Queensland Government
State Development and Innovation

NORTH-SOUTH BYPASS TUNNEL PROJECT

TERMS OF REFERENCE

FOR AN

ENVIRONMENTAL IMPACT STATEMENT

Project and Process Information

Project Proponent

The proponent for the North-South Bypass Tunnel (NSBT) is the Brisbane City Council. Brisbane City Council is Australia's largest local authority with a population of approximately 930,000 residents.

Project Summary

The North-South Bypass Tunnel Project (the Project) is part of an overall strategy to improve the efficiency of Brisbane's road network, consistent with long-established and accepted regional and city-wide transport planning objectives. The Project had its genesis as one part of the implementation of the *Transport Plan for Brisbane 2002 – 2016* which is public policy of the Brisbane City Council and is an outcome of the integrated transport planning process. More recently, the North-South Bypass Tunnel is encompassed by the *TransApex* transportation strategy.

The North-South Bypass Tunnel is intended to connect the South-east Arterial Road (Pacific Motorway) and Ipswich Road (at Woolloongabba) to the south with the Inner City Bypass and Lutwyche Road to the north. The proposed route will generally follow the alignment of Ipswich Road/Main Street, cross under the Brisbane River adjacent to the Storey Bridge, and then proceed through Fortitude Valley to emerge at Bowen Hills north-east of the RNA Showgrounds. It is intended that the NSBT connect with the Inner City Bypass and other local roads, such as Lutwyche Road. There would also be connections in the vicinity of Shafston Avenue to provide for traffic to and from the eastern suburbs. The study corridor for the EIS is shown in Figure 1.

There are four phases to the NSBT project, namely:

- Phase 1 – Pre-feasibility Studies including a financial investigation and an engineering investigation;
- Phase 2 – Feasibility Studies including an EIS, concept design studies, reference design and business case studies;
- Phase 3 – Documentation and tendering; and
- Phase 4 – Implementation and operation of the tunnel project.

The EIS is prepared as part of the Phase 2 Feasibility Studies being undertaken by the Brisbane City Council into the North-South Bypass Tunnel project.

The proponent has prepared an Initial Advice Statement (IAS) that provides further detail relating to the Project. The IAS provides a general indication of the possible NSBT corridor. Attached to these TOR is a diagram indicating the EIS study corridor, being that area to be investigated specifically during the preparation of the EIS and its component parts. Other areas of the City may also be investigated should the need arise.

Administrative Details for these Terms of Reference

The North-South Bypass Tunnel Project was declared a 'significant project for which an EIS is required' by the Queensland Coordinator-General (Cg) pursuant to Section 26 of the Queensland *State Development and Public Works Organisation Act 1971* (SDPWO Act). These TOR are to assist Brisbane City Council to develop a comprehensive EIS for the Project.

The Department of State Development & Innovation (DSDI) is coordinating the assessment of the EIS for this Project on behalf of the Cg.

When the proponent has prepared the EIS, it will be made available for public review and comment. Further details on this process are provided in Section 3.

The proponent may be requested to provide a response to the comments received on the EIS and make any consequential changes to the project to address the comments, and will prepare a Supplementary EIS for this purpose. At the conclusion of this process, the Cg will prepare a report evaluating the EIS.

With respect to any development application required under the *Integrated Planning Act 1997* (IPA) for the Project, the EIS process under Part 4, Division 4 of the SDPWO Act:

- replaces the information and referral stage and the notification stage under the Integrated Development Assessment System (IDAS) of the IPA;
- means that the Cg's Report is taken to be the concurrence agency's response under IDAS (i.e. there are no concurrence agencies); and
- provides that submissions received in relation to the EIS are taken to be 'properly made submissions' under the IPA.

The Cg's Report may state for the assessment manager one or more of the following:

- the conditions that must attach to any development approval;
- that the development approval must be for part only of the development; and
- that the approval must be a preliminary approval only.

Alternatively the Report must state for the assessment manager:

- that there are no conditions or requirements for the Project; or
- that the application for the development approval must be refused.

Where another Act (for example *Environmental Protection Act 1994*) requires the preparation of an EIS, or similar statement to address the environmental effects for the Project, this EIS can be taken as a statement satisfying those requirements. Where approval is required under another Act, the Cg's report may recommend to the person who will consider an approval required for the Project that:

- approval for the project be refused; or
- stated conditions be imposed on the approval.

Alternatively, the Cg's Report may recommend that there are no conditions to be attached to any approval given under another Act.

Where the Terms of Reference are addressed for a particular stage of the process under section 32 of the Act, the Proponent should identify the particular stage and the terms of reference addressed for that stage.

It is possible that aspects of the proposed works may trigger the requirements of the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act).* Brisbane City Council has indicated it may refer the project to the Commonwealth Department of Environment and Heritage for Ministerial determination as to whether the project is a "controlled action" under the EPBC Act, and therefore if environmental impact assessment pursuant to that Act is required.

The DSDI contact for coordination of the EIS process will be:

Project Manager– EIS North-South Bypass Tunnel
Project Delivery and Infrastructure Planning
Department of State Development and Innovation
PO Box 168
BRISBANE ALBERT STREET QLD 4002
Tel: (07) 3222 2841 Fax: (07) 3225 8282

CONTENTS

PART A – INFORMATION AND ADVICE ON THE PREPARATION OF THE ENVIRONMENTAL IMPACT STATEMENT (EIS)

1 INTRODUCTION

This Terms of Reference (TOR) for an EIS for the North-South Bypass Tunnel Project has been prepared in accordance with the requirements of the *State Development and Public Works Organisation Act 1971.*

The purpose of the TOR is to identify those matters that should be addressed in the EIS.

The nature and level of investigations should be relative to the anticipated benefits and likely extent and severity of impacts. These investigations are also to address, as relevant, potential impacts on matters protected under the *Environment Protection and Biodiversity Conservation Act* 1999 (EPBC Act). Commonwealth and State Governments, from which the Project Proponent requires approvals, may request additional information on any matter not adequately dealt with in the report. The Proponent is required to contact relevant government agencies and peak bodies representing particular areas of interest in the wider community to clarify the required nature and level of investigations.

Reference to any culturally sensitive confidential information should be indicative only and disclosure of any such information must be negotiated with traditional custodians. Other confidential information supplied by or to the Proponent must be clearly identified and placed in discrete attachments to the main report, together with a statement of confidentiality.

An executive summary should be provided in the EIS and be available separately for public information.

2 EIS OBJECTIVES

The objectives of the EIS are:

- to identify potential environmental, social and economic impacts and to ensure that adverse impacts are avoided or mitigated where possible; and
- to identify potential community benefits, including environmental, social and economic benefits.

Where unavoidable, the likely impacts (direct, indirect and cumulative) must be examined fully and remedial measures proposed, so that the development of the Project, including the selection of the final project specification, is based on sound economic, social and environmental protection and management criteria. Consistent with this objective, the EIS should be a stand-alone and comprehensive document containing sufficient information to make an informed decision on the potential impacts. The document should provide:

- for interested bodies and persons, a basis for understanding the project, alternatives and preferred solutions, the existing environment that it would affect, both on and off the site, the impacts that may occur and the measures to be taken to mitigate all adverse impacts;
- for groups or persons with rights or interests in land, identification of the impacts of the proposed Project on that land including access and measures to mitigate all adverse impacts; and
- for the Cg, a framework against which to:

- consider the economic, social and environmental aspects of the project in view of legislative and policy provisions and decide whether the project can proceed or not;
- set conditions for approval, as appropriate, to ensure economic, social and environmentally sound development; and
- where required by legislation, recommend an environmental management and monitoring program.

It is the responsibility of the Proponent to identify and address, as fully as possible, the matters relevant to the Project in complying with the statutory requirements for EIS preparation.

3 EIS PREPARATION GUIDELINES

The key principle is that there should be sufficient detail presented in the EIS to enable readers to identify and understand the benefits and to balance those against the impacts of the Project on the natural, social, economic and built environment (including existing infrastructure). Readers are likely to include representatives of Commonwealth, State and Local Governments, special interest groups and the general public. The EIS should contain sufficient information to avoid the need to search out previous or additional reports.

The EIS should state the criteria adopted in assessing the Project and its impacts, such as compliance with relevant legislation, policies, standards, community acceptance and maximisation of economic, social and environmental benefits and minimisation of risks.

The level of analysis and detail in the EIS should reflect the level of significance of the expected impacts on the environment.

The EIS should identify the anticipated life of the Project, where reasonable, taking into account the current planning phase of the project. The EIS should identify reasonable economic and technically achievable measures to be developed to ensure that the adverse impacts of the Project are limited to acceptable levels.

The EIS should include analysis of any cumulative impacts on economic, social and environmental values directly caused by the Project. The cumulative impacts of the Project must be considered over time and in conjunction with other major projects, approved and known to be proceeding at the time of commencement of operations of the Project.

The EIS should state the following about information given in the EIS:

- the source of the information;
- how recent the information is;
- how the reliability of the information was tested; and
- any uncertainties in the information.

All uncertainties in the assessment and assumptions made should be clearly stated. Where possible, information provided in the EIS should be clear, logical, objective and concise, so that non-technical persons may easily understand it. Where appropriate, text should be supported by maps and diagrams. Factual information contained in the document should be referenced wherever possible. Where applicable, aerial photography and/or digital information should be presented.

The terms “describe”, “detail” and “discuss” should be taken to include both quantitative and qualitative matters as practicable and meaningful. Similarly, adverse and beneficial effects should be presented in quantitative and/or qualitative terms as appropriate. Within this TOR the term “Project” includes all activities and ancillary works undertaken on lands related to the tunnel.

Should the proponent require any information in the EIS to remain confidential, this should be clearly indicated, and separate information should be prepared on these matters.

A listing of all Advisory Agencies for the EIS process should be provided in the EIS.

Copies of the prepared EIS should be lodged with DSDI for distribution for comment and review during the public review period. In addition, an electronic version of the EIS is to be provided to DSDI to be made available through the Department's web site or through a link to a web site maintained by the Proponent or its consultants. Copies of the EIS should also be prepared for distribution to relevant libraries and other key Government offices. Documents are to be made available in both CD ROM and hard copy format, at a cost not exceeding the cost of reproduction.

While every attempt has been made to ensure that these TOR address all of the major issues associated with this Project, they are not necessarily exhaustive and should not be interpreted as excluding from consideration matters deemed to be significant but not incorporated in them or matters (currently unforseen) that emerge as important or significant during the completion of scientific studies, from public consultation, or otherwise, during the course of preparation of the EIS.

4 ADVISORY AGENCY CONSULTATION

To facilitate the assessment process, Brisbane City Council should consult with Advisory Agencies and other appropriate stakeholders when required during the conduct of the EIS. The purpose of this consultation will be in part to identify legislation, policies and methodologies relevant to the assessment of the proposed tunnel project.

Advisory Agencies should include but are not limited to:

Department of Aboriginal and Torres Strait Islander Policy (DATSIP)

Department of Communities (DoC) and Disability Services Queensland (DSQ)

Department of Emergency Services (DES)

Department of Employment and Training (DET)

Department of Housing (DoH)

Department of Industrial Relations (DIR)

Department of Local Government, Planning, Sport and Recreation (DLGPSR)

Department of Main Roads (DMR)

Department of Natural Resources and Mines (DNRM)

Department of the Premier and Cabinet (DPC)

Department of Primary Industries and Fisheries (DPIF)

Environmental Protection Agency (EPA)

Department of Public Works (DPW)

Queensland Health (QH)

Queensland Police Service (QPS)

Queensland Rail (QR)

Queensland Transport (QT)

Queensland Treasury (Treasury)

Department of Environment & Heritage (Commonwealth) (DEH)

5 GENERAL STYLE AND FORMAT

The EIS should be written so that any conclusions reached can be independently assessed. This means that all sources must be appropriately referenced. The EIS should be written in a format matching the TOR or include guidelines (preferably as an appendix) describing how the EIS responds to the TOR. The EIS is to include a draft Environmental Management Plan (EMP).

The EIS should also include appendices containing:

- a copy of the TOR;
- a consultation report that lists the persons and agencies consulted during the EIS;
- the detailed specialist studies that support the main EIS document.

Maps, diagrams and other illustrative material should be included in the EIS.

6 TOR GLOSSARY

The following abbreviations have been used in this document:

Cg – the Coordinator-General;

DES – the Department of Emergency Services

DMR – the Department of Main Roads

DNRM – the Department of Natural Resources and Mines;

DSDI – the Department of State Development and Innovation;

DPIF – the Department of Primary Industries and Fisheries;

EIS – Environmental Impact Statement;

EMP – Environmental Management Plan;

EPA – Environmental Protection Agency;

EPBC Act - *Environment Protection and Biodiversity Conservation Act 1999*;

QT – Queensland Transport;

Project – the North-South Bypass Tunnel Project

SDPWO Act – *State Development and Public Works Organisation Act 1971*; and

PART B – SPECIFIC REQUIREMENTS – CONTENTS OF THE EIS

EXECUTIVE SUMMARY

The Executive Summary should be written as a stand-alone document, able to be reproduced on request for interested parties who may not wish to read the EIS as a whole. The structure of the executive summary should follow that of the EIS, though focused strongly on the key issues allowing the reader to obtain a clear understanding of the Project, its environmental and socio-economic implications and management objectives. The summary should include, utilising visual aids where appropriate:

- the title of the Project;
- name and contact details of the Proponent and its commitment to effective environmental management;
- a concise statement of the aims and objectives of the Project;
- the legal framework, decision-making authorities and involved agencies;
- a discussion of the background to, and need for, the Project, including the consequences of not proceeding with the Project;
- a discussion of the alternative options considered and reasons for the selection of the proposed development option;
- a brief description of the Project (pre-construction, construction and operational activities) and the existing environment; and
- an outline of the principal economic, social and environmental impacts predicted and proposed management strategies and commitments to minimise the significance of adverse impacts.

GLOSSARY OF TERMS

A glossary of technical terms, acronyms and references should be provided.

1 INTRODUCTION

The introduction should clearly explain the function of the EIS, why it has been prepared and what it sets out to achieve. It should also define the audience to whom it is directed and contain an overview of the structure of the document.

1.1 The Proponent

This section describes the Proponent in terms that are relevant to the proposed project. The section should outline the experience of the Proponent, including the nature and extent of business activities and the Proponent's environmental record and environmental policy.

1.2 Purpose of the EIS

Summarise the role and purpose of the EIS including compliance with regulatory requirements, reference to the TOR and any complementary or subsequent documentation (i.e. technical background papers).

The audience should be able to distinguish the EIS as the key environmental document providing information to decision makers considering approvals for the Project.

1.3 The Environmental Impact Statement Process

Describe the EIS process undertaken for the project with respect to any linkages between Commonwealth and State approvals required for the project.

Provide an explanation of the legislative process under which the EIS is being produced, including timing and decisions to be made for relevant stages of the project.

The explanation should include a description of the approval process as a significant project pursuant to the SDPWO Act, and any other State approvals required as part of the project.

The linkages between relevant State and Commonwealth legislation should also be identified if relevant.

1.4 The Public Consultation Process

The EIS should report on the consultation program which has been conducted with community members and other stakeholders throughout the study period. The full details of consultation should be provided in an Appendix. Objectives for consultation should include:

- To ensure community members, businesses, facilities and organisations in the study corridor and other stakeholders have access to information to allow their informed consideration of the Project's potential issues, benefits and impacts;
- To ensure the consultation process enables participation by people and organisations who have a direct interest in the study's outcomes;
- To provide ongoing and transparent two-way communication between the study team and community members and stakeholders, throughout the study process;
- To ensure community members' values, local knowledge and other input are considered in the assessment and design processes; and
- To contribute to the development of a project that addresses community concerns and values, and maximises opportunities for local and regional community benefit.

Proactive consultation should be undertaken with stakeholders within the study corridor and other stakeholders with a direct interest in the project's impacts and benefits.

The EIS should particularly report on consultation with direct stakeholders such as road users, motoring organizations, ratepayers and others with an identifiable financial interest in the project outcomes.

The EIS should report the extent to which the public consultation program satisfied the requirements under the SDPWO Act and the Brisbane City Council Public Consultation Policy, Standards and Guidelines.

This section should outline the methodology that was adopted to identify and mitigate socio-economic impacts that may arise from the project.

A list of affected persons and interested stakeholders as well as information on consultation with these persons is to be provided.

It is recommended that a Table of Consultation Findings be provided in the EIS, either as an appendix to, or included in, the EIS. The table should identify all the groups, agencies, and people who have been consulted, the issues they raised and the strategies put into place to resolve these concerns and or enhance particular positive impacts.

2 BACKGROUND AND PROJECT RATIONALE

This section is to provide the justification for the project, with particular reference made to conclusions on economic and social benefits, including employment and spin-off business development. This section should also describe feasible alternatives, if any, including conceptual, technological and locality alternatives to the Project and include discussion of the consequences of not proceeding with the project.

2.1 Background

The background leading to the project proposal should be provided. It should include general information about the Project in the local, regional and strategic context.

2.2 Need for the Project

State the objectives that have led to the development of the Project. Outline the events leading up to the Project's formulation and the alternatives considered.

The EIS should summarise the specific objectives and justification for the Project. Issues to be considered include:

- the strategic, economic and environmental needs for the Project;
- the need for the project based on studies including existing and projected traffic volumes;
- broad coherence with regard to the Integrated Regional Transport Plan for South East Queensland, SEQ2021, Regional Framework for Growth Management (RFGM) and other relevant strategic policy and planning documents; and
- the short-term and long-term strategic implications of the Project in terms of the local and regional road network and the demands on infrastructure arising from new proposals.

The EIS is to provide a description of the various options that were assessed in the development of the North-South Bypass Tunnel Project. Options should be discussed in sufficient detail to enable an understanding of the criteria for selecting the preferred option in terms of technical, commercial, social and natural environment aspects. The consequences of taking no action should also be discussed.

Relevant illustrations, maps and drawings that show the location and context of the assessed options should be provided.

3 PROJECT DESCRIPTION

The objective of this section is to describe the Project through its lifetime. This information is required to allow assessment of all aspects of the life of the Project including all phases of the Project from planning, construction, decommissioning of the construction site and long-term operation.

A detailed description of the North-South Bypass Tunnel Project is to be provided including:

3.1 Construction Arrangements (including decommissioning of the construction site)

- a preliminary predictive program of activities relating to design, delivery and construction. The description should also state the anticipated construction period for the Project, including the proposed construction hours of operation;
- options for potential construction lay-down areas, off-site/on-site prefabrication areas including casting facilities, vehicle/construction equipment storage/workshops, and parking facilities for the construction workforce;
- description of construction access and traffic arrangements for construction-related activities;
- spoil management arrangements (including re-use options), transport arrangements and routes for transport of spoil to possible disposal locations as well as any rehabilitation required at spoil disposal locations;
- the likely types of vehicles to be used;
- likely scenarios for origin and destination of inputs/supply source and likely transport routes;
- an assessment of the likely impacts on the adjacent road network;
- hazardous or dangerous material that may be transported to or from the site both during construction and operation.

3.2 Finished Project

Upon completion of the project, identification of:

- details of the design criteria applied for tunnels, roads and bridges;
- the preferred corridor within which the tunnel and roadway will be located, with the aid of maps and diagrams, describing indicative:
  - entry and exit roadways, intersections and interchanges;
  - indicative sections on typical embankments and bridged sections;
  - location of electronic tolling infrastructure;
  - ventilation and drainage works and outlets;
  - works within and outside of existing road reserves;
  - measures required for emergency access, retrieval of stalled or crashed vehicles, management of smoke or toxic emissions in the event of spillage etc.; and
  - design parameters including, horizontal and vertical alignment, representative road and tunnel cross-sections, predicted traffic volumes / capacity and anticipated design life.

- measures for access for maintenance equipment in the vicinity of a waterway or wetland, recreation and sport facilities, and parkland. Describe the criteria for any permanent access points;
- typical road reserve widths and access requirements along the alignment including the use of existing areas of disturbance for machinery access and future maintenance;
- options for corridor acquisition; and
- proposed tenure.

3.3 Other Infrastructure Requirements - Utility Services

3.3.1 Description of Existing Environment

Describe the existing utility services that may be affected by the project, including electricity, sewerage, water, gas and telecommunications infrastructure. Owners of the utilities should be identified, together with significant or critical users of the utilities (i.e. hospitals).

3.3.2 Potential Impacts and Mitigation Measures

This section is to assess the potential impacts of the project on existing utility services, including the identification of any critical users of the service. Strategies to minimise potential impacts on existing utility services, including required upgrading of infrastructure, should be provided, especially in regard to any users where it is critical to maintain constant service (i.e. health care facilities). Specifically, in regard to the construction phase, consultation with critical users prior to the movement/ disruption of any utility services and in the operational phase, consultation with users and service providers regarding potential increased load on utilities services is required.

3.4 Permits, Licences and Environmental Authorities

This section should identify any permits, licences and environmental authorities relevant to the project. The section should identify the legislation under which the permit, licence or environmental authority is required, together with the administering authority, the trigger mechanism for obtaining the permit, licence or environmental authority.

All relevant international conventions, Commonwealth and State legislation should be considered and the Brisbane City Council Environmental Legislation Register may be used for reference, though additional sources should also be investigated.

3.5 Rehabilitation of Construction Sites

This section should present the strategies and methods for progressive and final rehabilitation of the environment disturbed during construction. Final rehabilitation of the construction sites should be discussed in terms of ongoing land use suitability, management of any residual contaminated land and any other land management issues.

4.0 Traffic and Transport

This chapter provides an outline of the traffic and transport studies undertaken to demonstrate the need for the project and the provision of data for other aspects of the impact assessment.

4.1 Description of Existing Transport Network

The existing transport operations should be described, in terms of:

- The road network, broadly for the regional network and in more detail for the local road system;
- Road traffic composition and movement patterns
- Traffic flows – peak, daily, composition;
- Public transport services (bus, ferry and rail) – existing service details and facilities
- Cycle movements and facilities;
- Emergency services vehicle flows; and
- Pedestrian movements and facilities.

4.2 Transport Network Performance

The performance of the existing road network, should be described in terms of:

- Through traffic demands;
- Local access requirements, both for properties and local streets;
- Travel speeds and travel times;
- Road capacity (level of service, pax/hr, pax/vehicle)
- Intersection operation including operating level of service (delays and queuing);
- Interaction with public transport (including reference to public passenger transport demand, capacity, level of service and mode share;
- Tolling; and
- Road safety.

4.3 Description of Traffic Forecasting Methodology

A description of the studies undertaken for the project should be provided, with particular emphasis on:

- Land use patterns – a description of the population and demographic forecasts used;
- The scope and validity of the transport models used ;
- The provision of year forecasts (for air and noise studies) – 2004, 2011, 2016, 2021;
- An analysis of trends in household travel behaviour (by comparison of 1992 and 2004 household travel surveys) and assessment of the sustainability as reflected by those trends.
- Network improvements – which upgrades have been included and at what time (e.g. Gateway Bridge and arterial duplication and changes to land use resulting from urban renewal opportunities);
- An explanation of how alternative future scenarios, including tolling effects, were considered; and
- An explanation of how induced and suppressed traffic demand has been incorporated.
- Sensitivity of the model outputs to changes in key parameters and assumptions.

4.4 Future Base Traffic Conditions

Future conditions on the road network should be outlined for at least three years (2011, 2016, and 2021), without the tunnel in place, in terms of:

- Traffic patterns – volumes, speeds;
- Network performance – intersection operation (e.g. degree of saturation, delays and queues);
- Public passenger transport operation (including levels of service, and utilisation of bus and rail passenger transport capacity).
- Road safety assessment.

4.5 Effects of the Proposal

The effects of the proposed works on the transport network (and particularly on conditions in and near the CBD and Fortitude Valley) should be demonstrated for future model years, as follows:

- Traffic volumes – changes in 2011, 2016 and 2021 with the tunnel;
- Traffic flow on major and minor roads;
- Regional route traffic implications;
- Effects of the project in the immediate area and extending along the main feeder and exit routes up to three kilometres from the tunnel;
- Intersection and road capacity performance (Levels of Service);
- Car movements (e.g. travel times, vehicle kilometres travelled, trip diversions);
- Commercial vehicle movements (e.g. travel times, vehicle kilometres travelled (VKT) and trip diversions);
- Aggregate road network performance – VKT, Vehicle Hours Travelled (VHT), average vehicle speeds;
- Impacts on access to properties and existing roads;
- Impacts on pedestrians and effects on bicycle operations;
- Accidents;
- Bus services (e.g. travel times and new bus priorities);
- Emergency service vehicle movements; and
- Implications of tolling on untolled route alternatives.

Traffic changes on the local road network to provide for potential local improvements (urban renewal opportunities, community benefits, public transport benefits) should be identified and their implications provided. Any changes to the local traffic network are to consider the range of users, including emergency vehicles accessing hospitals within the catchment.

4.6 Construction Impacts

The transport implications (impacts and mitigation) of construction activities should be described, in terms of:

- Construction site traffic generation and access;
- Local impacts on traffic flows from temporary and permanent traffic changes;
- Impacts on bus operations on roads likely to be affected by construction activities;
- Construction impacts on pedestrians and cyclists;
- Construction workforce parking and impacts on existing parking at hospitals and health care facilities;

- Effects of construction equipment and air emissions on helicopter movements at hospitals; and
- Effects of construction traffic (deliveries and haulage of spoil) on the road network or rail/waterway systems if appropriate.

4.7 Pedestrian and Cycle Issues

4.7.1 Description of Environment

Describe the existing and planned infrastructure, including usage levels, for pedestrian and cycle movements and facilities within the environs of the Project.

4.7.2 Potential Impacts and Mitigation Measures

This section should discuss the potential impacts of the Project on existing and planned infrastructure for pedestrian and cycle movements and facilities affected by the proposal. Options for pedestrian and cycle use of the existing river crossing along and across the corridor should be investigated and reported.

These options are to recognise the specific needs of people with a disability such as the need for wheelchair accessible ramps with the appropriate Australian Standard gradient.

5.0 ENVIRONMENTAL VALUES AND MANAGEMENT OF IMPACTS

Detailed descriptions of the existing environment should be provided followed by an assessment of the potential impacts on this environment during the construction and operational phases. The formulation of high-level environmental protection measures to mitigate adverse impacts is also required. Baseline information from other relevant studies should be used and referenced where appropriate.

5.1 Land Use and Planning

5.1.1 Description of Existing Environment

This section should describe the existing land uses, both within and impacting on the study area, and the planning framework of the proposed works. The following issues should be addressed:

- identify current land use within and adjacent to the area of proposed project;
- identify in broad terms the regional patterns of development throughout the whole of the catchment area;
- identify various tenures of the study area;
- identify current planning designations within and adjacent to the area of proposed works as per the Brisbane City Plan;
- determine compatibility of the Project with the desired intent of City Plan as per the relevant planning scheme provisions and emerging urban renewal opportunities;

- determine compatibility with the SEQ Regional Framework for Growth Management 2000 and other regional planning documents including the Integrated Regional Transport Plan for South East Queensland, Transport 2007;
- consider requirements of the project under relevant State Planning Polices (SPP).

5.1.2 Potential Impacts and Mitigation Measures

This section should discuss the potential impacts of the Project on existing land use including compliance of the project with relevant planning policies and provisions.

The EIS should address any impact on existing residential/ commercial development in the vicinity of the North-South Bypass Tunnel Project that will arise from the project's construction and operation. This assessment should include any possible land acquisitions, property access, feeder street closures or widening, and construction of noise barriers adjacent to residential areas.

5.2 Waste Management

Waste production and management during construction should be described, including development of an indicative waste inventory. This would include an outline of proposed waste management strategies, having regard to the Environmental Protection (Waste) Policy, the principles of waste avoidance, reuse, recycling, treatment and disposal. Where solid (include spoil) or liquid wastes are to be disposed of off-site the following details should be provided:

- Typical facilities (locations) to which waste would be sent for disposal;
- Target rates for recycling;
- Indication of how the transport of the wastes from the site to the disposal facility will be undertaken;
- The likely times and days of the week that wastes, including hazardous or dangerous materials, would be transported from the site to the disposal facility;
- Review on-site storage and treatment requirements for wastes, including waste receptors as per ANZECC guidelines;
- Assess the impacts waste may have on the environment.

An assessment should be undertaken of extracted material in terms of its suitability for use as construction material and its contribution to the extractive material supply in Brisbane compared with disposal to land fill.

5.3 Topography/Geomorphology/Geology/Soils

5.3.1 Description of Existing Environment

This section should include descriptions, including mapping, of the topographical, geomorphologic and geological features of the study corridor including:

- the topography of the site with contours shown at suitable increments, shown with respect to Australian Height Datum (AHD);
- landforms of the study corridor and surrounding areas, including an analysis of subsurface and slope stability where appropriate (landform patterns and elements should

be described using the standardised classification of the Australian Soil and Land Survey Field Handbook, McDonald et al, 1990);

- significant geological and landform features;
- the presence of potentially economically significant mineral, energy and extractive material resources;
- the geology of the wider Project area, with particular reference to the physical and chemical properties of surface and sub-surface materials and geological structures likely to be intercepted during construction; and
- hazards such as geological faults and unstable areas.

Soil profiles in areas likely to be affected by surface works should be described, with reference to McDonald et al 1990 and Australian Soil Classification Isbell 1996.

The potential risk for intercepting acid sulphate soils and groundwater draw-down during construction should be investigated. The Department of Natural Resources and Mines should be contacted to determine the need and parameters for an ASS investigation arising from the Project, or alternative approaches to addressing the risk of intercepting potential acid sulfate soils.

An overview of data on contaminated lands should also be conducted. This should identify sites likely to contain contaminated soil that requires off-site disposal.

5.3.2 Potential Impacts and Mitigation Measures

Detailed descriptions of the potential impacts and mitigation measures on soils, including erosion risk, rehabilitation potential, acid sulfate soils and contaminated land, are required.

Erosion risk

The report should include an assessment of likely erosion effects, especially those resulting from the removal of vegetation, both on-site and off-site for all disturbed areas.

Strategies to prevent or control erosion should be specified and should be developed with regard to preventing soil loss in order to prevent significant degradation of local waterways by suspended solids.

Settlement risk

The report should present an assessment of the risk and consequence of settlement on adjacent land, either through tunnel collapse or slope failure of cuts on the approach roads. It should also contain a discussion on the impacts of dewatering or vibration on unconsolidated sediments for the foundations of buildings and services (pipes).

Rehabilitation potential

Strategies for the establishment and rehabilitation of worksites are to be provided. This should include descriptions of topsoil stripping, stockpiling and replacement. The minimisation of topsoil storage times (to reduce fertility degradation) should also be addressed.

Acid sulfate soils

If an investigation into potential acid sulfate soils is required as an outcome of discussions with the Department of Natural Resource, Mines and Energy, the EIS should outline strategies to manage acid sulfate soils based on assessment in accordance with the State Planning Policy 2/02 - Planning and Managing Development involving Acid Sulfate Soils, EPA's 2001 Instructions for the Treatment and Management of Acid Sulfate Soils and the DNRM's 2002 Queensland Acid Sulfate Soils Technical Manual - Soil Management Guidelines.

Contaminated land

The EIS should outline strategies to address the potential impacts associated with disturbance to any existing contaminated land and possible contamination of land from construction or operation of the project.

Strategies to prevent land contamination (within the meaning of the *Environmental Protection Act*) should be provided. Proposals for preventing, recording, containing and the remediation of any contaminated land likely to be intercepted by construction works should be outlined.

Investigation must be undertaken to identify all sites on the Environmental Management Register within the proposed project area. Sites above bedrock should be clearly identified.

The EIS should indicate how the project would comply with existing Site Management Plans (SMP) for sites located within proposed portal footprints (i.e. surface works areas).

Emergency procedures must be prepared for activities that have the potential to cause further soil contamination and should include but not limited to emergency response actions to be taken in the event of fuel leaks from storage or during refuelling procedures; or underground / above ground spills of contaminated soil.

5.4 Groundwater Quality

5.4.1 Description of Existing Environment

The EIS should review the significance of groundwater in the Project area, together with groundwater use in neighbouring areas. The depth to groundwater should be identified. All groundwater facilities within the influence of the project should be recorded.

The groundwater assessment should take into account the findings of the acid sulfate soils assessments as per Section 5.3.

The environmental values of the groundwater should be described in terms of:

- values identified in the Environmental Protection (Water) Policy;
- sustainability, including both quality and quantity; and
- physical integrity, fluvial processes and morphology of groundwater resources.

5.4.2 Potential Impacts and Mitigation Measures

The EIS should include an assessment of the potential for environmental harm to be caused by the project to any affected groundwater resources.

The impact assessment should consider the impacts of the Project on groundwater resources, define the extent of the area within which groundwater resources are likely to be affected, and the significance of the project to groundwater depletion or recharge. The assessment should take into account the potential impact of the project on any affected groundwater regime caused by the altered porosity and permeability of any land disturbance. The assessment should also identify any groundwater dependent ecosystems. Management options available to monitor and mitigate these effects should be provided.

An investigation of the potential for draw down on known and potentially contaminated groundwater and, if relevant, the identification of measures to manage significant contaminant migration to adjacent previously uncontaminated sites should be carried out.

5.5 Surface Water Quality

5.5.1 Description of Existing Environment

A description should be given of the watercourses affected by the Project with an outline of the significance of these waters to the catchment system in which they occur.

An assessment is required of existing water quality in surface waters and wetlands likely to be affected by the Project. The assessment should provide the basis for a long-term monitoring program, with sampling stations located upstream and downstream of the Project.

The water quality should be described from available information, including seasonal variations or variations with flow, where applicable and data are available. A relevant range of physical, chemical and biological parameters should be considered to gauge the potential for environmental harm on any affected watercourse or wetland system.

The environmental values of the waterways of the affected area should be described in terms of:

- values identified in the Environmental Protection (Water) Policy;
- sustainability, including ongoing maintenance of quality; and
- comparability with any Water Resource Plans, South East Queensland Regional Water Quality Management Strategy (SEQRWQMS), Land and Water Management Plans including the Brisbane River management Plan and other local authority stream management initiatives relevant to the catchment, to the extent any of the above are relevant.

Where relevant, the water quality objectives associated with environmental values for local catchments and watercourses should be described so that impacts from any proposed releases resulting from construction or operation of the North-South Bypass Tunnel can be determined.

5.5.2 Potential Impacts and Mitigation Measures

This section is to define the potential impacts of the project on the water environment, to outline strategies for protecting water resource environmental values, how nominated quantitative standards and indicators may be achieved, and how the achievement of the objectives may be monitored, audited and managed.

The EIS should describe the potential for environmental harm to be caused by the proposed works to environmental values for water as expressed in the Environmental Protection (Water) Policy.

Water management to address surface water quality, quantity, drainage patterns and sediment movements should be outlined. Key water management strategy objectives include:

- measures to avoid or minimise any proposed release, including but not limited to source reduction and water recycling;
- maintenance of sufficient quantity and quality of surface waters to protect existing beneficial downstream uses of those waters (including maintenance of in-stream biota and downstream wetlands including the Moreton Bay RAMSAR wetland);
- protection of important local groundwater aquifers; and
- measures proposed to avoid or minimise afflux resulting from changes to drainage patterns.

The EIS should identify possible sources of releases from the proposed construction worksites and the tunnel works. Possible releases should be characterised in terms of their location and the likely contaminants. The EIS should describe options for managing such releases and mitigating any adverse impacts that might result. Options for mitigation and the effectiveness of mitigation measures should be discussed with particular reference to sediment, acidity, salinity and other emissions of a hazardous or toxic nature to human health, flora or fauna.

Reference should be made to the Environmental Protection (Water) Policy, *Water Act 2000* and the Australian and New Zealand Environment and Conservation Council (ANZECC) 2000 guidelines.

5.6 Air Quality

5.6.1 Description of Existing Environment - Construction

The aim of the construction air quality assessment is to identify the main air quality issues associated with the proposed tunnel excavation and construction project, identify nearby sensitive places and ascertain the potential for nuisance and amenity impacts associated with air emissions, including dust, odours and particulates from the proposed works. The need for appropriate construction air quality management measures will also be identified as part of the works. The scope includes:

- Legislative and regulatory requirements for construction air emissions and establish relevant construction air quality goals (Environmental Protection (Air) Policy);
- Consistency with the South East Queensland Regional Air Quality Strategy (SEQRAQS); and
- Description of the existing environment including:
  - identification of nearby sensitive places;
  - description of existing sources of dust, odours and particulate emissions influencing air quality within the study area; and
  - review of prevailing meteorology and analysis of prevailing wind directions and threshold wind speeds (for dust and particulate generation).

5.6.2 Description of Environment - Operational

Operational air quality impacts are likely to be associated with the emissions resulting from the need to ventilate the tunnel from ventilation outlets. For comparison purposes, an assessment of air quality in the without project scenario should be made.

To assess the air quality changes associated with dispersion from ventilation outlets and changes in road traffic volumes, the following tasks should be undertaken:

- Preparation of land use and terrain information of the area to enable adequate prediction of air concentrations at ground level;
- Review of existing air quality monitoring and meteorological data for the area;
- Preparation of a 3-dimensional wind field model for the area using appropriate technology (for example, the CALMET meteorological model in conjunction with the CSIRO model TAPM);
- Estimation of likely future vehicle emissions in the study area including those from surface roads and ventilation outlets;
- Computer dispersion modelling of emissions into the study area and assessment against relevant air quality criteria and existing ambient air quality; and

- Presentation of the findings of the modelling for the construction and operational phases of the project. This is to include maps of modelled emissions from tunnel ventilation outlets and their predicted concentrations in different weather conditions in surrounding areas.

Additionally, the above information should be detailed in a health risk assessment (HRA), and should also include (but not restricted to):

- Estimation of emission rates;
- Estimation of ambient concentrations using dispersion modelling, calibrated and based on existing monitoring data;
- Identification of populations and estimation of exposure levels.

5.6.3 Potential Impacts and Mitigation Measures - Construction

Environmental impacts of air emissions, including dust and odours, during construction (nuisance impacts) should be described, including:

- review of project details and likely construction activities (location of route, surface excavations, site compounds, stockpiles, proposed transport routes to spoil disposal sites etc);
- discussion of proximity of construction activities to nearest sensitive places;
- identification of air quality issues associated with the preferred location for site compounds and construction works etc, discussion of the potential for air (dust and odour) emissions from these sources and the likely risk for nuisance impacts.

This section should also review any proposed control methods for construction works (including during tunnelling) and recommend management measures which would minimise air emissions, including dust and odour impacts on adjacent receivers during these works.

5.6.4 Potential Impacts and Mitigation Measures - Operational

Impacts on air quality during the operation of the tunnel and adjacent roadways should be assessed in accordance with the EPA's Environmental Protection (Air) Policy, 1997.

Reference should also be made to Brisbane City Council's Air Quality Planning Scheme Policy and the Brisbane Air Quality Strategy (2004). The assessment should be undertaken by:

- Computer based dispersion modelling of individual roadway emissions using appropriate technology (e.g. a line source model such as Caline4 or equivalent). This should give potential kerb-side concentrations of pollution for the build and no-build case;
- Computer based dispersion modelling of emissions from the tunnel ventilation outlets. This should be based on traffic modelling results and take into account the length of the tunnel, grade and proposed speeds within the tunnel as well as the composition of the traffic predicted to use the tunnel. Emission estimates should be based on a composite of Australian vehicle fleet emissions as well as using factors derived from PIARC or equivalent sources to determine the effects of grade at speed; and
- Assessment of predicted air quality conditions within the tunnel and compliance with PIARC standards for in-tunnel air quality This assessment should include a discussion on comparable standards for in-tunnel air quality currently adopted in other countries.

The suitability and availability of air filtration technologies should be identified in terms of their effectiveness, benefits, operational costs and energy requirements, noise vibration and visual amenity. Trends in technology development should also be considered.

An assessment of the potential impacts of the air emissions from the ventilation outlets on public health should be provided.

In undertaking this assessment, the location(s), size and heights of ventilation outlets and potential visual impacts on the community (if known), and contingency measures in the case of a breakdown of the ventilation system, for example air pollution advisory warnings for tunnel users should be presented.

5.6.5 Impacts of Greenhouse Gas Emissions

The Greenhouse Gas emission impacts of the project, both during construction and operations are to be assessed. This assessment should include the calculation and presentation of changes in volume of greenhouse emissions resulting from the predicted changes in traffic volumes (as per section 4.5). Proposed actions to mitigate the volume of greenhouse gas emissions attributable to the project should be outlined.

5.7 Noise and Vibration

5.7.1 Description of Existing Environment

The existing noise environment should be assessed by:

- Reviewing available data from any ambient noise monitoring in the study corridor; and
- Conducting additional baseline noise monitoring at selected locations, primarily at sensitive locations in the vicinity of tunnel portals, associated roadways and ventilation infrastructure.

5.7.2 Potential Impacts and Mitigation Measures - Construction

To assess construction impacts the following should be undertaken:

- Identification and assessment of significant noise and vibration impacts which may arise from the construction of the project, including noise and vibration generated by tunnelling works and surface construction sites;
- Identification and assessment of significant noise impacts associated with potential spoil disposal haulage routes;
- Identification of mitigation measures to address construction noise and vibration impacts, including work plans and modification of equipment, construction techniques and timing of construction.

This assessment is to be inclusive of noise to health care facilities and vibration impacts to health care facilities' equipment.

5.7.3 Potential Impacts and Mitigation Measures - Operational

To assess operational impacts the following should be undertaken:

- Assess the direct noise impacts associated with the tunnel by preparing a 3-D noise contour model of air-borne noise transmission from critical areas such as portals, new surface roadways and ventilation outlets;
- Carry out calculations to assess operational phase vibration and regenerated noise impacts in critical shallow tunnel areas;

- Analyse and identify significant changes in traffic noise generation on the road network remote from the tunnel;
- Assess and document the noise predictions against relevant guidelines and legislation;
- Comparison of predicted noise levels with planning levels stated in the *Environmental Protection (Noise) Policy 1997*; and
- Develop likely operational noise and vibration management measures. These measures are to include measures to limit vibration impacts to health care facilities' equipment if required.

5.8 Flora and Fauna

5.8.1 Description of Existing Terrestrial Environment

To assess terrestrial flora and fauna the study should:

- Conduct terrestrial flora and fauna assessments in all areas that may be affected by tunnel operations including but not limited to disposal areas, haulage routes, machinery storage areas and areas affected by earthworks;
- conduct terrestrial flora and fauna assessments to identify the presence of species, communities, habitat that may be affected by the project;
- identify areas of habitat that may be affected by the tunnel project, especially from noise, dust or other particulates and light impacts;
- describe the existing distribution of terrestrial flora and fauna in terms of location, health and threats, including areas of community revegetation projects in the vicinity of the tunnel portals and interchange areas;
- identify the presence of terrestrial fauna and flora species listed under the EPBC Act that may potentially be impacted by the proposed activities; and
- undertake a review of information on terrestrial flora and fauna at potential spoil disposal sites to determine the presence of species of conservation interest, communities of concern or other matters relevant to the assessment of impacts on terrestrial flora and fauna.

5.8.2 Description of Existing Aquatic Environment

To assesses aquatic and intertidal flora and fauna:

- if the bridge is to be widened or a new bridge constructed, conduct a baseline marine plant (mangrove) survey at Enoggera Creek, in the vicinity of the Horace Street bridge ;
- identify protected aquatic environments and potential impacts on those habitats;
- identify the presence of aquatic flora and fauna listed under the EPBC Act that may potentially be impacted by the proposed activities;
- if either construction or spoil disposal activities are proposed to occur in a waterway, describe the existing marine plant community potentially impacted on by the proposed activities, particularly in the vicinity of the Horace Street bridge and identify the value of marine plants in Enoggera Creek with regard to Fish Habitat Areas and conservation significance; and
- flora and fauna investigations should also include riparian areas, in-stream habitat, and fauna habitat and wildlife corridors.

5.8.3 Potential Impacts and Mitigation Measures

This section is to define and describe the potential impacts of the Project on terrestrial and aquatic flora and fauna to provide mitigation measures to minimise or avoid such impacts.

The discussion should cover all likely direct and indirect environmental harm on flora and fauna. Strategies for protecting any rare and threatened vegetation communities or species should be described, including any obligations imposed by State or Commonwealth legislation or local government policy.

The potential for environmental harm to be caused to the ecological values of the area affected arising from the construction, decommissioning of the site and operation of the project including clearing, salvaging or removal of vegetation should be described, and the indirect effects on remaining vegetation should be discussed. Short-term and long-term effects should be considered with comment on whether the effects are reversible or irreversible.

The potential impact on flora and fauna from any alterations to the surface and ground water environment should be discussed with specific reference to potential impacts on riparian vegetation, wetlands and other sensitive vegetation communities.

The EIS should:

- assess the potential impact that may result from removal of marine plants, deposition of spoil, and storm water run-off;
- develop draft environmental management plans to minimise potential impacts on aquatic flora and fauna values;
- explore the option to restore intertidal habitats post construction, should these habitats be disturbed; and

5.9 Cultural Heritage

5.9.1 Description of Existing Environment

The EIS should describe the existing environmental values for indigenous and non-indigenous cultural heritage sites, places, and their values that may be affected by the Project activities. This assessment should be developed in accordance with the *Queensland Aboriginal Cultural Heritage Act 2003*, administered by the Department of Natural Resources and Mines, and the *Queensland Heritage Act 1992*, administered by the Environmental Protection Agency. Reference to the Brisbane City Council Cultural Heritage Manual and City Plan's Heritage Register Planning Scheme Policy is advised.

In regard to indigenous cultural heritage, a cultural heritage study must be prepared which will describe indigenous cultural heritage sites and places and their values. The study must be conducted by an appropriately qualified cultural heritage practitioner and should include the following:

- Negotiation with relevant indigenous community/communities for the area concerning:
  - places of significance to that community (including archaeological sites, natural sites, story sites etc); and
  - appropriate community involvement in field surveys.
- Consideration of any requirements by communities relating to confidentiality of site data;
- Any places listed in the Register of the National Estate and/ or Queensland Heritage Register, the Aboriginal and Torres Strait Islander Database (maintained by the EPA), any local government heritage register; and any existing literature relating to the affected areas that may be impacted by the proposed activities; and

- Systematic surveys of the proposed area of development to locate and record indigenous and non-indigenous cultural heritage places.

In determining the significance of any cultural heritage sites or places located, as a minimum, investigations and consultation should be undertaken in such a manner and detail to satisfy statutory responsibilities and duties of care, including those under the *Queensland Aboriginal Cultural Heritage Act 2003*, *Queensland Heritage Act 1992*, and the *Commonwealth Aboriginal and Torres Strait Islander Heritage Protection Act 1984*, and to protect areas and objects of cultural heritage significance.

5.9.2 Potential Impacts and Mitigation Measures

This section is to provide a description of any likely impacts on sites of indigenous and non-indigenous cultural heritage. The identification of indigenous cultural heritage impacts is to take place in consultation with relevant indigenous groups. Recommended means of mitigating any negative impacts on indigenous cultural heritage values and enhancing any positive impacts is also required. Recommended means of mitigating any negative impacts on non-indigenous cultural heritage values and enhancing any positive effects is also required.

The management of cultural heritage impacts should be detailed in a cultural heritage management plan, which should provide a process for the management of cultural heritage places and values within the project study area. The development of the plan should be negotiated with relevant stakeholder representatives and must be completed prior to the commencement of project works. The Plan must provide measures managing the project to: (a) avoid harm to Aboriginal cultural heritage; and (b) minimise harm to Aboriginal cultural heritage, to the extent that harm cannot be reasonably avoided. The preparation of the cultural heritage management plan may be undertaken in satisfaction of a condition of the project provided the EIS establishes an appropriate framework for consultation and issues to be addressed.

5.10 Social Environment

5.10.1 Description of Existing Environment

This section is to describe the existing social values that may be affected by the project. The amenity and use of the study corridor should be described.

The existing social environment should be described by:

- Developing a set of social indicators to describe current social conditions in the study corridor;
- Describing existing social conditions (health, housing, social infrastructure, community values, amenity, community safety and access); and
- Mapping social indicators and social infrastructure.

5.10.2 Potential Impacts and Mitigation Measures

This section is to define and describe the potential adverse impacts of the project on the social environment and propose mitigation measures to minimise or avoid such impacts and to enhance positive impacts.

To assess the effects of the proposal on the social environment, the assessment should:

- Analyse the existing social data and the results of consultation with the community to identify potential changes to demography, equity, quality of life and community values which may result from the project;
- Undertake quantitative and qualitative assessment to determine specific social impacts and benefits within the study corridor and describe wider impacts and benefits;
- Undertake specific consultation to clarify and quantify impacts and benefits, including community members, Council and other stakeholders;
- Review relevant aspects of other technical studies (noise, air, economics, visual) to identify particular and cumulative impacts on amenity, access, housing and other social factors;
- Predict potential social impacts and benefits, including property impacts, quality of life, amenity (air, noise, visual), access, changes to population diversity, changes to the social environment, employment, equity in local distribution of the community benefits and social impacts;
- Develop mitigation strategies to maximise community benefits and minimise negative impacts, including development of design, public transport and urban renewal strategies.

5.11 Economic Environment

This section is to evaluate the overall impact of the project on the economic environment. An evaluation framework should be established and described clearly. This framework should, as a minimum:

- Provide a clear definition of the objectives and scope of the project, including the extent of the study area for the purpose of economic assessment;
- Set and justify a timeframe for analysis that reflects the economic life of the principal asset;
- Identify and justify an appropriate project specific discount rate;
- Identify and examine all costs and benefits of the project. This should include user benefits (such as travel time savings, reduced vehicle operating costs and safety improvements) and benefits to the broader community through transport network effects (induced travel, modal shifts etc), socio-economic effects (employment, land use changes etc) and environmental effects.

All data used in the economic analysis should be as accurate, current and relevant as possible, with reference made to the source of the data and its credibility. Costs and benefits are to be quantified where possible.

All assumptions underpinning the analysis are to be outlined explicitly, and the sensitivity of the analysis to key parameters is to be established.

Care should be taken to ensure that benefits accounted for are the most appropriate and relevant to the objectives and scope of the project and that double counting does not occur. The analysis should adhere generally to the economic assessment requirements contained in the *Queensland Treasury Project Evaluation Guidelines (March 1997)*.

5.12 Hazard and Risk

5.12.1 Description of Existing Environment

A hazard and risk analysis (using an all hazards approach) should be outlined which:

- describes the environmental values likely to be affected by hazardous materials and incidents; and
- identifies hazardous elements or activities likely or which may possibly occur both during construction and operational phases of the project. These could include:
  - -Transportation of hazardous goods in the tunnel and on the adjoining road network;
  - - Vehicle accidents in the tunnel and on the surrounding road network;
  - - Inundation/ flooding of the tunnel (including site during construction) by water;
  - - Fire in the tunnel due to accidents;
  - - Spillage of hazardous or other goods (e.g. gas leak) in the tunnel or on the adjoining roadway;
  - – Tunnel collapse or subsidence; and
  - - Explosions within the tunnel and associated infrastructure.

The EIS should report on a risk assessment of the above hazards, in order to outline the levels of risk, if possible in terms of consequences and probability arising from potential hazards, events and situations.

The EIS should describe the design features of the project and emergency services arrangements to manage accidents/incidents in the tunnel and on the road network, including all fire and life safety provisions in the design and incident management procedures proposed. These features are to consider the specific needs of people with a disability who may experience access problems, in particular to any emergency evacuation exit points within the tunnel.

5.12.2 Potential Impacts and Mitigation Measures

This section is to outline strategies for hazard and risk management including access and egress for emergency vehicles, containment procedures for the spillage of goods and hazardous substances, the adequate provision of hydrant water systems and the specific details of the traffic management system to deal with emergencies. It would facilitate emergency planning if a personal accountability system was developed and implemented during each construction phase.

5.13 Urban Design and Visual

5.13.1 Description of existing environment

The project has both the potential to facilitate urban design improvements in the study corridor and across a wider area. The urban design analysis should consider the project as a whole, on its merits within a wider context and at a local level in terms of project surface works. To evaluate the urban design elements of the project this section of the EIS should:

- Assess the existing study area on the basis of context and issues, that is describing the wider and local characteristics such as the overall visual values of the study area and the visual elements of building and street form in key locations, as well as access and amenity considerations for residents, pedestrians, cyclists and public transport users;
- Develop urban design goals and objectives for the project as a whole and in terms of key locations;
- Develop urban design, landscape and visual assessment principles for the project as a whole and for key locations.

5.13.2 Potential impacts and mitigation measures

To assess the urban design and visual outcomes of the project, the study should:

- Develop urban design concepts for the key locations identified, reflecting predicted changes to land use, public amenity and public access. In presenting urban design concepts, consideration should be given to similar measures or programs, such as BCC's Living Villages project including Suburban Centre Improvements Projects (SCIP);
- Assess likely visual impacts of the proposed works on the landscape and viewer perceptions of changes to the landscape.

Mitigation measures for any perceived visual impacts should be provided. This should consider a range of treatments on visual elements, including surface landscaping, portal design, ramp design and siting and design of surface structures. In addition to urban design issues, the issue of lighting impacts, particularly associated with the construction phase should be identified and mitigated.

6 ENVIRONMENTAL MANAGEMENT PLAN

A Draft Environmental Management Plan (EMP) should be provided outlining the strategies to be adopted to address identified impacts (as per Section 5 of these TOR).

The purpose of the EMP is to set out the proponents' commitments to environmental management. That is, how environmental values will be protected and enhanced. The EMP is an integral part of the EIS, but should be capable of being read as a stand-alone document without reference to other parts of the EIS (therefore some sections may be duplicated). The EMP should include the following:

- an introduction to the project that includes a concise project description;
- the project's legislative requirements;
- the mitigation measures for inclusion in the detailed design of the project and for the development of the construction contract documentation;
- the mitigation strategies for the construction phase;
- the mitigation strategies for the operational / maintenance phase;
- desirably, mitigation measures should include performance criteria and outcomes. These are to be measurable criteria against which the implementation of the actions and the level of achievement of the performance objectives will be measured;
- monitoring, auditing and reporting strategies for the construction and operational aspects of the project;
- responsibilities assigned to a relevant person/organisation; and
- the procedure and reporting framework, including a complaints mechanism for the identification of non-conformances and the implementation of the subsequent corrective action is to be outlined.

When information is unavailable during the EIS preparation, this should be described with an indication of how and when the information will be acquired and incorporated into the final EMP.

7 CONCLUSION AND RECOMMENDATIONS

A balanced overview of the project's impact should be provided together with recommendations (based on the studies undertaken and the environmental management plan developed) aimed at ensuring the project contributes to ecologically sustainable development.

8 REFERENCES

References should be presented in a consistent and recognised format.

9 RECOMMENDED APPENDICES

9.1 Terms of Reference for this EIS

A copy of the Terms of Reference should be included in the EIS. Where it is intended to bind appendices in a separate volume from the main body of the EIS, the Terms of Reference at least should be bound with the main body of the EIS for ease of cross-referencing.

9.2 Consultation Report

The Consultation Report should summarise the results of the community consultation program, focussing on the issues raised and the means by which the issues were addressed. The discussion should include the methodology used in the community consultation program including criteria for identifying stakeholders and the communication methods used.

A list of all parties consulted should be included, in addition to a description of how 'interested' and/or 'affected persons' (EP Act) and 'affected parties' (EPBC Act, if relevant) were identified.

9.3 Study Team

The qualifications and experience of the study team and specialist sub-consultants and expert reviewers should be provided.

9.4 Specialist Studies

All reports generated on specialist studies undertaken as part of the EIS are to be included as appendices.