1 Introduction to CBA6

The *User Guide* provides system users with an authoritative understanding and instruction for using TMR's CBA6. An important part of the *User Guide* has been the inclusion of the case studies. The case studies have been carefully designed with the intention of assisting system users to undertake economic evaluations of road projects of different types within the CBA6 modules. The *User Guide* also provides an interpretation of the results generated by CBA6 and has an array of screenshots to demonstrate the application of the tool.

1.1 About CBA6

CBA6 is TMR's designated road project evaluation tool. CBA6 has the technical capability to undertake economic evaluations of TMR projects. CBA6 has been developed and tested by a diverse multi-disciplinary project team consisting of software developers, engineers and economists.

CBA6 was developed by TMR to make the CBA process as accessible and transparent as possible, and to provide an efficient means of processing a large volume of calculations that even small, simple projects entail. CBA6 is not always an all-encompassing tool for every road project; some projects may require the use of CBA6 in conjunction with spreadsheets or other software tools. Guidance is provided for more complex applications of CBA6.

The system user will have to exercise judgement when designing an evaluation. CBA6 is a tool used to assist in the evaluation process. It is necessary to define the problem, cost the potential solutions and gather traffic estimates, before using CBA6.

Input data for CBA6 needs to be acquired from sources such as ARMIS or SIDRA. The system user may be required to manually calculate some of the input data, such as traffic composition and traffic growth. CBA6 processes most of the benefit calculations that were such an onerous part of manual procedures set out in the previous manual. CBA6 has been designed to allow the system user to systematically conduct CBA.

1.1.1 Software description

CBA6 is a PC-based tool which automates the process of performing CBA for road infrastructure projects. It's a Windows application that runs stand-alone and has been developed by TMR using MS Visual Basic 6.0 and MSDE database environment.

1.1.2 History of CBA6

The *Cost-Benefit Analysis Manual for Road Projects* was first produced in 1993. At that time, QTMR CBA procedures relied almost exclusively on manual calculation. The introduction of computer software in 1994 largely eliminated the need for manual calculation and streamlined the CBA process.

The CBA manual produced in 1999 incorporated the use of software with the introduction of CBA4. This edition of the manual incorporates case studies based on the use of the current version of TMR's project evaluation tool CBA6.

Since the previous CBA manual was produced, there have been several significant developments in the field of road project evaluation. These developments include the release of the (2006) ATC material and the (2005) *Austroads Guide to Project Evaluation*. Substantial efforts have been made to harmonise CBA6 with other state-based project evaluation software models. Since 2005, TMR has focussed considerable efforts in harmonising the results generated in CBA6 with HDM-4. CBA6 has been updated to include the necessary calculations and features consistent with ATC guidelines.

1.1.3 Scope of CBA6

CBA6 has been developed with the capability to undertake economic evaluations for a wide range of road projects. The tool also has the capability to be used to undertake evaluations, or alternatively, partial evaluations of road links in urban environments, for example the Pacific Motorway in south-east Queensland. In these cases, system users will need to exercise caution, as the tool may not be suitable to operate in urban environments.

Some of the more complex rural project types that CBA6 is equipped to undertake, but is not limited to, include diversions, bypass projects and incremental projects. CBA6 is not equipped to undertake evaluations for rail projects or upgrades of other modal infrastructure. For these types of evaluations, system users will be required to obtain specialist advice from either the CBA Team or relevant experts.

1.2 Relationship with other software

This section aims to provide system users with some appreciation of other software tools that can be used in association with CBA6, and tools that prioritise road investment decisions on the basis of economic criteria. This section is not intended to provide system users with a detailed guide/explanation of these models, but to inform them of the available software models, and provide some information on their relevance with reference to the operation and use of CBA6 and road project evaluation.

1.2.1 ARMIS

ARMIS is essentially a system for collecting and storing road-related data, auditing its quality and currency, and presenting that data into information formats which assist decision making by TMR. ARMIS provides strategic and operational management information for the planning, design, construction, maintenance and management of the state's road network, and is fundamental to TMR in supporting the *Queensland Transport and Roads Investment Program*. The information supplied through ARMIS is a key input for road project evaluations using CBA6. ARMIS also incorporates a suite of presentation and analysis tools which are supported by a 'data warehouse' of roads information, the Roads Information Data Centre (RIDC). ARMIS data is summarised in the RIDC and integrated with a broad range of internal and external data sources. Presentation tools provided for accessing RIDC include ChartView, MapView, Roads Information Online (RIO), ARMIS GIS and any other Open Database Connectivity (ODBC) compliant tool, such as Microsoft® Excel or Access. ChartView is a useful tool when obtaining data and information to undertake a road project evaluation using CBA6.

1.2.2 DVR

TMR annually collects digital video data for the sealed road network from a network survey vehicle. Four directions are captured - forward, rear and both sides. Digital Video Road Viewer (DVR Viewer) is a viewer program that plays digital road videos so that they can be viewed on a PC screen. A system user can choose to simultaneously play any or all of the directional views and easily arrange their layout by dragging and dropping.

DVR Viewer also includes tools for taking measurements of features in the video image, adding text annotations, and attaching images to video frames.

The use of digital videos avoids cumbersome manual methods using video tapes, and opens the way to integration of the viewer with other applications. Currently, integrated applications include:

• SCENARIO

• ChartView

The different road video views can be analysed to collect information on road features for inventory purposes, and on the condition of the roads including defects such as cracks and pot-holes. DVR is a useful tool when obtaining data and information to undertake a road project evaluation using CBA6.

1.2.3 SCENARIO

SCENARIO is a decision support tool used by asset managers in developing maintenance strategies for road networks. It is a rule-based system, where system users have the freedom to develop their own rules or to adopt corporate rules. A corporate pavement condition deterioration model is also supplied, however system users have the freedom to create their own local model. SCENARIO's pavement management system analysis is complemented with reporting capabilities and budget constraint analysis. SCENARIO is predominantly used by RAM and gives the system user a detailed profile of maintenance expenditure of a predefined time. This is vital to include in the project analysis, especially for the accurate specification of the base case. SCENARIO calculates three economic criteria: NPV, BCR and IBCR.

1.2.4   HDM-4

HDM-4 is an internationally developed software tool which allows system users to evaluate alternative and competing maintenance strategies. The tool has been used by the World Bank primarily to conduct economic appraisals of maintenance strategies for rural roads in Indonesia and parts of South East Asia. The software model has been licensed and adapted for use in Australian conditions by ARRB. The inputs used in HDM-4 are quite complex and generally require the system user to possess an engineering background together with a detailed knowledge of pavement/asset management. HDM-4 software produces economic decision criteria, NPV and an IRR for each maintenance strategy. HDM-4 contains one module with the capability to undertake an economic appraisal of rural road projects.

For more information on the above software models, please contact Road Asset Management Branch, TMR.

1.2.5   SIDRA INTERSECTION evaluation and design

SIDRA INTERSECTION is an advanced micro-analytical traffic evaluation tool that employs lane-by-lane and vehicle drive cycle models. SIDRA INTERSECTION is a renowned software package used worldwide for intersection capacity, level of service and performance analysis by traffic design, operations and planning professionals.

Using SIDRA INTERSECTION, the system user can evaluate and compare capacity, level of service and performance of alternative treatments involving signalised intersections, roundabouts, two-way stop and give way (yield) sign control, all-way stop sign control, single point urban interchanges, signalised midblock crossings for pedestrians, and all-in-one package. Intersections with up to eight legs, each as a two-way road, one-way approach or one-way exit, can be modelled with ease. SIDRA INTERSECTION is available from Akcelik & Associates Pty Ltd.

http://www.sidrasolutions.com/akcelik_company.htm

1.2.6   NIMPAC software tools

All road project evaluation software models in use in Australia are based on NIMPAC or its immediate predecessors and are equipped to calculate road user and travel time costs. NIMPAC is known as the NAASRA Improved Model for Project Assessment and Costing. Austroads was previously known as NAASRA. All NIMPAC-based software models have been harmonised with each other and with the international software HDM-4. Each of the NIMPAC-based models generates estimates of road user costs at an individual component level .

1.3 Installing CBA6

This section covers aspects of CBA6 installation from a system user's viewpoint. It explains how to acquire CBA6, who will install it, requirements by CBA6 on where it's installed and how, TMR Terms of Use, and for external system users the License Agreement. The chapter also describes what is installed and where, demo install, re-install and some housekeeping.

Software request and installation of CBA6 is very simple. After submitting a CBA6 software request form, the CBA Team will register a license in the Tracker system and provide an intranet link to the system user via email. The link enables a download of the CBA6 install package to anywhere on the TMR computer network. Local IT staff will download and install the software package onto a system user's PC.

1.3.1 How to request CBA6 installation

To provide ongoing updates to pricing models and maintain a consistent version of the tool, the CBA Team needs to maintain a contact register of current system users. The register will assist in planning ongoing training and communication in CBA-related topics. This is one of several reasons why system users need to fax or email their details in a software request form. The form is available from the CBA intranet site http://RAMS/CBA. The request form includes an acceptance of CBA6 Terms of Use, which outlines the terms under which the tool may be used at TMR for road evaluations.

External parties (e.g. contractors) who provide CBA for TMR may also request use of the tool. They can send a request through the region, who will contact the CBA Team by email and submit the request form. External parties are also subject to the Terms of Use plus a License Agreement as a condition for use. As a general rule, external parties and consultants need to be pre-qualified in economic studies.

The process for obtaining pre-qualification is detailed in *Manual - Consultants for Engineering Projects* available through Contracts and Standards Branch, TMR. Policy information is available on TMR's intranet site.

System users who just want to try out the tool, can request local IT support to download and install the demo install from the CBA intranet website. The demo install is fully functional, but limited to 30 days before it expires.

1.3.2 License and registration

When the 30-day period of a demo install expires, CBA6 will ask for license and registration code. A demo install can then continue if such details are obtained and entered, but this is not the usual approach for the majority of system users.

Instead, a CBA6 install requested as described in 1.3.3, will not require the system user to register or enter any license details. The license code registration is built in and automatic, and each system user is registered when a request form is submitted.

Registration credentials are checked automatically each time a system user logs into CBA6, since each license has an expiry date, typically one year. After expiry, the system user needs to contact the CBA Team and request renewal, which is easily done by email to CBATeam@tmr.qld.gov.au.

1.3.3 Installation requirements

In summary, CBA6 will install on any standard TMR PC without any additional requirements.

CBA6 needs to be installed on a Windows PC with the TMR Standard Operating Environment (SOE) i.e. a PC supplied and maintained by TMR. This is currently a Windows XP sp3 environment with MS Office 2003. There are no other specific requirements, however CBA6 runs a local database, and it's advisable to have at least 1 Gb RAM (Random Access Memory).

CBA6 has only been tested on Windows XP. It has not been tested, and is not supported, on Windows PC operating systems that are later than Windows XP.

The PC may be a laptop, and the install as well as the using of CBA6 can be without continuous access to the TMR computer network.

Downloading the install package requires access to TMR's intranet network i.e. using a location of http://rams/cba brings up a TMR web page. If there is no such access, an installation CD needs to be supplied by the CBA Team.

CBA6 has not been tested to run on a PC that has a database management system later than MSDE 8.00 SP3. For instance a PC with other software, that uses the later version of Microsoft SQL Express, may install and work but is not supported. This can sometimes be the case with non-departmental PCs.

Finally, as also noted in the instructions displayed during the install, the Windows configuration setting found at Control Panel—Administrative Tools—Services—Server needs to be enabled and started during the installation, after which it may be restored to the previous setting.

1.3.4   Install process

Only software available for installation via the Novell Windows can be installed by system users themselves. CBA6, for technical reasons, has to be installed by IT support with administrative rights on the PC.

For re-installs, the system user must first ensure that any existing CBA6 evaluations are first exported, as the re-install will delete existing databases.

1.3.5   Installation for TMR staff

The following steps will be used in the install for TMR staff.

1   The system user visits the CBA intranet website, downloads the CBA software request form and reads the CBA Terms of Use document.

2   The system user fills in the request form and sends a fax (ref. intranet website or departmental phone book) or scan/ email to the CBATeam@tmr.qld.gov.au.

3   The CBA Team registers a license for the system user using the RAMS Tracker registration interface and distributes the install package. The install will appear as a compressed file on the TMR intranet, accessible through a network link which is emailed to the system user.

4   The system user, or local IT support, downloads and decompresses the package file from TMR's intranet using the supplied download link.

5   Local IT support will use the information contained in the CBAInstallationReadMe.htm file, found in the downloaded compressed file, to install CBA6.

6   Additional support is available during the installation from the CBA Team.

1.3.6   Installation for non-TMR staff

CBA6 is sometimes made available to non-TMR staff such as contractors.

Non-TMR staff and consultants need to be pre-qualified in economic studies, to ensure consistency of use and approach in the selection of data, subjective definitions and non-automated steps of a CBA when using CBA6.

The process for obtaining pre-qualification is detailed in *Manual - Consultants for Engineering Projects* available through TMR's Contracts and Standards Branch.

The following steps should be used to install CBA6 for non-TMR staff:

1   The system user emails CBATeam@tmr.qld.gov.au requesting a CBA6 request form, Terms of Use document and License Agreement. The request form is then returned by fax or scan/email, to the same email address.

2   The CBA Team registers a license for the system user for the requested period using the RAMS Tracker registration interface, distributes the install package and writes the package to a CD. The CD is then sent to the system user.

3   The local IT support for the system user, or a person with administrative PC rights, will use the information contained in the CBAInstallationReadMe.htm file (found in the downloaded compressed file), to install CBA6.

Non-TMR staff will need to accept and adhere to both the Terms of Use and a License Agreement which specify conditions and limitations covering TMR's provision of access to CBA6. The process for this and the acceptance of these agreements are detailed in the CBA request form.

(the CBAInstallationReadMe.htm file, as viewed by MS Internet Explorer)

1.3.7   What will be installed?

The installation process will install and register several Windows components that will be located at C:\Program Files\ CBA in directories under this location.

The main files will be the CBA program, some additional linked modules, export template file, crystal report template, a CBA Windows help file and two databases represented by two pairs of files: CBAProj_cases.mdf, CBAProj_cases.ldf, DMR.mdf and DMR.ldf.

The DMR files contain the TMR pricing data, road types and other common parameters for calculations such as deterioration values, accident costs, etc.

The CBAProj_cases files constitute the database for the system user's evaluation data.

1.3.8   Demo installation

The Demo CBA6 is a full version of CBA6 available from TMR's intranet site http://rams/cba under downloads. It will expire 30 days after installation and is to be used for evaluating CBA6. Once downloaded, the installation is identical to the licensed version. The installation steps are the same, starting at point 4 for TMR (1.3.5).

1.4   Housekeeping and updates

Approximately every second year, the CBA Team will distribute an update of the DMR to registered system users. This will keep pricing and variables such as fuel costs, oil, tyres etc. up to date.

The system user will update simply by replacing the existing two DMR files at C:\Program Files\CBA\Databases with those contained in the compressed distributed file.

The system user needs to do frequent backups of evaluation data, typically after major work has been entered. Departmental PCs have a network file location, the H: drive, where system users normally store data that should be secured through system backups. Using the H: drive will ensure that the data is covered by the system backup process, and can be restored in case of catastrophic failure of software or hardware.

The exported files of evaluations can be compressed and emailed when interacting with the CBA Team.

During the re-install, the existing user data will be lost and the system user will need to import their saved exported evaluations. Details about updates and new releases will be communicated through the CBA6 intranet website and newsletter.

1.5 Help and support

The CBA Intranet website http://RAMS/CBA is kept up to date with the latest information on CBA6, and maintains a regular newsletter.

The CBA Team is a dedicated support team for CBA work on TMR projects and the installation of CBA6, as well as ongoing support and advice regarding CBA issues. The team can be contacted by email on CBATeam@tmr.qld.gov.au.