

# **Drafting and Design Presentation Standards Manual**

## **Volume 1: Chapter 6 - Visualisation**

**October 2016**



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## **Amendment Register**

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## 6 Visualisation

### Acknowledgement

This chapter incorporates the results of a paper by Ricky Cox (Cox RL, 2005; Visualisation – Why it should now be a Basic Tool for Geometric Road Design, 3<sup>rd</sup> International Symposium on Highway Geometric Design, Chicago, USA).

#### 6.1 *Introduction*

This chapter provides information on how a range of visualisation tools and techniques may be used in the planning, design and presentation of road projects. Visualisation techniques can be used on any road design, not just restricted to the more major projects. Within the context of geometric road design, visualisation can give a true representation of what the road will look like to the designer and the end user. This enables both appearance and safety issues to be detected and addressed before the road is built. It also enables the designer to check the electronic model for completeness and accuracy, e.g. verify that the interfaces are joined and consistent.

Visualisation is also an effective presentation tool. Detailed presentations can be created for use in planning and design workshops as well as in the community consultation forum. The visualisation tool provides a photo-realistic representation of the design proposal which is easier to understand for lay people than engineering drawings.

#### 6.2 *Visualisation as a road design tool*

With the continual development of road design software applications it is possible to create simple wire frame perspectives and to render drive-throughs easily and effectively. This ability provides the designer with an invaluable tool for assessing the geometric design of the road.

At all times, visualisation should be used as early as possible in the planning and design process to detect and fix problems. This tool can be used to assess a number of different issues including:

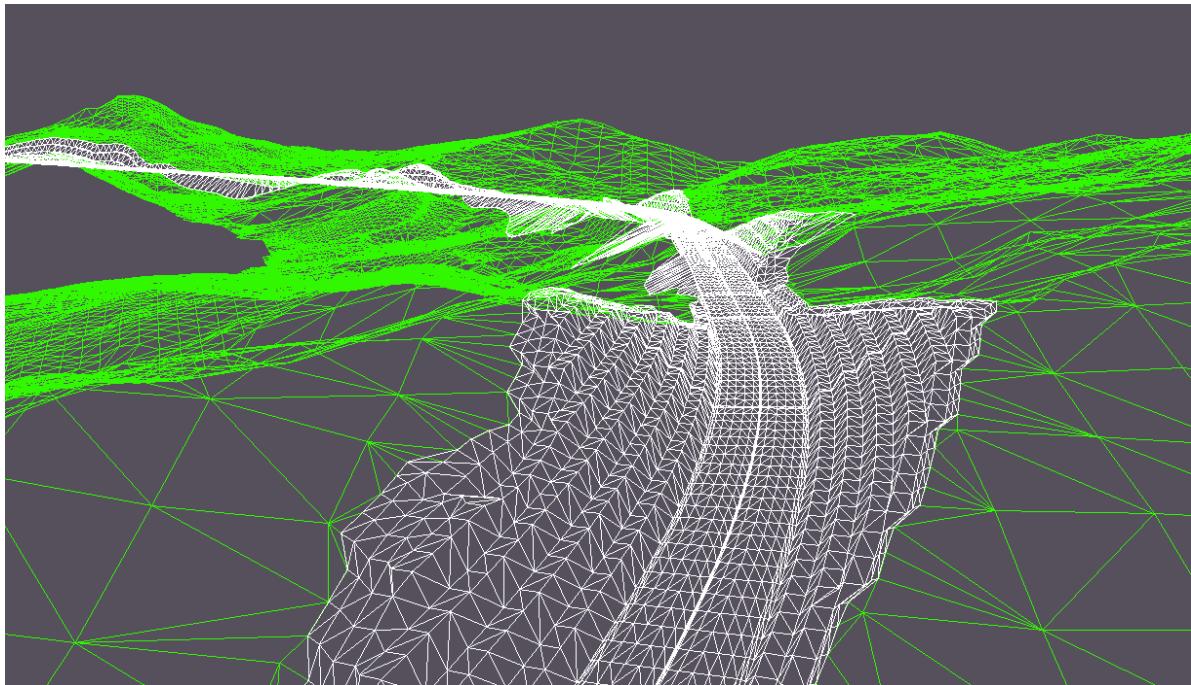
- appearance of the road
- sight distance
- hidden dips
- how the road fits the terrain
- curve perception
- perception of turns required at intersections
- geometry that may mislead some drivers
- maintaining views or conversely, avoiding distractions
- appearance of the road from a vantage point off the road – for example, to check concerns that the road may intrude upon the landscape, and
- viewing possible conflicts between underground services and the proposed road.

##### 6.2.1 **Wireframe perspective views**

The wireframe perspective view can be produced quickly and easily in most 3D road design applications. These views can be used for checking the appearance of alignments including optical summits, avoiding the appearance of “kinks” and checking the combination of horizontal and vertical

curves. Wireframe perspectives can also be used to check how the road fits the terrain from vantage points away from the road as well as on the road. As can be seen in Figure 6.2.1, wireframe perspectives, even with hidden line suppression, are quite “raw” and can be difficult to interpret.

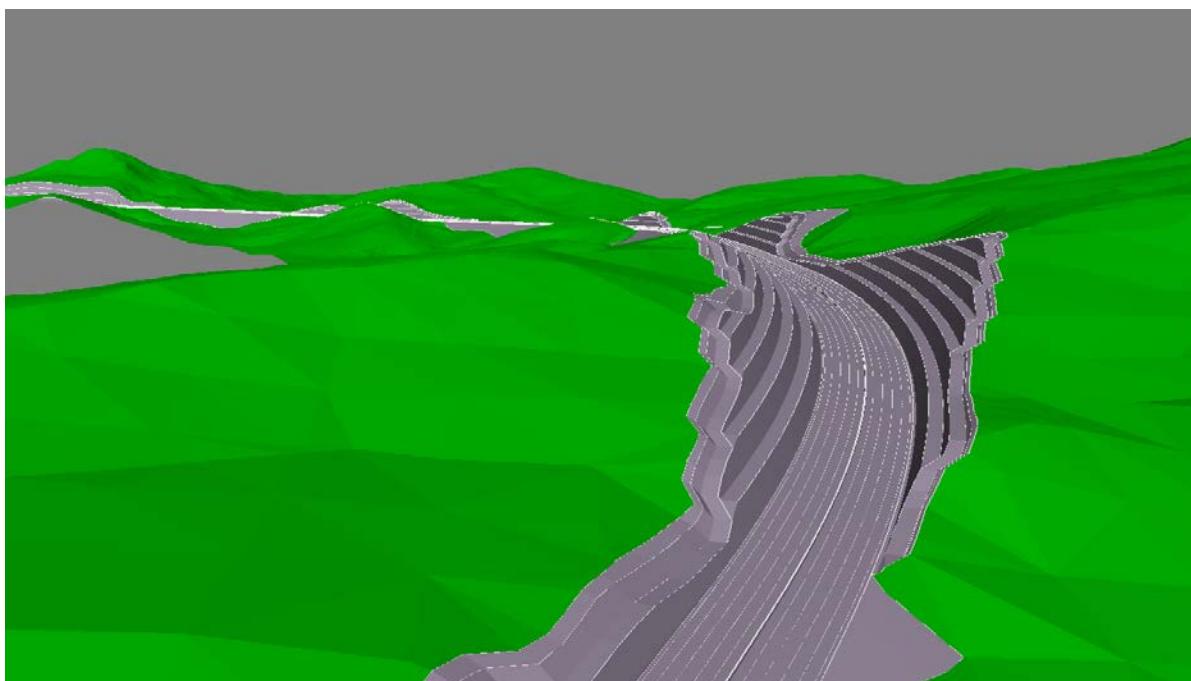
**Figure 6.2.1 - Wireframe perspective**



## 6.2.2 Simple, rendered triangulations

Simple rendering can be used to improve the interpretation and realism of the design model. The ability to shade and illuminate a triangulation model is an automatic process. The resultant display helps the designer to analyse the design and how it fits the existing terrain. See Figure 6.2.2.

**Figure 6.2.2 - Simple, rendered triangulation**



### 6.2.3 Simple rendered drive-throughs

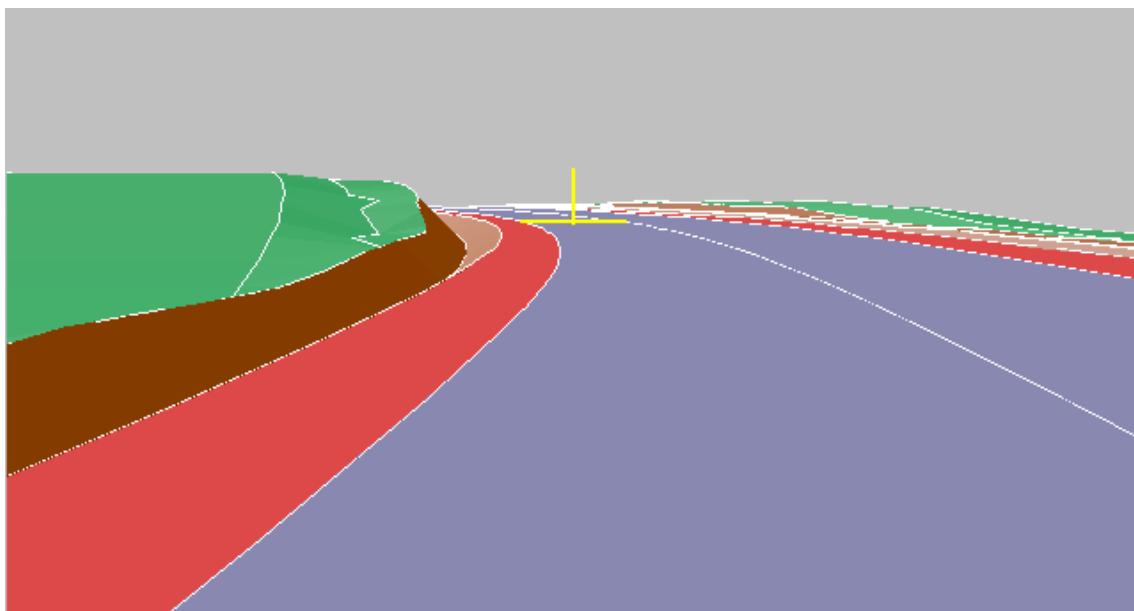
In addition to producing simply rendered triangulations which view the model from a fixed point, designers also have the ability to analyse the design from a driver's point of view utilising drive-through tools. This tool is useful in checking sight distance, how structures may effect visibility and the appearance of the road. It also helps to highlight cases where the road geometry or features near the road may deceive or distract drivers.

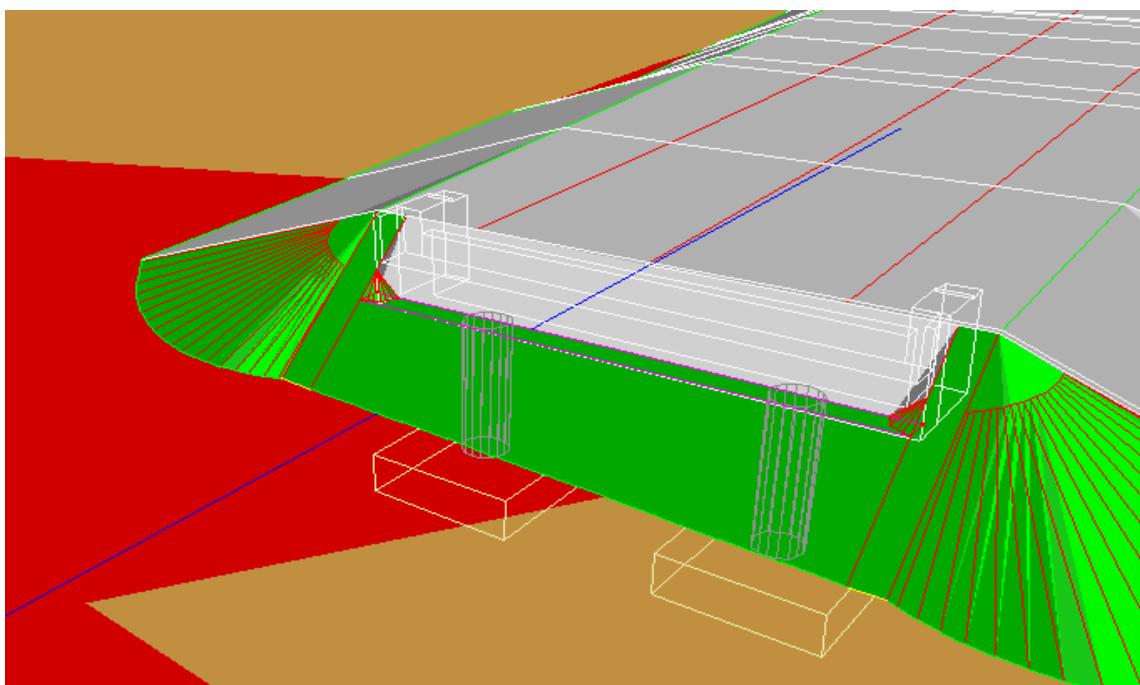
Drive throughs can also be created which follow strings other than the road centreline. Orbital fly-overs above and around the project can be used to view particular aspects of the design, for example under bridge structures or around interchanges.

**Figure 6.2.3(a) - Simple, rendered drive through**



**Figure 6.2.3(b) - Sight distance check using visualisation**

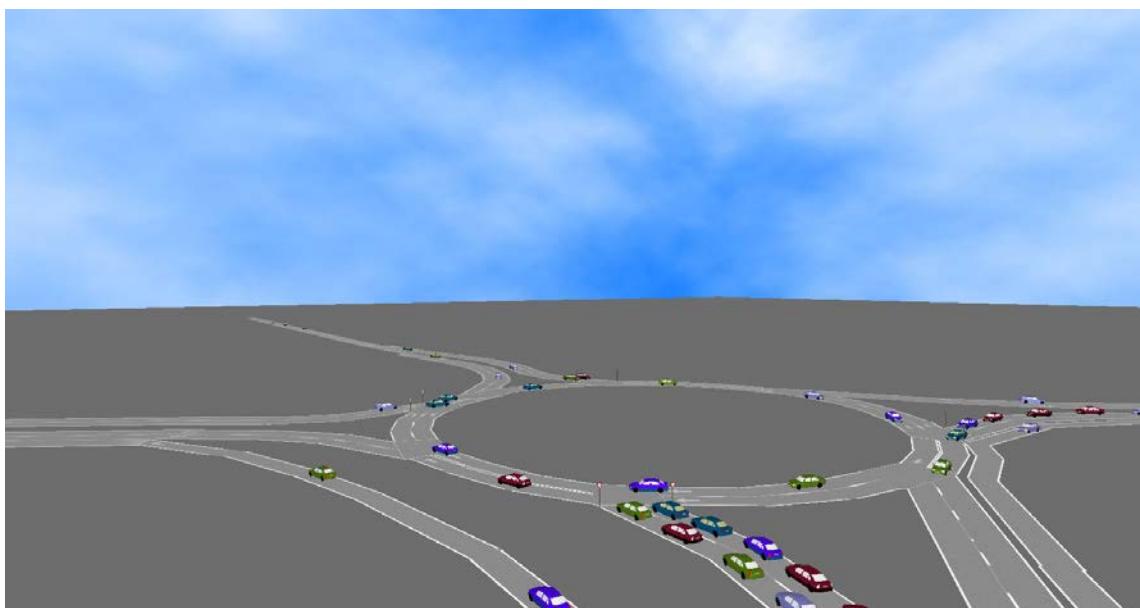


**Figure 6.2.3(c) - Simple, rendered visualisation of road and partial bridge structure**

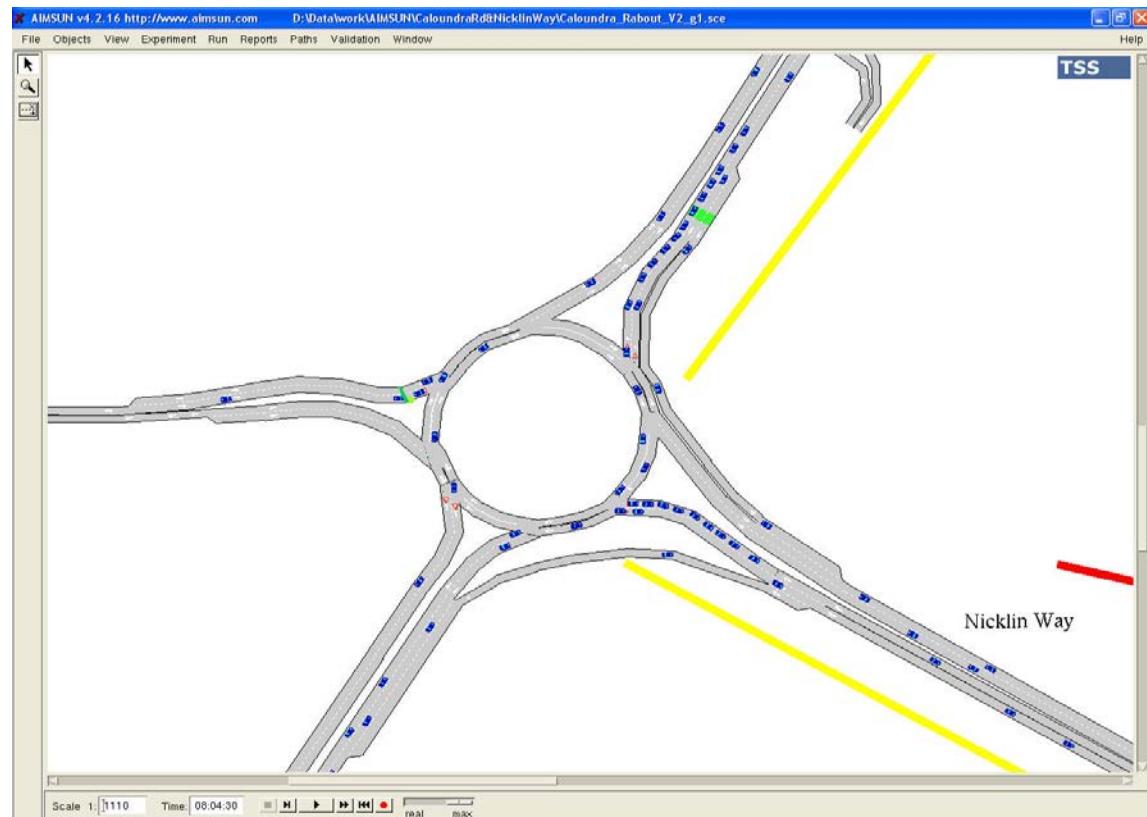
The examples shown in Figure 6.2.1 to Figure 6.2.3(c) can be created directly from the design model, the existing surface model and their respective triangulations.

#### **6.2.4 Traffic simulation**

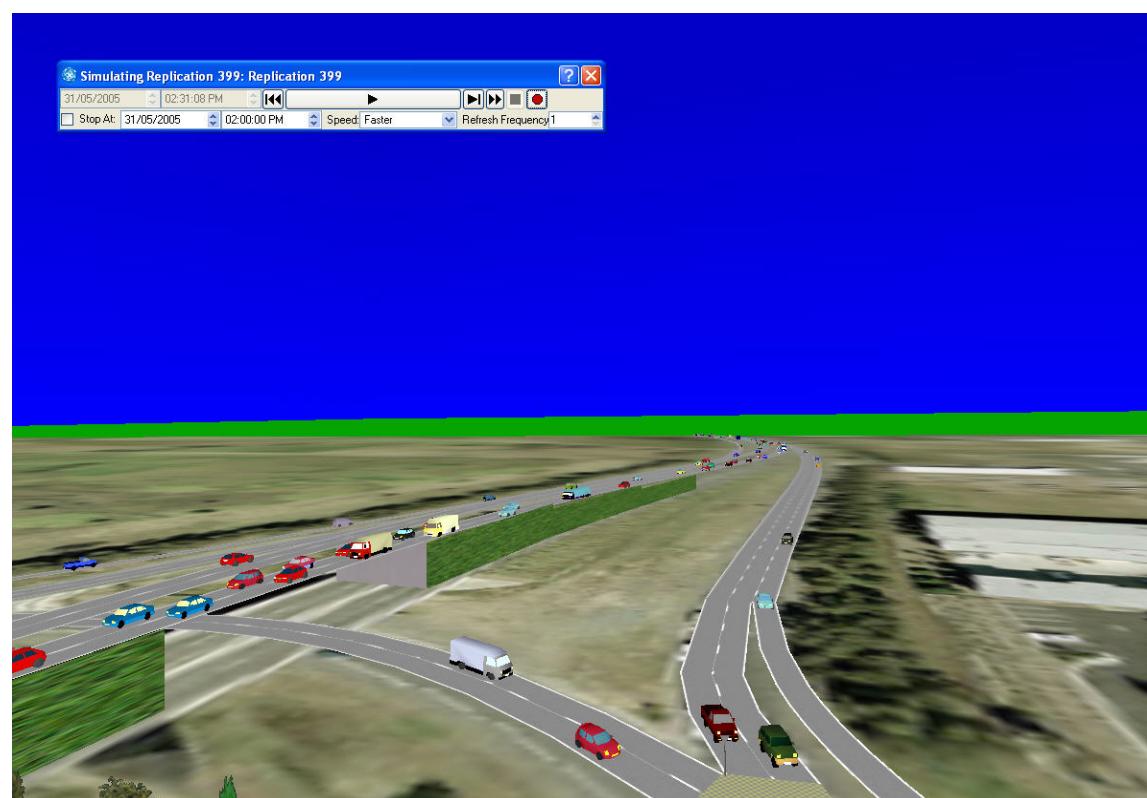
There are many software packages available that carry out simulation of traffic movement and behaviour to assist in planning and design. This software can produce visual displays of the traffic behaviour in most situations within the road network. Figure 6.2.4(a) to Figure 6.2.4(d) below provide examples of visualisation available, including intersection, interchange and roundabout analysis, behaviour at pedestrian crossings and signalised intersections and also overtaking behaviour.

**Figure 6.2.4(a) - Perspective view of roundabout analysis**

**Figure 6.2.4(b) - Plan representation of roundabout analysis**



**Figure 6.2.4c) - Perspective view of interchange analysis**



**Figure 6.2.4(d) - Intersection and pedestrian analysis**

### **6.3 Visualisation as a presentation tool**

Visualisation can also be used for presenting designs in different forums. Perspective views and drive-throughs are particularly effective when presenting design concepts to lay people who don't have a technical background. Generally lay people have difficulty understanding engineering drawings. It has been found that visualisation gives a clearer picture of a design as it puts the viewer in the driver's seat or in a position where they can view a proposed road from particular points of interest.

Plans with aerial photo backgrounds, fully rendered perspective views and drive-throughs are effective when used in planning and design workshops. They can be used as focal points for large discussion groups relating to various technical issues.

For presentation purposes visualisations should be as true-to-life as possible. This can be achieved by draping the aerial photography on the natural surface triangulation, using 'real life' textures when rendering and including all design features and road furniture.

#### **6.3.1 Plan with aerial photo background**

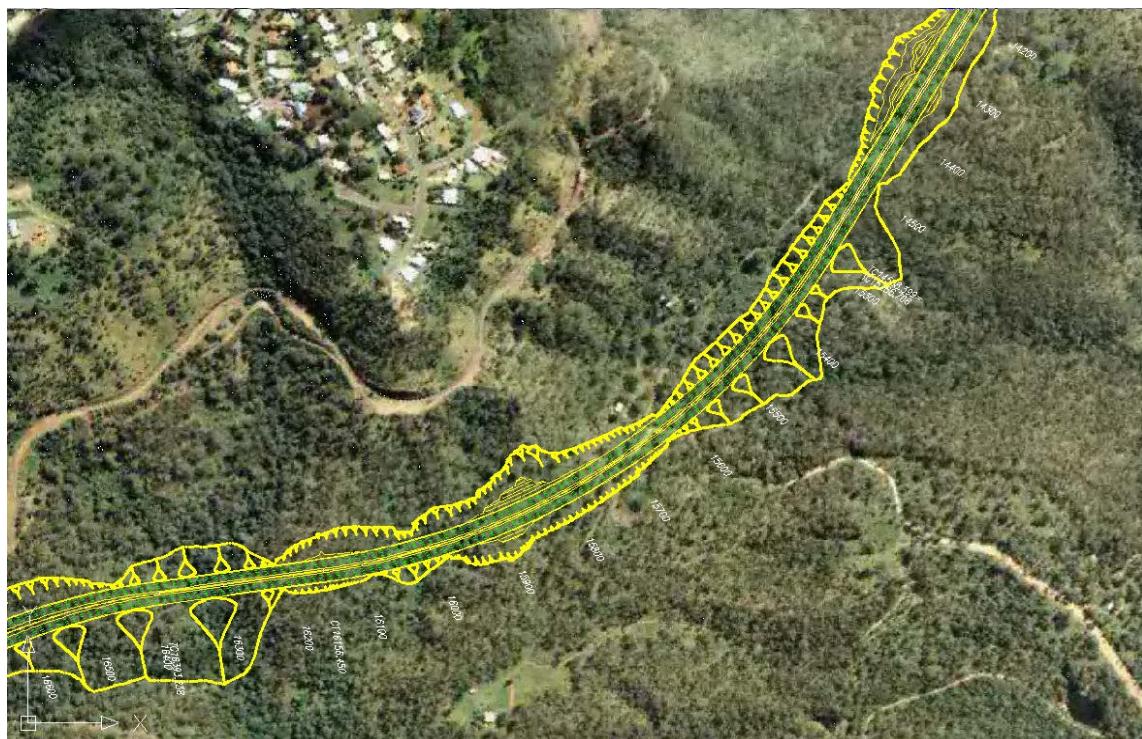
This type of plan gives the viewer an idea of where the road will be positioned in relation to surrounding buildings, features, etc. The inclusion of the aerial photo background allows a clear understanding of the road's location.

It is very important that current photography is used so that all existing features are included. The photographic image must also be accurately positioned in relation to the co-ordinate base used for the design model so that the location of the proposed road is correct in relation to the existing features shown on the photo.

Care should be taken with colour selection when creating this type of plan. Line colours used for the design strings should be chosen carefully so that they are clear and do not blend with the wide range of colours normally found in aerial photography.

Figure 6.3.1(a) to Figure 6.3.1(c) show examples of how aerial photography can be incorporated into the plan presentation.

**Figure 6.3.1(a) - Roadway and interface design overlaid on aerial photography**



**Figure 6.3.1(b) - Roadway layout overlaid on aerial photography**



**Figure 6.3.1(c) - Preliminary interchange layout overlaid on aerial photography**



### **6.3.2 Fully rendered perspective views**

Fully rendered perspective views can be used to provide the viewer with a complete representation of the final constructed roadway. These views generally contain a composite triangulation combining both the design and existing surface. The aerial photography is draped on the existing surface and the design is fully rendered with true to life textures. All design features and road furniture are realistically represented.

The fully rendered perspective views can be used in community consultation to view the roadway from particular points of interest e.g. the view from an owner's property or from a public lookout. The perspective view can also be used in technical workshops to view particular aspects of the design in detail.

Figure 6.3.2 is an example of a fully rendered perspective view of a proposed road viewed from a distant location. It should be noted that the draped aerial photography may look distorted close to the viewing position.

**Figure 6.3.2 - Fully rendered perspective view with draped aerial photography**



### 6.3.3 Fully rendered drive throughs

Fully rendered drive throughs provide a realistic representation of the roadway and surrounding terrain from the driver's point of view. This type of presentation provides the viewer with a realistic idea of what the final constructed roadway will look like.

The examples shown in Figure 6.3.3(a) and Figure 6.3.3(b) below require post-processing of the design model. Textured render patterns need to be applied, along with the creation of linemarking polygons and road furniture features. Generally this type of work requires additional software modules or dedicated visualisation software applications. Some of these dedicated applications also give the ability to include moving vehicles on the road in the drive-through presentation.

**Figure 6.3.3(a) - Fully rendered drive through presentation**



**Figure 6.3.3(b) - Fully rendered drive through presentation**



