

Virtual Stafford



Setting Up of a 3-Dimensional Digital Model for Stafford Town Centre Area

November 2003

A Companion Document to 'The Stafford Town Centre Vision – Urban Design Framework 2002'



Stafford
BOROUGH COUNCIL

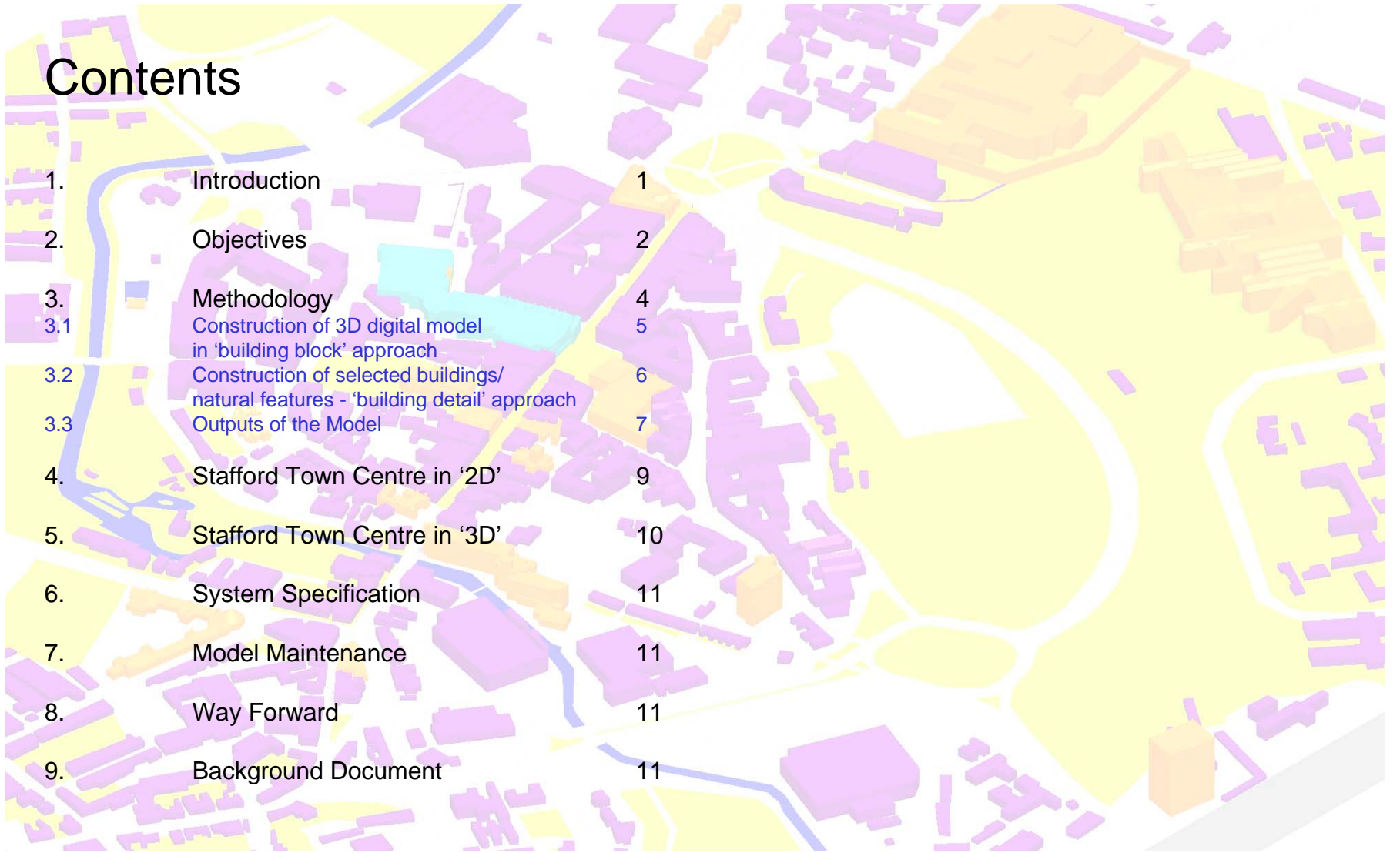


INVESTOR IN PEOPLE

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1. Introduction

The advantages in computer hardware and software technology, such as Geographical Information System (GIS) and Computer Aided Design (CAD) specifically, have enhanced the capacity for the management of planning data significantly. Such improvements do not only lead to better data visualisation, but also enables innovative analysis and presentation of planning and redevelopment proposals. The improvement in technology is particularly useful to Stafford Town Centre Area where planning and development have to cater for a fast pace of change.

This report outlines how the Forward Planning Team has capitalised on the recent advancements in computer technologies (including aerial photography, three-dimensional modelling and flythrough animation) to deliver a 3D digital model of Stafford Town Centre, which enables the management of planning data and assessment of visual impacts in a more effective manner.



Figure 1: Modelling Area in 2D form

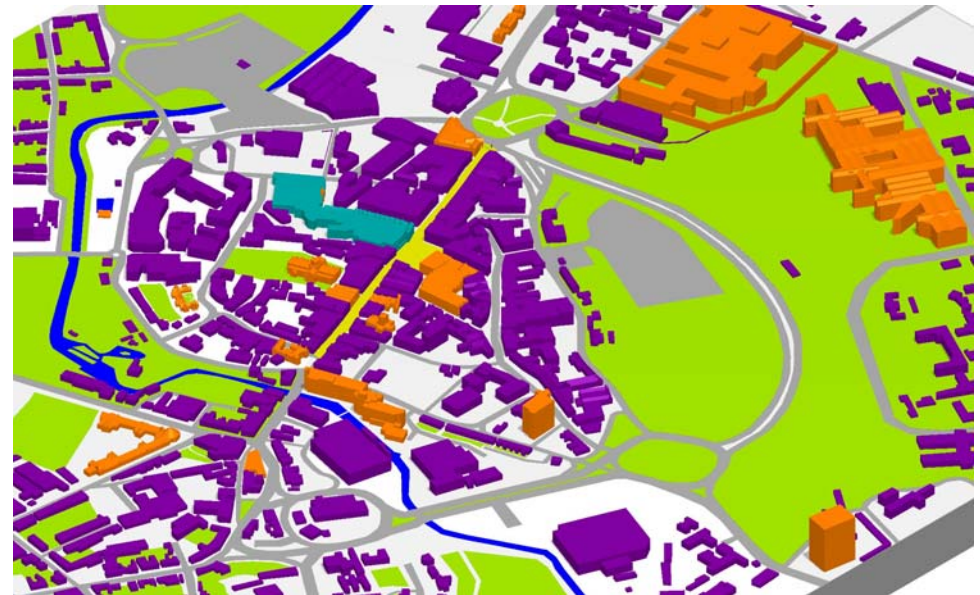


Figure 2: 3D Digital Model of Stafford Town Centre Area

2. Objectives

When planning and considering various kinds of development and redevelopment, it is often necessary to assess the visual relationships and possible impacts between a particular development and its surroundings. In view of this, a 3D digital model for the town centre area of Stafford has been established to assist the assessment of the following:

i, Consideration of the visual impacts in development applications and objections submitted

It allows the visualisation of macro impacts in a development to be revealed instantly at different viewpoints, even at inaccessible locations.

ii, Formulation of land use options for the preparation of Local Development Framework (LDF) Proposals Map

In the process of evaluating different land use options in the preparation of LDF Proposals Map, the 3D digital model will be useful to permit more effective analysis of different land use options and their impact on adjacent development and urban setting.

iii, Formulation of a base-model for various planning documents

Both 2D and 3D models can be used as a base-model for future 'design briefs' and 'masterplans', where buildings in the model can be modified i.e. remove old building(s) and added new building(s) to the model.

iv, Facilitation of visual simulation for presentations

The 3D digital model is an invaluable tool to illustrate the visual experience of Stafford urban area in public forums and Council meetings. By using the techniques of flythrough and walkthrough in association with the traditional presentation materials such as sketches, diagrams, illustrations and photomontages, a more realistic and conceivable experience can be conveyed to all participants.

Figures on the next page is an example to illustrate how the 3D model can be used to assist in the assessment of a new development within the Stafford Town Centre Area, its visual relationships and possible impacts between a particular development and its surroundings.

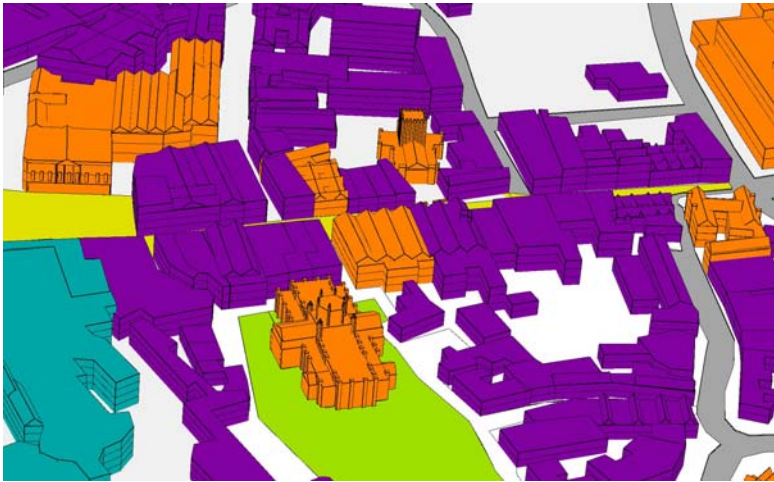


Figure 3: Macro level of any part of town centre can be revealed instantly

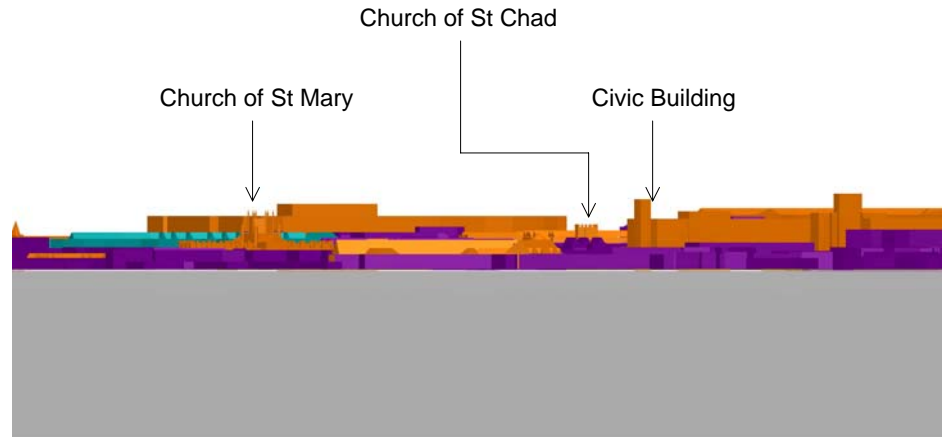


Figure 4: The Model allows participants to observe the town centre from different viewpoints and even at inaccessible locations

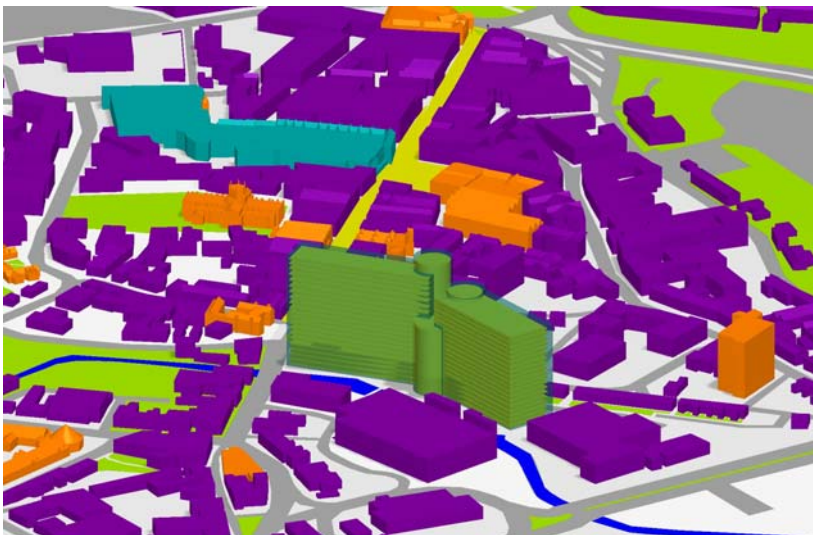


Figure 5: Demolition of Civic Building and replace it with a new 20 storey Civic Tower Complex – (Example only)

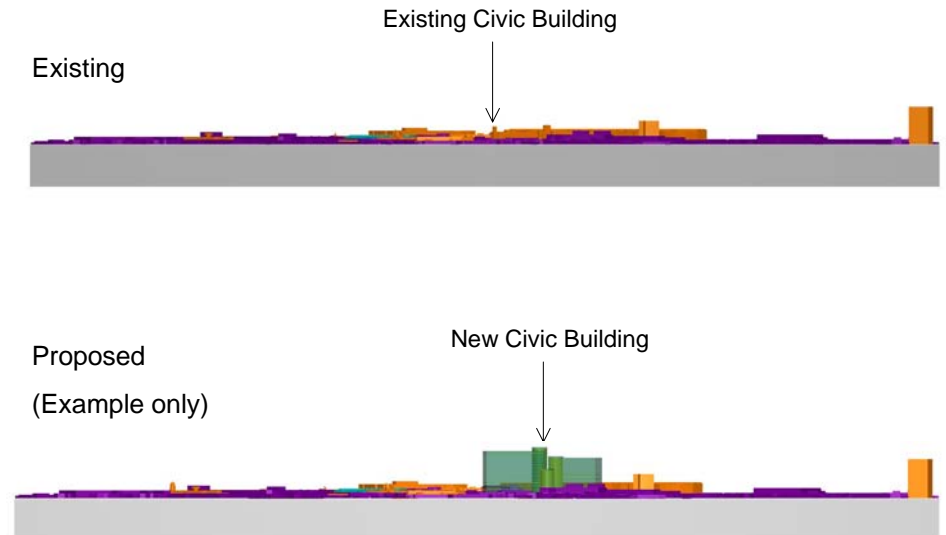


Figure 6: Shows the visual impacts of new Civic Tower Complex upon town centre skyline

3. Methodology

The 3D digital model was mainly developed and constructed according to a 'building block approach' i.e. extrude building footprint to actual building height. Because of the extensive coverage of the project area, a 'building block' based model is the most viable and technically feasible approach.

In the model, the 'building block approach' is further supplemented by the use of 'building detail' techniques, where 18 selected buildings were provided with a more detailed look for close range viewing.

The project has the following major merits:

1. The 3D digital model is a computer system which has sufficient capacity to process and store an enormous amount of data covering the whole town centre area with the capability for future expansion to cover the whole of Stafford Borough including rural areas.
2. The 3D model can articulate buildings in order to perform various types of visual analysis such as photomontage and skyline profile to aid planning decision making.
3. The 3D model allows development proposals to be manipulated instantly. For example, a particular site can be displayed in different development scenarios or building scenes simultaneously.
4. There are visualisation and flythrough functions which provide visual experiences of walkthrough simulation.
5. It could enhance presentations of development proposals in Council meetings and is capable of being understood by members of the general public.
6. It provides a system for which updating can be readily made by Planning and Urban Design Officers.

However, there are limitations with the 'building block approach'. The 'building block approach' is only able to model real world features in block mass. Overhanging structures and texture mapping to built structures cannot be achieved. In fact, both of these problems can be solved by using 'building detail approach' and 'photomontage technology'. However, 'building detail and photomontage technology' cannot manage to model a large area and as a result, the 'building block approach' is adopted as the major technology in this project to model the Stafford Town Centre Area. The construction of the model comprises of two major processes, which are described briefly on the next page.

3.1 Construction of 3D digital model in 'building block' approach

In this process, large volume of spatial data such as urban blocks, road systems and building footprints were transformed into the appropriate formats for the compilation of the model.

Digital photographs of each town centre buildings were taken to obtain the height of individual buildings.

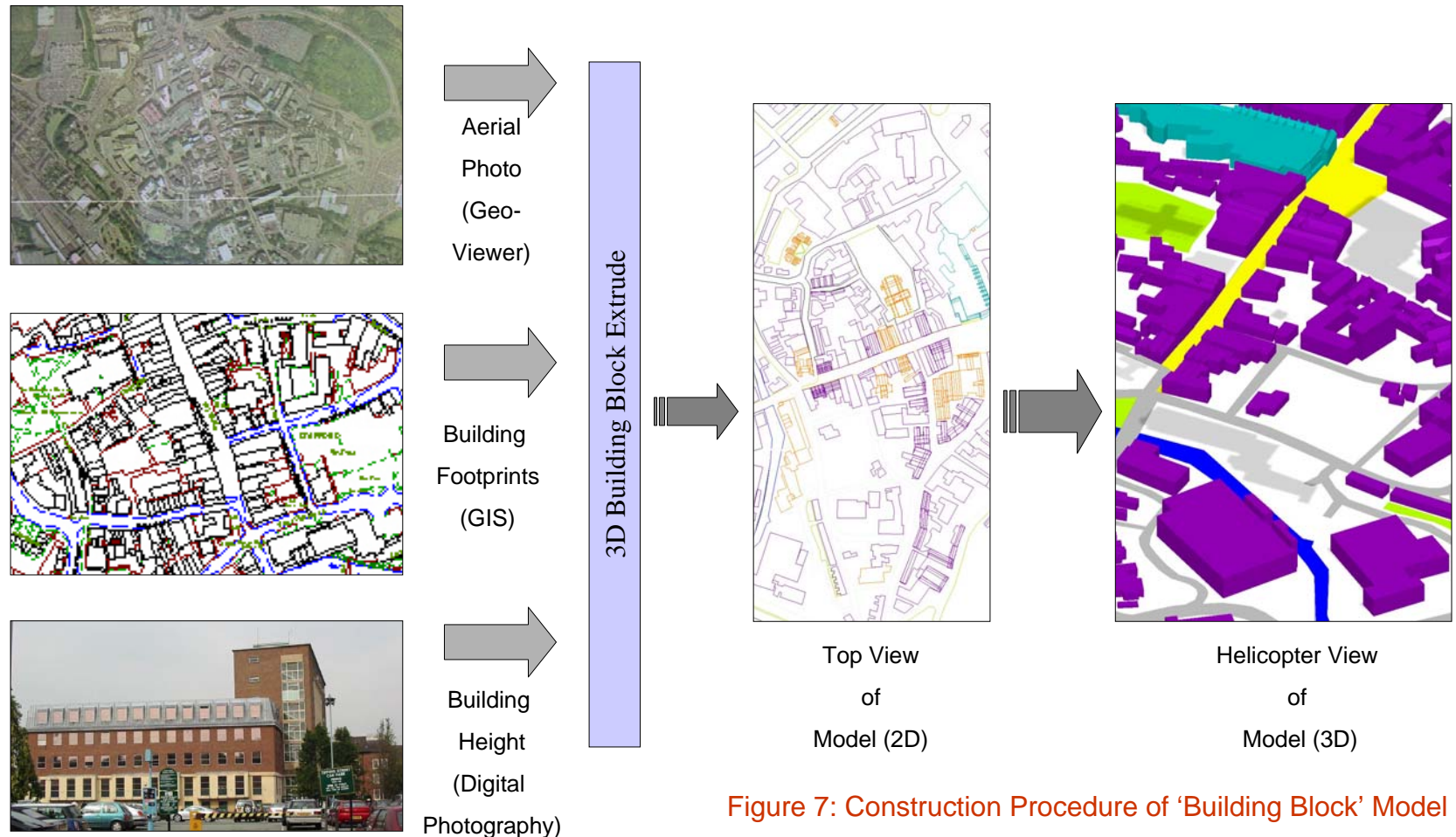
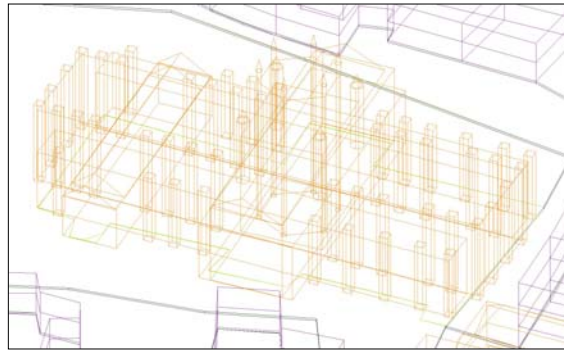


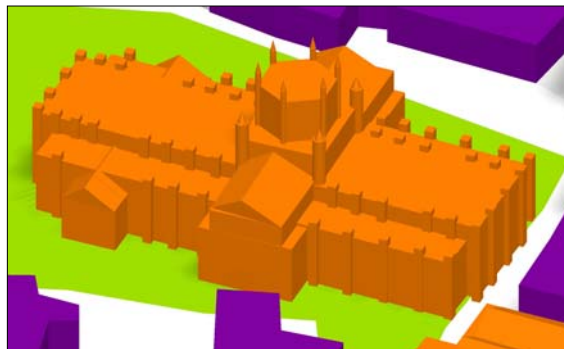
Figure 7: Construction Procedure of 'Building Block' Model

3.2 Construction of selected landmark buildings/key natural features – ‘building detail’ approach

In this process 18 buildings including many Listed Buildings were modelled as wire-frame model in traditional vector format with reference to building plans. More details of building features (such as windows, roofs and columns etc) were then applied to the wire-frames to generate richer details in these buildings. In addition, key natural features such as the River Sow and major open grass areas are rendered with realistic materials.



Wireframe Model of
Church of St Mary



3D Rendered Model showing key building
features and shadow



A collections of ‘Building Detail’ Models (showing in orange), including Ancient High House, Post Office, Church of St Mary, Church of St Chad, Novell Almshouses, Shire Hall and Civic Building etc.

Figure 8: Construction Procedure of ‘Building Detail’ Model

3.3 Outputs of the Model

- i. If a basic outline is needed then the 'building block' approach in Section 3.1 will readily provide a close approximate outline of buildings from any selected viewpoints.
- ii. If details of buildings are required then the 'building detail' approach in Section 3.2 will provide good images of key features of buildings and key features of natural environment.
- iii. However, if more detailed buildings and scenery are required then the 3D model needs to combine with actual images of the real world to generate a 'real world' model (i.e. real buildings and natural environment) by photomontage techniques.

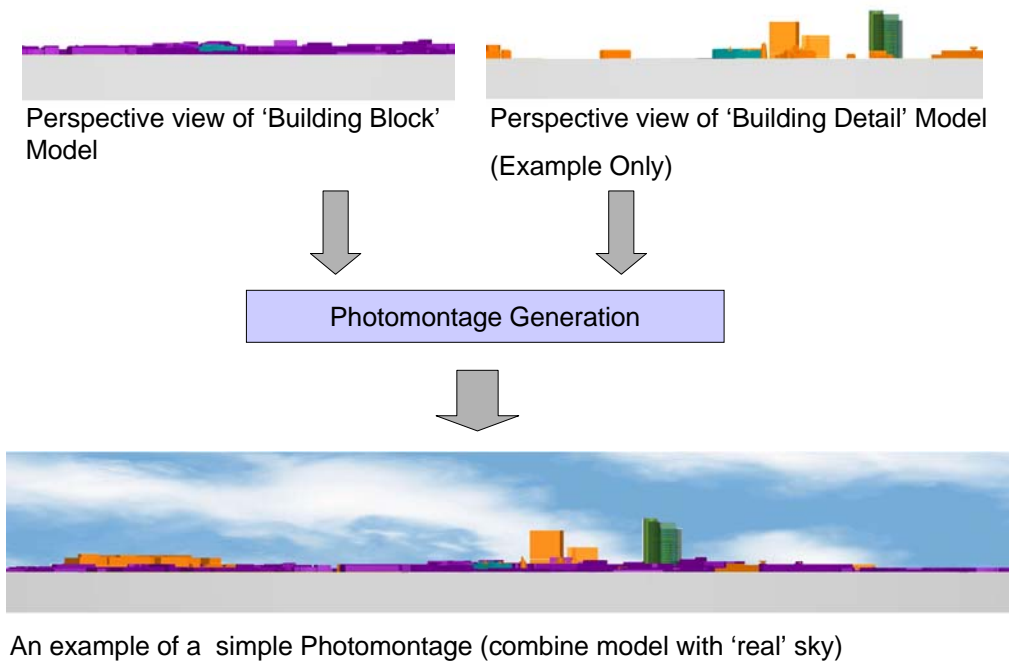


Figure 9: Construction Procedure of 'Real World' Model

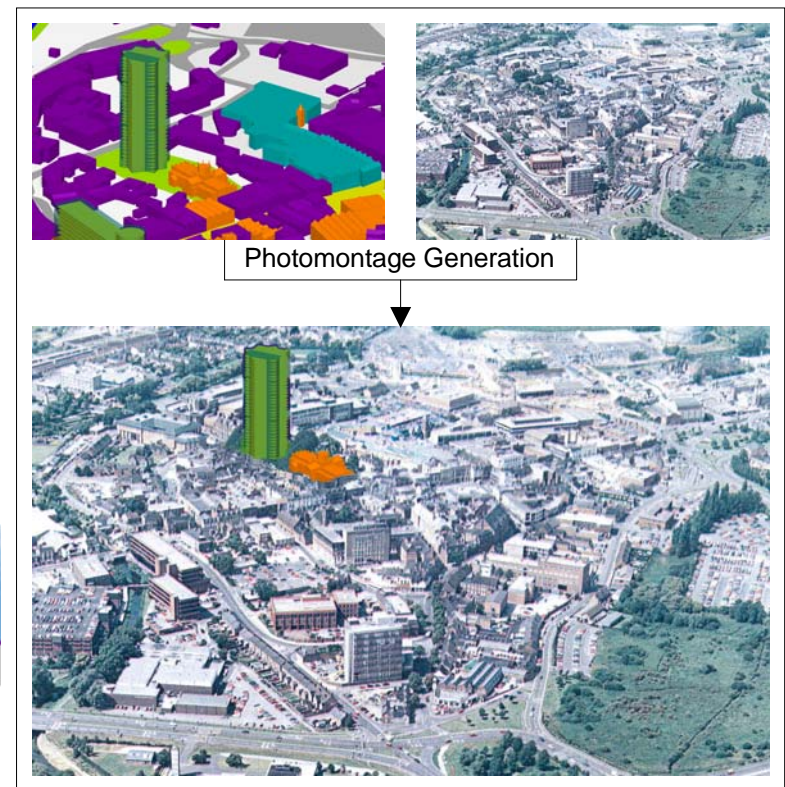
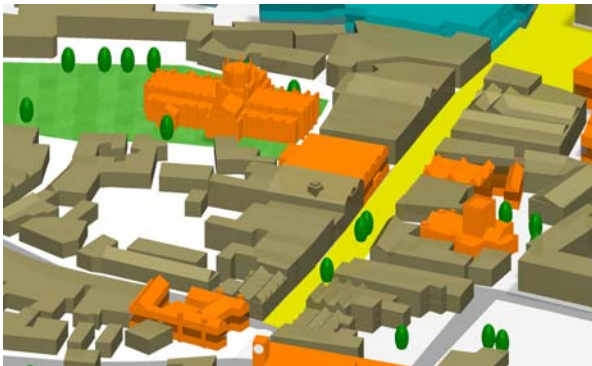


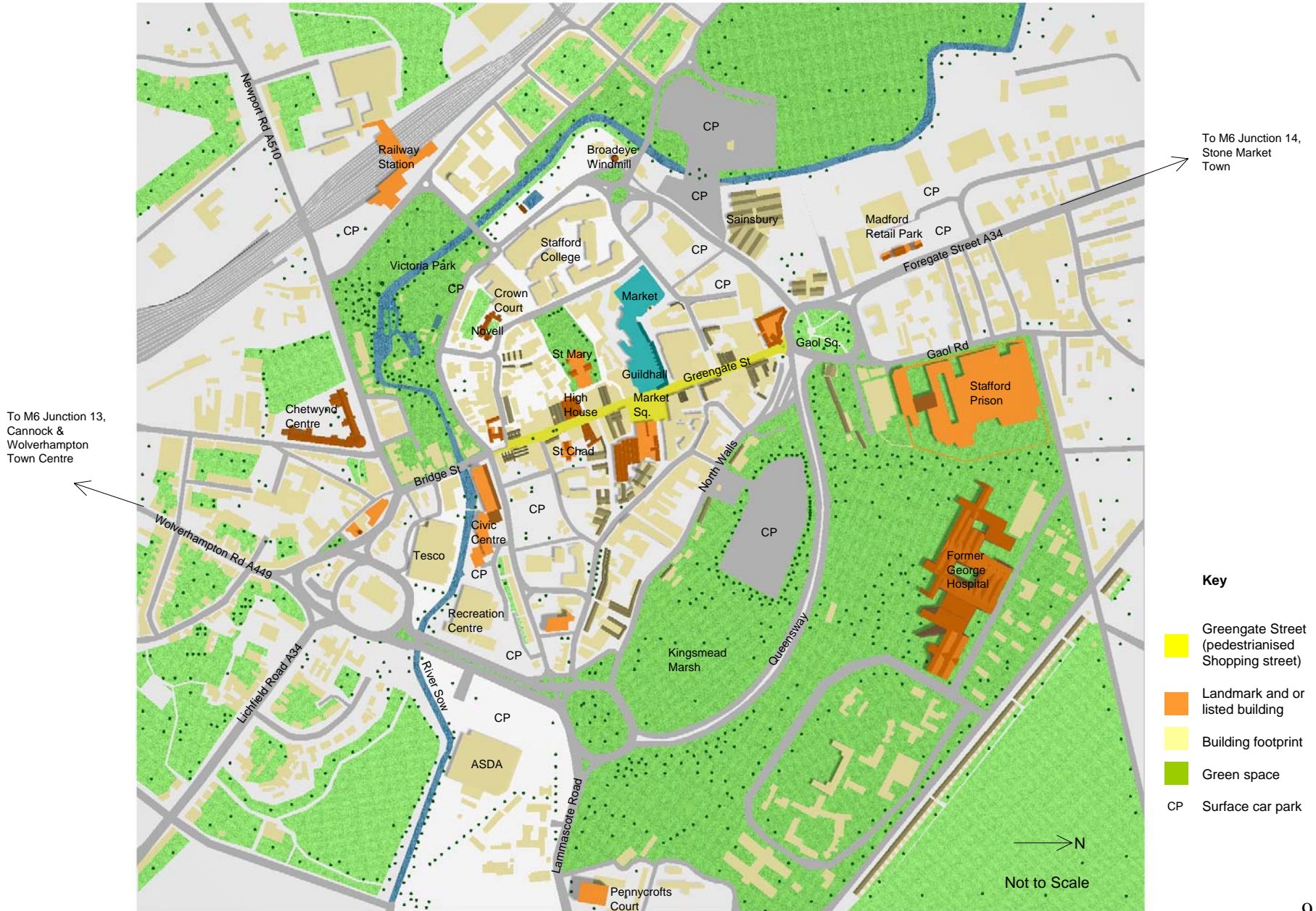
Figure 10: Composition of 'Building Block' & 'Building Detail' & 'Real World' Model (Example Only)

- iv. 3D animation is the final output that can be generated from the model to produce helicopter and walkthrough experiences of Stafford Town Centre Area.

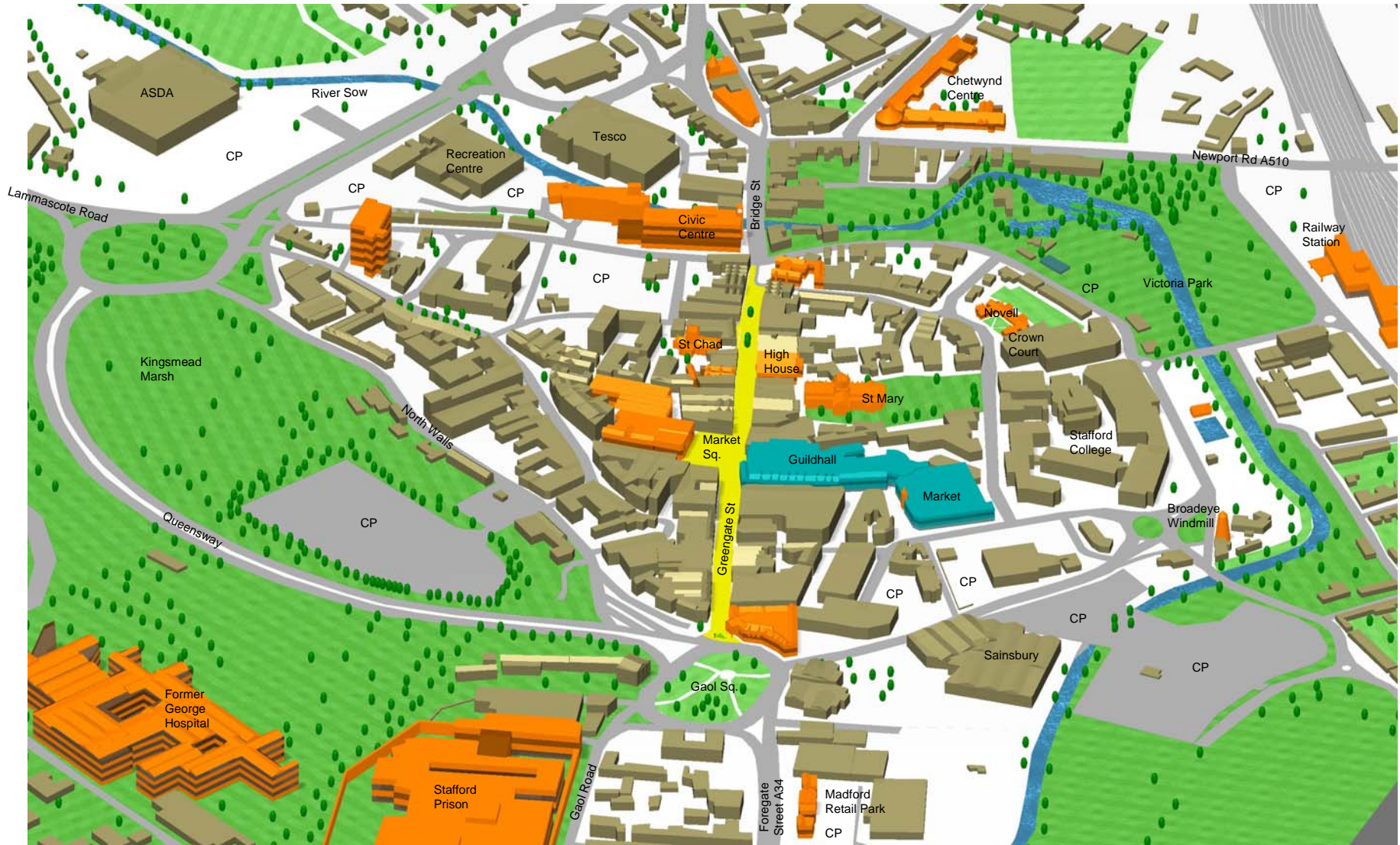


**3D
Animation
will be
present
shortly**


4. Stafford Town Centre in '2D'




5. Stafford Town Centre in '3D'





Key

 Greengate Street (pedestrianised Shopping street)

 Landmark and or listed building

 Building

 Green space


 CP Surface car park

Fly Through Animation

A 360 degree bird eye view of Stafford Town Centre Area

Key

 Greengate Street (pedestrianised Shopping street)

 Landmark and or listed building

 Building

 Green space

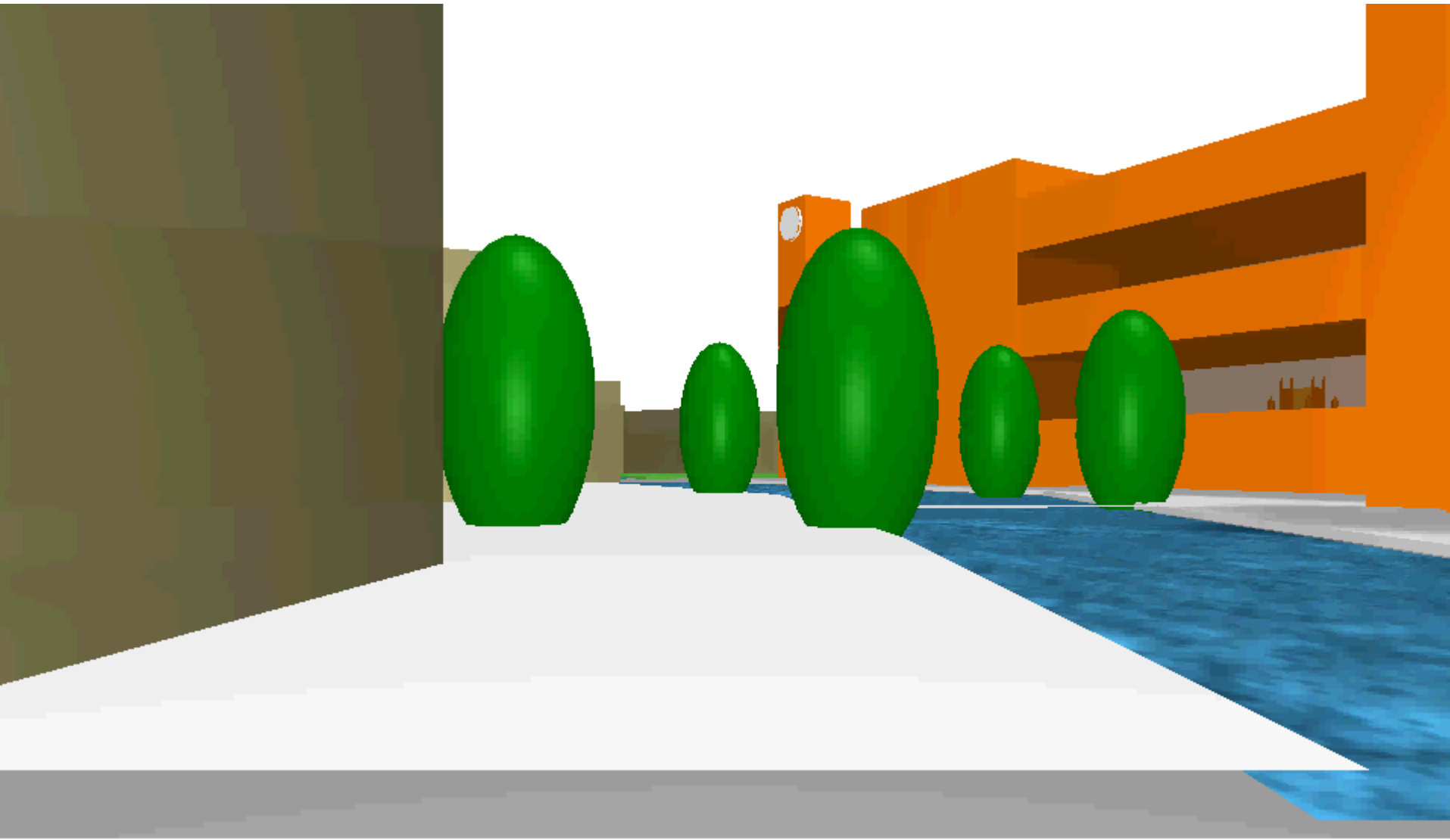


Walk Through Animation

Depart from Civic Building, through Market Square and railway station, arrive at Gaol Square.

Key

- Greengate Street (pedestrianised Shopping street)
- Landmark and or listed building
- Building
- Green space



6. System Specification

The system runs on a Microsoft Windows based PC Workstation which is a common, easy-to-use platform. The 'Building Block' Model was built by using a CAD software - 'Microstation V8.1'. The 'Building Detail' Model of 18 selected buildings and 3D animations were produced by using 'Tri-max', an extension pack of Microstation V8.1'.

All 2D and 3D image outputs from the model can be saved as a 'jpeg' file that can be viewed in all PC computers. All 3D animation outputs from the model can be saved as an 'avi' file that can be played on all PCs via 'Real Player' or 'Microsoft Media Player'.

7. Model Maintenance

The maintenance of the model covers two major areas namely system maintenance and model-updating:

- System maintenance includes routine backup, archival and other housekeeping tasks which can be carried out by the Forward Planning Team.
- The model-updating task is more complicated. Various levels of technical skills are required to perform the operation. Both large scale covering large areas and small scale updating can be done in-house by the Forward Planning Team's Urban Design Officers.

8. Way Forward

To ensure that the data in the model is up-to-date and ready to use, regular updating is required to be carried out.

To increase the application and usefulness of the model, the model may be extended to cover the whole of Stafford Borough Area including rural area.

Developments in computer technology are expected to grow continuously and at a fast pace. Therefore, opportunities to increase the application and usefulness of the model should continually be explored.

9. Background Document

The Stafford Town Centre Vision, Urban Design Framework 2002, Planning & Regeneration Department, Forward Planning Team, Urban Design Section,, Stafford Borough Council.

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