows to indicate which movement is green during this phase. Do the same for each phase in turn by selecting the next phase using the phase selector. To change the phase sequence use the “move right” “move left” buttons.
4.1.25 Phase & sequence data

The Variable phases are not to be ticked in the models reported to DPTI. The phase sequence is to reflect the actual phase sequence and signal groups displayed by SCATS®, and is not to be determined by SIDRA.

The reference phase is merely to indicate the phase that is co-ordinated in a SIDRA network model. Although of no significance for individual sites one phase needs to be selected and this should normally represent the SCATS® stretch phase.

Enter the Phase Times. The Phase Time is the Displayed Green Time plus Intergreen Time where Intergreen Time is Yellow Time plus All-Red Time specified for the phase.

For the base case the user must enter the phase times provided in the SCATS® summaries.

To enable validation of the base case, the Phase splits entered here should match as closely as possible the traffic volumes and saturation flows taken for the same model period.

[Note: It is essential that the “User Given Phase times” has also been selected in the Timings Option tab (see next page).]

Yellow and all-red times will also be provided in the SCATS® summaries for existing intersections. SIDRA will only permit integer values so any other values are to be rounded up to the nearest whole number and the phase time amended accordingly.

For Proposed New, or modified signal sites Yellow time and all-red clearance times should be calculated. Use the Yellow / Red form which is available as a spreadsheet from DPTI. A copy of the output is shown in Appendix D DPTI SUPPORT SERVICES.
Dummy movements are normally created to hold phase green for a fixed period where the traffic volume is too low to justify the extended green time. Therefore it will not normally be necessary to create Dummy Movement Data.

If there is a need to create dummy phase/s, discuss the purpose and scope in the modelling report.

**Figure 33 PHASING & TIMING <Timing Options tab dialogue**

4.1.26 Timing Options

For the base case you must select the radio button for “User-Given Phase Times” and un-tick the check box for “Green Split Priority”.

Note; In order to use these User Given Phase times the actual Phase times shall be entered in the Phase and Sequence Data tab (see previous page).

After the base case has been successfully calibrated and validated it may be necessary to create an Interim model, base case for comparison or a future year model, by optimising the green splits to obtain a performance measure that can be related to the project scenarios, and as a check on the appropriateness of the SCATS® settings. (See the section 3 Model Development)

The optimisation for Interim models, Base Case for Comparison, Future year models, and Project Scenarios, can be achieved by selecting the “User given cycle time” (UGCT) and entering a “cycle time” which should equal the sum of the SCATS® Summaries phase times.

For new signal installations the Maximum user given cycle time should be set at 120 seconds unless otherwise specified in contract documents or approved by DPTI. Where 120 seconds or the specified value is not practicable the reason for the alternative shall be documented in reports.
Ensure that the Green Split Priority remains unticked otherwise any underutilised green time (UGT) will be allocated to the “reference phase”, and not shared equally between phases.

**Figure 34 PHASING & TIMING <Advanced tab dialogue**

Use the Advanced tab to apply correct phase transitions to ensure intergreen times are applied where appropriate (as indicated by the red dot). The state without the red dot will allow signal groups to overlap without an intergreen.

This dialogue is also used to define undetected movements which are shown in grey outline. These are uncontrolled (give way) movements.
4.1.27 Priorities dialogue

Priorities are used to define how drivers behave when they have to “give way” to other users. This situation typically occurs at traffic signals when right turning vehicles turn across the opposing through movement.

The Priorities menu will not appear in the project tree (left side window in SIDRA) in the case of pedestrian crossings (signals) where filter (permitted) turns are not relevant.

The priorities are selected by first choosing the movements (red) using the radio buttons and then selecting the opposing movements (green) by clicking the arrows displayed.

Default opposing movements should be used unless evidence is provided showing the actual opposing movements behave differently. This may be the case for an intersection with an unusual geometry, turn designations or specialised treatments.

Refer to SCATS® Summaries for right and left turn filtering information. Right turn filtering may be different for different periods of the day.

For new or modified intersections right turn vehicles shall not filter across opposing though traffic.

![Figure 35 PRIORITIES dialogue](image)
4.1.28 Gap-acceptance

**Figure 36 GAP ACCEPTANCE < Gap Acceptance Data tab dialogue**

4.1.29 Gap-acceptance data

For exiting signalised intersections the most likely Give way situation is were right turning vehicles give way to oncoming traffic, i.e. filter turning. SIDRA relies on user-specified critical gap and follow-up headways to model this effect. Default values should be adjusted for different geometric arrangements.

**Critical Gap** is the minimum time (headway) between successive vehicles in the opposing (major) traffic stream that is acceptable for entry by opposed (minor) Stream drivers.

**Follow-up Headway** is the average headway between successive opposed (minor) stream vehicles entering a gap in the opposing (major) traffic stream.

Gap-acceptance parameters applicable to particular intersection geometry and flow conditions should be selected by measuring these parameters where right turning is critical to understanding the intersections performance.

For right turns at signalised intersections the default values of the gap-acceptance is 4.5 seconds and Follow-up Headway is 2.6 seconds (equivalent to a saturation flow of 1384veh/h). Adjust default values for gap-acceptance parameters (i.e. critical gap and follow up headway) to local site conditions and provide and document justification. Note the gap acceptance and follow up headway parameters are only modified in this dialogue for Light vehicle characteristics.

To account for Heavy Vehicle (HV) effects, the designer shall consider changing the Gap Acceptance and Opposing Vehicle calibration values in the VEHICLE MOVEMENT DATA < Calibration tab dialogue (Heavy Vehicles) by selecting the Heavy Vehicles radio button (see Section 4.1.9, page 34).
The End Departures should remain at the default setting unless there is better information available. Wider intersecting roads can be expected to have more right turning vehicles departing the intersection at the start of red, than narrow intersecting roads.

The Exiting Flow Effect should normally set at the default value.

**Opposing Peds (Signals)** If there is underutilised green time for left or right turning vehicles, at the start of the Phase, e.g. because of high pedestrian volumes, you may need to put a value for a Start Loss (StL) in the drop down box. These high pedestrian volumes are typically found in the City Centre or Shopping centres. The underutilised green time is created by the numbers and distribution of pedestrians crossing from both directions and shall be measured on site. The options available in the drop-down box are as follows:

- **None** (No interference by pedestrian)
- **Prg (StL)** (The default “Program” option for Extra Start Loss)
- **Inp (StL)** (Input option for Extra Loss)
- **Prg (SF)** (Program option for Saturation Flow Adjustment).

If an adjustment is necessary the **Inp (StL)** option shall be used, the parameter being expressed in seconds.

**Figure 37  GAP ACCEPTANCE < Settings tab dialogue**

<table>
<thead>
<tr>
<th>Gap Acceptance Options</th>
<th>Gap Acceptance Capacity</th>
<th>Gap Acceptance Data for Specific Applications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Turn on Red</td>
<td>Critical Gap</td>
<td>End Departures</td>
</tr>
<tr>
<td></td>
<td>6.00 sec</td>
<td>1.0 veh</td>
</tr>
<tr>
<td></td>
<td>Follow-up Headway</td>
<td>Exiting Flow Effect</td>
</tr>
<tr>
<td></td>
<td>3.00 sec</td>
<td>0 %</td>
</tr>
<tr>
<td></td>
<td>End Departures</td>
<td>Percent Opposed by Nearest Lane Only</td>
</tr>
<tr>
<td></td>
<td>1.0 veh</td>
<td>0.0 %</td>
</tr>
</tbody>
</table>

**4.1.30  Settings**

There should not be any need to change the default settings in this Settings tab dialogue.
4.2 Proposed scenario models

SIDRA models of proposed scenarios are created by cloning and modifying any of the base case, interim, base case for comparison or Future Year models. All these models are derivatives of calibrated and validated base case models, and are suitable for comparison with project scenarios dependent on the specific needs of the project.

Consideration needs to be had in each scenario of proposed changes to the following:
- the physical intersection geometry,
- traffic signal controls and operation, and
- The future year traffic flow volumes.

4.2.1 Proposed Geometric changes

Modified intersections are created from existing road geometry reflected in the base case model and interim models. Care should be taken that the traffic characteristics (e.g. saturation flows) of additional lanes or modified lanes reflect similar characteristics to the existing intersection.

For new intersections ensure that the models represent realistic designs. Saturation flows should be representative of the geographical location or similar environment, e.g. city centre / suburban. Typical measured saturation flow values from adjacent intersections will form a good basis for an initial “basic saturation flow” parameter for through lanes. (See Section 3.3.1 Calibration and Section 4.1.13 Lane Data)

Intersection layouts must be designed to provide the most flexible signal operation possible. Opposed right turns should be designed to run concurrently to allow diamond right turn operation. Shared lanes should not be used. Split-approach phasing should be avoided unless the benefits of increased capacity and reduced delays can be demonstrated for the whole of day operations. To assess whole of day operations the designer may require additional model periods for completeness.

If the intersection is to be used by large vehicles ensure that the minimum green time settings and intergreen clearances are appropriate and in accordance with NTC guidelines. Ensure that the swept paths are suitable to ensure the turns do not need to be traversed at restricted speeds which will affect model assumptions.

In developing turning bays ensure that they are long enough to be used effectively. Do not extend or reduce the cycle length to make the queue fit the geometry.

Increased pedestrian delays may result from your proposal. Consider the means of alleviating these delays which might include, double cycling, staged crossings, wider crossings, and or a combination of these measures.

Assume that all right turn movements are fully controlled. Right turn filtering will generally only be allowed at existing intersections where capacity issues cannot be resolved.

4.2.2 Proposed phase arrangements

For existing intersections which are proposed to be modified the project scenario models will be created from the calibrated and validated base case, interim or base case for comparison model. The parameters are to remain unchanged except those pertinent to the represent the proposal. Only the final proposal need be presented and reported to DPTI but shall be in the form of a fixed “user given cycle Time” length and fixed phase sequence.

For projected intersections, the phasing arrangements, phase sequence options and time settings for new signalised intersections should be designed in accordance with DPTI...

Where an intersection is part of a SCATS® grouping, the cycle time is generally controlled by the SCATS® master subsystem. [i.e. A site with Offset Plan values set at 0 and having no link offsets, but to which other sites link]. The designer shall use the grouping cycle time as the “user given cycle time” for analysis of proposed or modified intersections included in this system. (See link to DPTI TS100 traffic signals design specification webpage on page 8)

Where no cycle length can be determined from existing SCATS® settings the acceptable “User given cycle time” length for new traffic signals is 120 seconds.

In the PHASING AND TIMING dialogue boxes the designer shall ensure that the model selections provide practical outcomes which can be programmed in the controller and set up in SCATS®. Operational economies in the design are not permitted. For example it is to be assumed that all phases are serviced, and only once in a single cycle including pedestrian phases.

Intergreen times shall be designed in accordance with the DPTI Yellow Red template. Minimum green times shall accord with the National Heavy Vehicles Register report “NTC Performance Based Standards Scheme - Network Classification Performance”.5

In respect of pedestrian phases, as outlined in the notes on preparing the base case model, the pedestrian time should reflect the average use of the pedestrian phase times and shall be adjusted by the use of the “Pedestrian Activation” %age Ped Call (see Section 4.1.21 Pedestrian timing data, page 45).

Approach arrival types for signal co-ordination effects should always be set at “Program”, the default of which is isolated (type 3).

The designer shall determine the most appropriate phasing arrangement to suit the new geometry being proposed.

The phasing of the proposed intersection shall not include:

- Right turn filtering
- Shared lanes i.e. left and through movements or right and through movements in the same lane
- Left turn on red permitted after stopping
- Banned turning movements
- U turn permitted
- Phase skipping
- Double cycling

If the intersection is in an area of high pedestrian usage ensure that the pedestrian phase duration times are representative of the demand. In the first instance assume time settings that represent the design values for pedestrian clearances and assume that all the pedestrian phases are demanded every cycle.

4.2.3 Future Year traffic volumes

The future year traffic volumes will be normally be provided as part of a specification or client brief, and may represent different projected development and population projections. For developer initiated proposals projected volumes shall be subject to prior approval of DPTI before commencement of scenario modelling.

5 MODEL CONSTRUCTION ROUNDBOUTS AND PRIORITY INTERSECTIONS

This part covers the additional or changed items, compared with the information required for traffic signals that need to be considered when setting up a roundabout or priority intersection.

The designer will need to select the roundabout or priority item from the main menu. Then from the side menu select the Intersection dialogue

5.1 ROUNDBOUTS

Figure 38 INTERSECTION < Intersection dialogue (roundabout)

5.1.1 Intersection - roundabout

For Roundabout assessments values for extra bunching should be used if there are upstream signals in close proximity. Extra bunching should only be applied to sign-controlled and roundabout intersections. Maximum values to be used to simulate the effects of extra bunching should be as per Table 5.

<table>
<thead>
<tr>
<th>Distance to upstream signals (m)</th>
<th>&lt; 100</th>
<th>100–200</th>
<th>200–400</th>
<th>400–600</th>
<th>600–800</th>
<th>&gt; 800</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extra bunching (per cent)</td>
<td>25</td>
<td>20</td>
<td>15</td>
<td>10</td>
<td>5</td>
<td>0</td>
</tr>
</tbody>
</table>
5.1.2 Roundabouts dialogue

![Image of Roundabouts dialogue]

**Figure 39 Roundabouts < Options tab dialogue**

5.1.3 Options

The options shall be the default options i.e. “SIDRA Standard” model and level of service the “SIDRA roundabout LOS”.
Figure 40 Roundabouts < Roundabout data dialogue

5.1.4 Roundabout data

For roundabouts, when developing a base case, the island Diameter, circulating width and number of circulating lanes, etc., should conform to the existing geometry. This data must be specified for each approach. The accuracy of the input data is critical as this data is used by SIDRA for the calculation of approach capacity.

The calibration parameters in the roundabout data section i.e. the Environmental factor and the “Entry/Circulation Flow Adjustment” should only be changed as part of the model calibration. For this purpose measurements of the entry and circulation flows are required.

For a SIDRA roundabout model the Environment Factor can be used to calibrate the capacity to allow for less restricted (higher capacity) and more restricted (lower capacity) roundabout environments. (See SIDRA INTERSECTION 7 User Guide Section 5.6.4 Calibration Parameters for Roundabout Capacity Models) Capacity increases with decreasing value of the Environment Factor. The Standard SIDRA default value for this is 1.0. A value in the range 0.50 to 2.00 can be specified and any changes should be justified by on-site assessments for the base case model. The Environment Factor adjusts the dominant lane follow-up headway at zero circulating flow. The subdominant lanes follow-up headway will also be adjusted by this change.

The Roundabout capacity model can also be calibrated by choosing the appropriate level of “Entry/Circulation Flow Adjustment” using the observed or expected local driver behaviour characteristics. For this adjustment the maximum entry capacity is required to be known for the dominant lane at zero circulating flow. The options available from the drop-down menu are High, Medium, Low and None. The SIDRA default setting is “Medium”. The selected option determines the adjusted dominant lane follow-up headway at zero circulating flow. The adjustment is effective for low to medium circulating flow rates. Capacity is highest when “High” is selected, and lowest when “None” is selected.
5.1.5 Gap-acceptance - ROUNDBOUTS

Figure 41 GAP ACCEPTANCE < gap acceptance data dialogue (roundabout)

5.1.6 Gap Acceptance Data
Default estimates should be used In the SIDRA roundabout model.

It is possible to include User-Given Parameters if the “Program” dropdown is changed to “input” so data can manually inserted. If the critical gap and follow up headway are changed these changes must be reported on in the written report. As these factors are movement based, all factors should be changed to the same values for each movement in the approach.

The default settings for “Exiting Flow Effect” and “Percent Opposed by Nearest Lane Only”, (PONLO) should remain at 0% for a conventional roundabout. The PONLO might however apply where there is a dedicated left turn from the roundabout on the adjacent exit (see the SIDRA INTERSECTION 7 User Guide section 5.10.1 Gap Acceptance Data Tab < subheading Percent Opposed by Nearest Lane Only)
5.1.7 Lane Geometry - Roundabouts

![Figure 42 LANE GEOMETRY < Lane Configuration tab dialogue](image)

5.1.8 Lane Configuration

The lane configuration should reflect the actual dimensions of an existing intersection and the design dimensions of a proposed intersection.

For an existing intersection the SIDRA model should be checked to ensure that the lane configuration reflects how the intersection is actually used by drivers in congested conditions, and modifications made where necessary.
5.2 PRIORITY INTERSECTIONS - STOP or Give Way

First select the priority intersection item "sign control" from the main menu.

This initial selection will determine the sign symbol displayed in the middle of the intersection layout but the form of control can be changed to suit the intersection configuration from the "INTERSECTION" dialogue (See below). The model parameters will change to reflect the new configuration.

![Figure 43 Site layout two-way STOP](image)

From the side menu first select the "Intersection" dialogue
5.2.1 Intersection

Extra bunching should be applied to sign-controlled intersections as appropriate. Maximum values to be used to simulate the effects of extra bunching should be as per the Table 4 below.

<table>
<thead>
<tr>
<th>Distance to upstream signals (m)</th>
<th>&lt; 100</th>
<th>100–200</th>
<th>200–400</th>
<th>400–600</th>
<th>600–800</th>
<th>&gt; 800</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extra bunching (per cent)</td>
<td>25</td>
<td>20</td>
<td>15</td>
<td>10</td>
<td>5</td>
<td>0</td>
</tr>
</tbody>
</table>

5.2.2 Sign Control

Irrespective of the choice of stop or give way from the main dialogue horizontal toolbar menu, the “Sign Control>Approach Control” on each approach can be changed in this dialogue to be Stop or Give Way. This will change the way that the approach is displayed in the layout diagram i.e. continuous stop line or broken give way line; and will affect the driver behaviour “Program” parameters for critical gap and follow up headway, in the “GAP ACCEPTANCE” dialogue.
5.2.3 Gap Acceptance

![Figure 45 GAP ACCEPTANCE < gap acceptance data dialogue (priority intersection)](image)

5.2.4 Gap Acceptance Data

For two-way sign control SIDRA relies on critical gap and follow-up headways. It should be noted that the capacity and performance of sign-controlled intersections are particularly sensitive to the values of these parameters.

**Critical Gap (tc)** is the minimum time (headway) between successive vehicles in the opposing (major) traffic stream that is acceptable for entry by opposed (minor) stream vehicles.

**Follow-up Headway (tf)** is the average headway between successive opposed (minor) stream vehicles entering a gap available in the opposing (major) traffic stream. This is a saturation (queue discharge) headway, and the corresponding saturation flow rate (vehicles per hour) in gap-acceptance analysis is $3600 / \text{Follow-up Headway}$. It is the largest gap-acceptance capacity possible, which occurs at zero opposing flow.

“Two Way Sign Control” (TWSC); ensure that the tick box is checked. SIDRA default values for stop-sign and give-way sign intersections are based on a two lane main road; however, if the “Apply TWSC calibration” parameter is checked the values shown in the boxes below the checkbox will be modified by the geometry parameters provided by the designer.

The default values of the gap-acceptance parameters and the variations permitted by the program, for all priority movements, are given in Table 5.10 of the SIDRA INTERSECTION 7 User Guide, which is shown overleaf. These should not to be relied on without calibration.
Gap-acceptance parameters applied by this method should be calibrated by measuring on-site characteristics for existing intersections (see section 5.2.6 Field measurements and Calibration of Gap Acceptance, page 66).

The “Exit Flow Effect” is normally set by the program default at either 0% or 50% depending on the site configuration the user has selected. The factor applies to traffic on the next anticlockwise approach. The percentage is the proportion of the exiting flow added to the opposing flow which is relevant to vehicles leaving the approach under consideration, i.e. the larger the value the more difficult it is to find a gap in the traffic. For priority intersections the default parameters for all Minor Road movements is 50% for and for Major Roads is 0%.

“Percent Opposed by Nearest Lane Only” This is used for multilane conflicting approaches where only the left lane has an influence on the emerging traffic. Use of this parameter will negate the “Exit Flow Effect”.

### Table 5.10.6 - Gap acceptance parameter values given in AUSTROADS Road Design Guide Part 4A (AGRD04A-10) and the corresponding default values for the SIDRA Standard Model including adjustments to the base values given in Table 5.10.2

<table>
<thead>
<tr>
<th>Type of movement</th>
<th>AUSTROADS Road Design Guide Part 4A (AGRD04A-10)</th>
<th>SIDRA Standard Model defaults and reasonable ranges for user specification</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Critical Gap (seconds)</td>
<td>Follow-up Headway (seconds)</td>
</tr>
<tr>
<td>Left Turn (1)</td>
<td>5</td>
<td>2 - 3</td>
</tr>
<tr>
<td></td>
<td>1-lane opposing</td>
<td>4.5</td>
</tr>
<tr>
<td></td>
<td>2-lane (or more) opposing</td>
<td>5.0</td>
</tr>
<tr>
<td>Through movement crossing one-way road</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2-lane one-way</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>3-lane one-way</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>4-lane one-way</td>
<td>8</td>
<td>4</td>
</tr>
<tr>
<td>Through movement crossing two-way road</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2-lane two-way</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>3-lane two-way</td>
<td>8</td>
<td>5</td>
</tr>
<tr>
<td>4-lane two-way</td>
<td>10</td>
<td>8</td>
</tr>
<tr>
<td>Right Turn from Major Road (2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Across 1 lane</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Across 2 lanes</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>Across 3 lanes</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>Right Turn from Minor Road (3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>One-way</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>2-lane two-way</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>4-lane two-way</td>
<td>8</td>
<td>5</td>
</tr>
<tr>
<td>6-lane two-way</td>
<td>10</td>
<td>8</td>
</tr>
<tr>
<td>Merge from acceleration lane</td>
<td>3</td>
<td>2</td>
</tr>
</tbody>
</table>

Notes (1) to (3) below are not included in the AUSTROADS Guide:

(1) This is considered to apply to Left Turn movements from Minor Road, as well as Slip-Lane Left Turn movements from Minor Road.

(2) This case is relevant to two-way Major Road conditions with one direction of the Major Road opposing (1-lane, 2-lane or 3-lane).

(3) The conditions specified (one-way, 2-lane two-way, 4-lane two-way, 6-lane two-way) are relevant to the opposing movement lanes on the Major Road.

Figure 46  Gap acceptance parameters

Material from SIDRA INTERSECTION Version 7 User Guide has been reproduced with permission of Akcelik and Associates Pty Ltd who are the copyright holders of this document.
Table 5.10.6 from the SIDRA INTERSECTION 7 User Guide summarises the critical gap and follow headway parameter values recommended by the AUSTROADS Road Design Guide part 4A (AGRD4A (AUSTROADS 2010) together with the default values in SIDRA. These are the SIDRA “Program” determined values obtained when “Apply TWSC Calibration” parameter is checked. They also represent reasonable ranges of the parameters that could be considered for the user to specify. The SIDRA default values vary from the AUSTROADS guide in order to provide more flexibility to match varying intersection geometry.

Figure 47 GAP ACCEPTANCE<Two-Way Sign Control tab dialogue (priority int.)

5.2.5 Two-Way Sign Control

The two way sign control dialogue provides a means of changing the individual turning moment settings from those specified for the whole intersection in the Gap Acceptance Data dialogue, but if the “Apply TWSC Calibration” parameter is checked in the Gap Acceptance Data tab (see section 5.2.4 above) no changes should be necessary to cater for the geometry.

The “Two-Way Sign Control Calibration” factor is a means of adjusting all the give way parameters simultaneously. Initially the setting Level of reduction with Opposing Flow Rate should be set at “None”, and the Major Road Turning Flow Factor at “1.0” SIDRA 7 will automatically adjust the values if you specify a Give Way sign in place of a STOP sign control in the INTERSECTION dialogue.

Use the “Level of reduction with Opposing Flow Rate” to adjust the gap acceptance and follow-up headway using the calibration method described below in section 5.2.6.

5.2.6 Field measurements and Calibration of Gap Acceptance

The capacity and performance results for gap acceptance cases at unsignalised intersections are very sensitive to the follow-up headway and critical gap parameters.
The field survey method comprises measuring departure flow rates during saturated (queued) portions of individual stop-go (gap-acceptance) cycles.

The survey method is implemented by:

- Making observations during times when there is constant queuing in the minor street, say for 5 minutes.
- Record the number of vehicles, n, entering each main stream gap (headway) of duration t.
- For each of the gaps accepted by n vehicles compute the average of accepted gaps t.
- Find the linear regression of the average gap headway values as a function of the number of vehicles.

From this, compute the “follow up headway” and “critical gap” using the formulae contained in the SIDRA INTERSECTION 7 User Guide, Section 5.10.5, Gap Acceptance Survey Method. Use the values obtained to modify where necessary the “base values” in SIDRA by using the “level of reduction with opposing flow rate”.

The gap-acceptance method uses the follow-up headway \( t_f \) as the queue discharge (saturation) headway. This is the maximum capacity that can be achieved when the opposing flow is close to zero. This corresponds to a saturation flow rate of \( s = 3600 / t_f \).

For example, where \( t_f = 2.5 \) seconds this implies a saturation flow of 1440 veh/h, where \( t_f = 4.0 \) seconds means a maximum capacity of 900 veh/h whereas \( t_f = 3.0 \) s means a maximum capacity of 1200 veh/h. The capacity is reduced from this value with increased opposing flow rates, due to decreased proportion of acceptable gaps.

As a useful rule of thumb, the Follow-up Headway will usually represent 60% of the Critical Gap.

After running the SIDRA model the calculated input values can be compared with the measured values and adjustments can be made by changing the “level of reduction with opposing flow rate” (SIDRA INTERSECTION 7 User Guide section 5.10.2, Two-Way Sign Control Tab). The levels available are “None”, “Low”, “Medium” and “High”.

The survey date data shall be included in the report.

### 5.2.7 Staged crossing – special parameter settings

Staged road crossings might be experienced at priority controlled “Tee” intersections where the major road has a wide median and where it designed for vehicles to give way to traffic in the nearside carriageway and, after moving to the centre median, give way or merge in a separate movement.

Movements with similar characteristics can be experienced at intersections with a seagull traffic island.

The current version of SIDRA envisages the use of the “networking” capabilities to model this staged crossing. DPTI does not currently approve models using the network feature of SIDRA. In previous versions of SIDRA, DPTI has used a dummy movement to simulate this situation.

For staged crossings the designer shall scope a suitable model format for approval by DPTI.

Because the staged crossing is not a standard feature of the SIDRA, the designer shall establish suitable parameters for the critical gap and follow up headway. Smaller values of critical gap and follow-up headway than the default settings shall be used for each stage of the two-stage right-turn movement. The HCM 2000 recommends reducing the critical...
gap value by 1.0 s for each stage of a two-stage gap-acceptance process. For existing intersections these parameters should be measured on site.

Depending on the modelling method adopted the designer will need to uncheck some of the default settings for TWSC for the minor road right turn and enter the measured parameters. For proposed models the designer shall consider suitable parameters and should document these in the modelling report.

The designer shall ensure that the number of individual vehicles modelled can be physically accommodated (stored) in the central median by checking the predicted queue lengths against the storage available.

If wide cross intersections, with give way or stop signs, are to be modelled the behaviour of right turn drivers in the median needs additional consideration.
6 MODEL REPORTS

All SIDRA analysis reports should be completed and/or reviewed by experienced model developers. An accompanying statement with name and signature of the checking personnel should accompany the final report.

The final report must justify and explain the reasons for using any input or output values other than those identified in this guideline. A summary shall be provided in the report of the performance measure comparisons between alternative scenarios, the base case, the interim model, base case for comparison and future year models where used.

Following is the list of files, tables and diagrams required (as minimum but not limited to) that should be submitted to DPTI with the report for the analysis:

A written report is required which outlines the calibration and validation issues identified during development of the base case model. This shall be in a read only, preferably *.pdf format.

Electronic SIDRA Project File (*.sip7) including input and output data for all scenarios used. All scenarios should be labelled appropriately.

Draft design plans for the proposed modifications to the intersection showing the extent of modification, physical constraints and existing intersection layout.

All traffic counts, SCATS® Summaries and ancillary data used in the intersection assessment.

Figure 48 Main Screen < Settings tab dialogue - reporting options
SIDRA produces a variety of outputs to assist in compiling the written report. These outputs are selectable from the: "Settings" tab dialogue. (The example shown above is the variable run report)

Extracts of these outputs may be used in the Model report and in the Traffic Signals Operation Performance Report (TSOPR).

The written report may use part of the output to illustrate project issues but should not comprise copious amounts of irrelevant output.

A Traffic Signals Operation Performance Report is required for new traffic signal projects as a requirement of the TS100 Traffic Signals Design specification. The TSOPR should reflect the logical approach taken by a designer to resolve the complex and iterative nature of traffic modelling. It should emphasise the sound engineering principles adopted during model development. Without accurate reporting the model development process is hindered by a lack of historical information. The following subsections outline an approach to model reporting which should allow a third party to accurately comprehend the decisions made during the development process from intersection site familiarisation through to scenario evaluation.

A traffic model may be developed over a long period by a number of different designers. While developing a model the designer/s should retain detailed notes that include a record of all assumptions and modelling decisions. These notes should be kept for future reference, and can form the basis for subsequent reporting in the Traffic Signals Operation Performance Report.

It is the responsibility of the designer and the project manager to ensure that all reporting is accurate, thorough and sufficient, and that submitted documents are fit for purpose to adequately support accompanying models. The SIDRA *sip7 data files for each intersection included in the report must accompany the Traffic Signals Operation Performance Reports submitted to DPTI.

6.1 Calibration Report

The calibration section of the Traffic Signals Operation Performance Report should present all relevant survey data and include a history of model development.

Model auditing will rely on the Traffic Signals Operation Performance Report to explain how the model has been calibrated. For this reason the calibration section of the Traffic Signals Operation Performance Report should focus on presenting traffic model inputs and detailing how the model has been developed to ensure that it represents existing conditions. In particular, the following should be included:

- The stated purpose of the model;
- A list of all SCATS® site numbers related to the model/s, with street addresses, and where required, a note detailing any operational relationships with adjacent major intersections.
- Clear notes on any site observations and measurements, covering both the physical attributes and observed vehicle behaviour. Where behaviour is specific to a particular time of day, this should be noted along with how it has been accounted for in the model/s;
- A table of adjusted saturation flows for each lane of the intersection and the relative measured saturation flows,
- The effective bay lengths and flare lengths
- The lane utilisation used in the model compared to measured queues or volumes.
6.2 Validation Report

Validation Traffic Signals Operation Performance Reports should look in detail at comparisons between calibrated model results and existing conditions. The designer should detail the validation process, from on-site surveys through to adjustments made within the model. Any decisions made by the designer should be captured in the report especially where model inputs have been adjusted in order to achieve validation.

Validated model results should be tabulated and compared with the surveyed on-street values for all modelled periods. If there are discrepancies between the model outputs and the on-street conditions then these should be identified, investigated and explained. Specific items that could be included in the validation section of the Traffic Signals Operation Performance Report are:

- Details of traffic flows used, where and when they were sourced from and how the model periods were chosen;
- Minimum Phase time adjustments made to reflect average phase utilisation e.g. where pedestrian phases are demand dependent;
- Validation data, such as DoS and vehicle journey times;
- Relevant site observations not already included in the calibration section of the Traffic Signals Operation Performance Report, such as:
  - Give-way behaviour, exit-blocking, flare/non-green usage, parking/loading and bottleneck details; and
  - Evidence of validation, comparing modelled results to on-street observations and measurements.
- Any discrepancies between observed and model outputs should be analysed and discussed.

6.3 Scenario Models Report

The Traffic Signals Operation Performance Report accompanying any scenario model must give a full description of the scenario and any expected model impacts (e.g. any expected changes in demand i.e. the project specification requirement for projected flows). The modifications made to the validated base case model to develop the scenario model should all be based on these key details. All changes made in order to develop the scenario model should be documented by the designer, along with the reasoning behind them. Specific items that should therefore be included in the scenario section of the Traffic Signals Operation Performance Report are:

- Project summary
- Project objectives/problem identification
- Scenario traffic management strategy
- Evaluation of scenario results compared to the base case for comparison including vehicle delays and level of service.
- Conclusions and recommendations
- Design summary sheets
- Model source data
- Modelling assumptions - (including workaround’s required because of model limitations)
- Electronic copies of model data file/s (*sip7), (which include input and output data), must be supplied with the text report

The Scenario report must also provide details of the performance of each intersection using the specified design traffic flows including:

- Degree of saturation, LOS and predicted queue lengths for individual traffic lanes
- Intersection layout plans, traffic signal phasing, phase sequences and time settings
6.4 Recommended Scenario

It is essential that the designer include in the scenario section of the Traffic Signals Operation Performance Report a clear description of the recommended Scenario for the project.

SIDRA uses vehicle delays as the principle method of comparing alternative project options, and this shall be used to compare the base case with the project scenarios and to select the recommended scenario. The designer may however base the selection using additional criteria and this needs to be included in the report.

The designer needs to be cautious that the preferred option does not include excessive queues [e.g. on side roads], not apparent in comparing overall performance.
7 APPENDIX A - MODEL SCOPING DOCUMENT

Document clearly in a “model scoping document” the reason for and purpose of the model e.g. to consider the impact of a major project or a new development, and all the model requirements.

Where the model/s is being prepared for a discrete project the project specification should adequately describe the modelling requirements. The designer shall however prepare and submit to DPTI a “model scoping document” in order to confirm the modelling requirements before commencing modelling.

In preparing the model scoping document the designer should describe the objectives in a clear series of expected Outputs for example:

- Use the model to recommend any Phase sequence and or infrastructure changes that would improve transport/travel conditions.
- List all the sites to be included in the model/s and provide a mud map to illustrate the model scope showing symbolically the location of the intersections.
- List the model options to be created; which shall always include a base case and at least one project case scenario. The project case scenarios shall be compared with the “base case for comparison”.
- List the Scenarios options which may include various changes to the Phase Sequence/s, Geometry, lane configuration and Cycle Lengths.
- Input Objectives:
  - Collect input data; Use SCATS® summaries for all control data.
  - List the traffic demand periods to be modelled e.g. AM and PM peaks and representative development site peak hour. The models shall represent hourly traffic volumes.
  - Calibrate base case models based on AM and PM peak traffic operations. Calibration is intended to check all model input parameters are correct.
  - Validate base case models of existing traffic conditions for AM, PM and any other model periods required to be modelled.
- Comparison of Degree of Saturation output with expected values shall be the main parameter used for validating the model.
- Optimise signal timings for the scenario models for the same periods of the day as the base case models.
- The scenario options shall not be modelled until the base case model is calibrated and validated to the satisfaction of the project manager and DPTI.
- Models of new scenarios are to reflect alternative phasing, recent traffic signal changes and geometric changes to the road.
- The Base Case for Comparison model shall be a fair representation of the traffic conditions prevailing at the start of the project construction/installation.
- The traffic modelling tool selected for this project is the latest version of SIDRA. The SIDRA version number should be provided in the modelling scope statement.
8 APPENDIX B - DATA COLLECTION

Once familiar with the modelled intersection/s it is necessary to collect the relevant information required to generate an accurate base case traffic model. Without accurate data a model cannot be correctly developed, calibrated or validated. A common cause of inaccurate data is a lack of understanding and experience on behalf of a person collecting data. The designer must possess a thorough understanding of modelling concepts as well as experience of developing traffic models.

Prior to building a model in SIDRA the following information should be available:

- Site Layout Drawings
- SCATS® SUMMARIES; these provide most of the Traffic Signal Controller and SCATS® site information necessary to create a model; these summaries include a SCATS® Picture Diagram
- DPTI Traffic Signal Controller Specifications and Signal “Controller Operations Sheet” may be required if more detailed information is required than contained in the SCATS® summary
- Measured values for bay/flare usage.
- Existing traffic data including DPTI Vehicle Turning Movement Survey volumes and vehicle classification data from ITIMS and lane by lane volumes from SCATS® VS data.

Detailed drawings, maps and aerial photographs can be used to determine site layout. However, a site visit must be carried out to confirm the accuracy of any material used.

Site-specific parameters should also be collected for all periods of the day for which the models are being prepared as site conditions can vary temporally. Common examples of data that can be noted or measured during site visits are:

- Date, time of day and day of week
- Intersection/network layout; lane / link lengths, lane widths and pedestrian crossing distances
- Lane/road markings and usage
- Saturation flows
- Give-way behaviour
- Vehicle and/or pedestrian spot counts
- Right-turner effective bay length and blocking effects
- Left-turner effective bay length and blocking effects
- Short through lane (Flare) lengths and usage
- Diverging and merging lane measured lengths and observed operational characteristics.
- Exit-blocking (measurement of wasted green time on approaches)
- Bus lanes, hours of operation, bus stop locations and bus stop dwell times [only required where buses are to be modelled]
- Car parks, street parking and interference during parking manoeuvres
- Restrictions on the approaches (parking/stopping/loading, etc.)
- Speed limits
- Roadworks and other incidents, and their impact on throughput
- Degree of saturation (it is important to know which approaches are oversaturated for each modelling period, this is used in validating the models); and
- Queue lengths

Whilst many of these parameters can be measured in quantifiable terms, it is also important to record general site observations that capture more subtle behaviour exhibited within the study area. It can be useful to note where traffic behaviour does not reflect street
markings or the intended geometric design of an intersection, for example where ahead moving vehicles use a dedicated left-turn lane.

Many parameters are time dependent, and should therefore be recorded for each period being modelled, such as effective bay usage which can vary at a site according to differing traffic patterns.

8.1 Traffic Count Data

The project specification will detail the traffic flow requirements for model assessment. It is however essential, that recent and relevant traffic volumes are used to assess existing traffic networks, for validation purposes.

The selection of suitable model data is the responsibility of the designer, and the model process should allow for the survey of additional data to fill any gaps in the data available from previous surveys.

It is the designer's responsibility to ensure that the Traffic counts and green splits are supplied for the same relative periods at all modelled intersections, i.e. that they are compatible for calibration and validation of the models, and representative and appropriate for the project assessment being undertaken.

Vehicle Turning Movement Survey volumes and classified counts may be obtained on request from the "Integrated Transport Intelligence and Mapping System" (ITIMS) Traffic Information Map website maintained by the Road Asset Management Section (RAMS). This information may be requested from the address DPTI.RoadTrafficData@sa.gov.au.

An example of the Vehicle Turning Movement Survey pdf format report is shown below:

**Figure 49 Typical Vehicle Turning Movement Survey PDF format.**
The iTIMS intersection manual Vehicle Turning Movement Survey reports are not seasonally adjusted and may not be suitable for use as direct inputs to models without some adjustment in consideration for their age and the season they were counted.

SCATS® VS data can also be supplied by DPTI to support the temporal adjustment of the turning movement counts. This information may be requested from the address DPTI.TrafficOpsData@sa.gov.au. VS data is in the form of lane by lane detector counts, for any detected lane at traffic signal sites in the Adelaide metropolitan area. The VS counts are in units of vehicles and contain no classification data.

The designer should be aware that SCATS® VS count data may under-represent actual traffic volumes in congested conditions where wasted green time occurs because of downstream queues. Poor physical conditions of detectors, detector faults and poor driver lane discipline can adversely affect the counts. Not all lanes at an intersection may have detectors installed.

SCATS® VS count data is also useful for the assessment of the lane utilisation of adjacent lanes.

The designer is responsible for any manual counts that may be required, including for non-signalised intersections.

### 8.2 Typical Traffic Conditions

Where data needs to be collected from site, either during general site visits or traffic surveys, the designer must ensure that network conditions and traffic signals are operating typically and there are no other unusual activities or travel patterns. This includes, but is not limited to:

- Day of week behaviour (e.g. avoiding Monday mornings and Friday evenings)
- School holidays
- Roadworks
- Temporary road closures
- Events
- Festivals
- Traffic incidents
- Temporary loss of SCATS® Masterlink control (e.g. local control), and
- Temporary use of atypical (e.g. SCATS® fall back) timing plans and strategies
APPENDIX C - QUICK GUIDE - Traffic Signals Configuration Checks

START
Open the application and at the site tab select the “Signals” type At-Grade Intersection to be analysed (refer page 23)

From the main screen select the Settings tab and check “Standard Left”, appears as the “Current Setup” (refer page 24)

From the main screen, Settings tab select the “Volume Displays” button. Uncheck the “Same as Volumes Dialog” and select the radio button for “separate” Light and Heavy Vehicles (refer page 25)

Open the INTERSECTION dialogue box and enter the site and project description. Ensure that the Area Type Factor (ATF) is set to ONE (refer page 26)

SAVE THE FILE USING THE DPTI FILE NAMING CONVENTIONS: yyyyMMddTSxxxxprojectnameV1.sip7 (refer page 27)

Open the PARAMETER SETTINGS -Options Tab dialogue – check that the SIDRA (Standard Left) default settings are actually being used. (refer page 27)

PARAMETER SETTINGS - Model parameters
Calculate and Enter the Heavy Vehicle (HV) movement Class pcu/veh factor based on classification counts. (refer page 28)

Open Demand and Sensitivity dialogue and check that for the Analysis Option “None” is selected (refer page 30)

VEHICLE MOVEMENT DATA - Calibration
Select the Heavy Vehicle radio button and calculate and enter equivalent Queue space and Vehicle lengths based on classification counts. (refer page 34)

Enter LANE GEOMETRY - Lane Data tab
ENTER a suitable value for the “Basic Saturation Flow” and use “Quick Input” to apply it to all lanes for consistency [note this value is to be calibrated after initial model processing] (refer page 39)

Open “VOLUMES” “Vehicle Volumes” tab and check: “Unit Time for Volumes” is 60 minutes, “Peak flow Period” is set to 30 minutes Volume Data Method is set to “Separate” In the Volume Factors tab check the “Peak Flow Factor is set to 95% for all movements (refer pages 41 / 42)

Enter PHASING & TIMING - Timing Options Tab select “User Given Phase Times” Uncheck the tick box “Green Split Priority” [at least one phase time will need to be entered in the “Phase and Sequence Data” tab to enable return to the main menu] (refer pages 49 / 50)
10 APPENDIX D – DPTI SUPPORT SERVICES

10.1 SCATS® summaries

These are issued with the following caveat: “Please note that the information has been collected for internal use by this department and is provided herein as an information resource only. It is not a substitute for independent professional advice and users should exercise their own skill, care and judgement with respect to the use of the material.

Whilst all reasonable care has been taken in its preparation, the State of South Australia does not guarantee, and accepts no legal liability arising from or connected to, the accuracy, reliability, currency, suitability or completeness of the material.”

The following is an example of a SCATS® Summary (data and format will vary to suit the site): **TS052 – Elder Smith Rd Main St/ Mawson Lakes**

**PHASING OPERATION**

- Double Diamond Overlap phasing
- Running phase sequence A, C, D, E, G, G2 during weekday PM peak 1600 – 1800
- A, D, E, G2 at all other times.

**RIGHT TURN OPERATION**

Right Turns from NE, SW & SE filter at all times

**PHASE TIMES DURING PEAK PERIODS**

- A is the stretch but the site runs Master Isolated so A is permitted to gap out.
- Average phase times (seconds) on 23 March 2017

<table>
<thead>
<tr>
<th>Period</th>
<th>Time</th>
<th>Average CL</th>
<th>A</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>G⁺</th>
<th>G2</th>
</tr>
</thead>
<tbody>
<tr>
<td>AM</td>
<td>0745 - 0845</td>
<td>109s</td>
<td>41</td>
<td>17</td>
<td>24</td>
<td>-</td>
<td>27</td>
<td></td>
</tr>
<tr>
<td>BUS</td>
<td>1400 - 1500</td>
<td>92s</td>
<td>29</td>
<td>21</td>
<td>20</td>
<td>-</td>
<td>22</td>
<td></td>
</tr>
<tr>
<td>PM</td>
<td>1700 - 1800</td>
<td>102s</td>
<td>29</td>
<td>16</td>
<td>20</td>
<td>22</td>
<td>14</td>
<td>6</td>
</tr>
</tbody>
</table>

Note: The frequency of E phase during Bus peak is 75%

Notes:
G2 runs an average 85% of cycles during the morning peak but rest of the time G runs.  
G2 runs an average 92% of cycles during the afternoon peak but rest of the time G runs.  
G2 runs an average 80% of cycles during the business peak but rest of the time G runs.

**LINKING:** Site runs Master Isolated.

**MINIMUM GREEN TIME**

<table>
<thead>
<tr>
<th>Phase</th>
<th>A</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>G</th>
</tr>
</thead>
<tbody>
<tr>
<td>Min. green time</td>
<td>7s</td>
<td>7s</td>
<td>8s</td>
<td>8s</td>
<td>7s</td>
</tr>
</tbody>
</table>

**INTERGREEN TIME**

- A, C, G phases have 7.5 sec intergreen time (Yellow = 4.5s, Red = 3.0s)
- D, E phases have 7 sec intergreen time (Yellow = 4.0s, Red = 3.0s)

**PHASE SKIPPING** None
**CYCLE TIME** Maximum cycle length is 120 seconds during the morning and afternoon peaks.

**WALKING TIME**

<table>
<thead>
<tr>
<th>Pedestrian</th>
<th>Parallel Vehicle Phase</th>
<th>Time Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1</td>
<td>A</td>
<td>23s</td>
</tr>
<tr>
<td>P2</td>
<td>AC</td>
<td>18s</td>
</tr>
<tr>
<td>P3</td>
<td>E</td>
<td>28s</td>
</tr>
<tr>
<td>P4</td>
<td>E</td>
<td>28s</td>
</tr>
</tbody>
</table>

**SCATS GRAPHICS**

![SCATS Graphics](image)

**TABLE:** SCATS Maximum Flow recorded on 23 March 2017

<table>
<thead>
<tr>
<th>Detector No</th>
<th>Maximum Flow</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1978</td>
</tr>
<tr>
<td>2</td>
<td>2130</td>
</tr>
<tr>
<td>3</td>
<td>1525</td>
</tr>
<tr>
<td>4</td>
<td>1558</td>
</tr>
<tr>
<td>5</td>
<td>1636</td>
</tr>
<tr>
<td>6</td>
<td>1827</td>
</tr>
<tr>
<td>7</td>
<td>1978</td>
</tr>
<tr>
<td>8</td>
<td>1457</td>
</tr>
<tr>
<td>9</td>
<td>1434</td>
</tr>
<tr>
<td>10</td>
<td>1674</td>
</tr>
<tr>
<td>11</td>
<td>1978</td>
</tr>
</tbody>
</table>
10.2 Yellow Red template spreadsheet

This template is used to calculate clearance times for new or modified intersections.

![Traffic Modelling Guidelines](image)

**Figure 50 Yellow / Red template**

The spreadsheet is available from the Traffic Operations Section. The menu on the right hand side will condense the sheet for pedestrian crossings, and include cells for use of the early cut off facility. The grey cells are those to be completed for the calculations. The design speed is normally taken to be the current speed zone on the approach. “Width” is the distance from the stop line to the last collision point, which will usually be the pedestrian crosswalk on the far side of the intersection. For pedestrian crossings it will be from the stop line to the crosswalk. A print from the output shall be included in the TSOPR.
APPENDIX E - REFERENCES


Director General of Transport, South Australia - “Land Use Trip Generation Stage 2 Report” (1987) (by Shane P Foley and Travers Morgan Pty. Ltd.)

DPTI - Trip Generation Rates for Assessment of Development Proposals, January 2014

National Heavy Vehicle Register, National Transport Commission – Performance – Based Standards Scheme – Network Classification Guidelines July 2007


National Transport Commission - Heavy vehicle charges Report to the Standing Council of Transport and Infrastructure February 2012


