C7511 – Information Brochure

Prequalification of Consultants for Engineering Projects

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Government

Contents

1   Introduction

Engineering consultant organisations wishing to provide engineering services to the department for transport infrastructure projects must first be prequalified. The aim of the prequalification system is to classify consultants commensurate with their technical skills, available resources, and managerial capability to undertake commissions for those projects.

1.1   Scope

The department's Engineering Consultant Prequalification System applies to organisations (i.e. not to specific individuals) wishing to make competitive offers for engineering projects fitting the following 13 categories of prequalification:

1. Bridge Design

2. Cost Estimating

3. Data Analysis & Insights

4. Economic Studies

5. Financial / Commercial

6. Geotechnical Engineering

7. Highway Engineering

8. Hydraulic Design

9. Intelligent Transport Systems

10. Marine Engineering

11. Traffic Engineering

12. Transport & Land Use Modelling, and

13. Transport Planning.

There are three levels (Level 1, 2 and 3) for each of the above categories where Level 3 is the highest. These prequalification requirements also apply to consultants wishing to tender in response to public advertisement for the provision of services on engineering projects.

2   Definitions

Term	Definition / Abbreviation
consultant	A consultancy (organisation) either prequalified for engineering projects or with the capacity / capability to provide engineering services not covered by the department's Consultants for Engineering Projects prequalification system (non-prequalified). These consultancies will usually comprise an Engineer or engineering consultancy, local government engineering service unit undertaking services on engineering projects.
department	Queensland Department of Transport and Main Roads
Ethical Supplier Threshold	means the Ethical Supplier Threshold in paragraph 2.3 of the *Queensland Procurement Policy*.
manual	*Consultants for Engineering Projects Manual*.

Term	Definition / Abbreviation
non-prequalified consultant	A consultant (organisation) with the capacity and capability to provide engineering services not covered by the department's Consultants for Engineering Projects prequalification system.
PMD	Program Management and Delivery Section (within the department).
prequalified consultant	A consultant (organisation) approved under the department's Consultants for Engineering Projects prequalification system, to make competitive offers on the department's transport infrastructure projects and work packages that stipulate a prequalification category / level.
sub-consultant	A consultant (organisation) engaged by a primary consultant to provide a component(s) of an engineering service covered by the department's Consultants for Engineering Projects prequalification system.
system	The department's Consultants for Engineering Projects prequalification system.

3   Requirements for prequalification

Consultants wishing to make application for prequalification shall first demonstrate that they can meet the mandatory requirements of prequalification.

3.1   Appropriately completed application form

Applicants are required to complete all relevant parts of the application form (Form C7512) and supply objective evidence supporting the applicant's required prequalification requirements.

3.2   Requirements for prequalification of consultant organisation

Consultants shall be prequalified to the categories and levels commensurate with the capability and capacity of the consultant organisation together with the experience of the applicant's nominated personnel.

3.3   Quality system

Applications for Bridge Design:

- shall hold current third party certification to the relevant Australian Standard from a JAS-ANZ accredited organisation. Self-assessed systems are not acceptable. The scope of the certification must reference the services relevant to the categories of prequalification.

Applications for Geotechnical Engineering, Highway Engineering, Hydraulic Design, Marine Engineering (except Level 1 subcategories of ME1.b Numerical modelling and ME1.c Finite element modelling) and Traffic Engineering:

- shall hold current third party certification to the relevant Australian Standard from a JAS-ANZ accredited organisation. Self-assessed systems are not acceptable. The scope of the certification must reference the services relevant to the categories of prequalification,

    OR

- where an applicant can demonstrate that the organisation has no employees other than the individual providing the service, Controlled Self Assessment in conjunction with the department is acceptable. The department will require comprehensive documentation of the Consultant's quality system as part of the assessment process. Refer to Attachment P in the application document (Form C7512).

Applications for Cost Estimating

For CE Levels 1 and 2 – Controlled Self Assessment in conjunction with the department is acceptable. The department will require comprehensive documentation of the Consultant's quality system as part of the assessment process. Refer to Attachment P in the application document (Form C7512).

For CE Level 3 - shall hold current third party certification to the relevant Australian Standard from a JAS-ANZ accredited organisation. The scope of the certification must cover CE services.

Applications for Economic Studies, Financial / Commercial

- shall *preferably hold* third party certification to the relevant Australian Standard from a JAS-ANZ accredited organisation,

    OR

- where third part certification is not undertaken, Controlled Self-Assessment in conjunction with the department is acceptable. The department will require comprehensive documentation of the Consultant's quality system as part of the assessment process. Refer to Attachment P in the application document (Form C7512).

Applications for Intelligent Transport Systems

For ITS Level 1 and 2 – Controlled Self Assessment in conjunction with the department is acceptable. The department will require comprehensive documentation of the Consultant's quality system as part of the assessment process. Refer to Attachment P in the application document (Form C7512).

For ITS Level 3 - shall hold current third party certification to the relevant Australian Standard from a JAS-ANZ accredited organisation. The scope of the certification must cover ITS services.

Applications for Marine Engineering (Level 1 subcategories of ME1.b Numerical modelling and ME1.c Finite element modelling)

- shall *preferably hold* third party certification to the relevant Australian Standard from a JAS-ANZ accredited organisation,

    OR

- where third part certification is not undertaken, Controlled Self-Assessment in conjunction with the department is acceptable. The department will require comprehensive documentation of the Consultant's quality system as part of the assessment process. Refer to Attachment P in the application document (Form C7512).

Applications for Data Analysis & Insights (DAI) and Transport & Land Use Modelling (TLUM)

- shall *preferably hold* third party certification to the relevant Australian Standard from a JAS-ANZ accredited organisation,

    OR

- where third party certification is not undertaken, Controlled Self-Assessment in conjunction with the department is acceptable. The department will require comprehensive documentation of the Consultant's quality system as part of the assessment process. Refer to Attachment P in the application document (Form C7512).

Note: when a consultant applying for DAI or TLUM already holds third party certification for prequalification purposes, the DAI or TLUM service shall be covered by that certification.

Applications for Transport Planning

For TP Level 1 and 2 – Controlled Self Assessment in conjunction with the department is acceptable. The department will require comprehensive documentation of the Consultant's quality system as part of the assessment process. Refer to Attachment P in the application document (Form C7512).

For TP Level 3 - shall hold current third party certification to the relevant Australian Standard from a JAS-ANZ accredited organisation. The scope of the certification must cover TP services.

> Applications for multiple categories
>
> For applicants who hold third party certification, all categories applied for shall be covered by the certification.

Use of subconsultants

If the Consultant outsources any component of a contract service to a sub-consultant, the Consultant shall control the processes required in providing these outsourced services. Control of these outsourced services shall be identified within the Consultant's quality system.

3.4 Registered Professional Engineers

Under the provisions of the *Professional Engineers Act 2002* in Queensland, it is a legal requirement for individual engineers to register with the Board of Professional Engineers before they can practise as a professional engineer in Queensland. That is, persons who in their employment or business provide an engineering service must be a Registered Professional Engineer of Queensland (RPEQ). The exception is for persons who provide an engineering service to be under the direct supervision of a RPEQ registered engineer in the same field of engineering. The requirement applies regardless of whether the professional engineer provides professional engineering services to his or her employer or to external clients.

A condition of prequalification with the department is that engineering consultants comply with the statutory requirements of the *Professional Engineers Act 2002* in Queensland, and ensure at all times that persons employed as professional engineers are registered (as RPEQ), or work under the direct supervision of a professional engineer registered in the same field of engineering.

A further condition of prequalification is that a person's RPEQ registration is in the relevant field (discipline) of engineering for the engineering service being provided.

While the overall responsibility for engineering project design and documentation services rest with the consultant organisation carrying out the work, the department requires that individual design responsibility for each area of engineering under the *Professional Engineers Act 2002* is identified and recorded in accordance with the department's *Drafting and Design Presentation Standards Manual – Volume 1*, *Chapter 1*.

Applicants are required to demonstrate in their application how the above RPEQ requirements will be addressed.

If overseas personnel are nominated in an application, applicants are required to advise how the organisation would manage the above RPEQ requirements.

3.5 Australian Business Number, Australian Company Number

Applicants must have a registered Australian Business Number (ABN) and / or an Australian Company Number (ACN).

3.6 Insurances at Prequalification Stage

It is a condition of the department's Consultant Prequalification System that applicants hold Consultant Arranged Insurance consisting of:

- Professional Indemnity (for an amount not less than $1 million for any one claim and $2 million in the aggregate)

- Public Liability (for an amount not less than $20 million for each occurrence), and

- where applicable, Workers' Compensation insurances.

Additionally, all contracts for Consultant Services require the Consultant to have current Professional Indemnity (if Principal Arranged Insurance not applicable), Public Liability and Workers' Compensation insurances.

The level of insurance cover required for individual projects will be specified in the *Invitation for Offer* (Form C7585).

Insurance policies come in different forms and have a multiplicity of possible detailed requirements and conditions. Accordingly, it is essential that the adequacy of a Consultant's liability insurance be checked prior to:

- the granting of Prequalification Level(s), and

- the award of a contract for consultant services.

In all circumstances, the Consultant must provide evidence that its insurance policies for professional indemnity and public liability meet the department's requirements.

A Certificate of Currency will be acceptable evidence of the adequacy of the offeror's Professional Indemnity, Public Liability and where applicable Workers' Compensation insurance. For all contracts for Consultant Services, the consultant's insurance policies must meet the requirements in the *General Conditions of Contract* (Form C7545).

4   Prequalification

The consultant prequalification system is managed and maintained by the department's Prequalification and Contracts Team in PMD.

Where the required service does not align with any of the prequalification categories and levels, refer to *Chapter 5 Invitation Process – Non-Prequalified Consultants* in the *Consultants for Engineering Projects* manual.

4.1   Prequalification registers

The Consultants for Engineering Projects system permits two types of engineering consultant registration comprising:

- a state-wide register, and

- a district register

4.1.1   State-wide register

A state-wide register is the primary register of the department as it records all consultants who are prequalified to provide services on engineering projects for the department. The state-wide register will only be used where the district register does not meet the work categories and levels required for a particular commission.

4.1.2   District registers

District registers are compiled by individual regions from the state-wide register, to identify those consultancies which have been assessed as having the appropriate credentials to meet specific work requirements in that district.

These special district requirements (local needs) will normally be for any of the following reasons:

- **Local knowledge and interfaces** - knowledge and experience (for example, expansive black soils, wet tropics, etc), local delivery capability / availability of local personnel, and/or

- **Face-to-face project reviews** - communication capability.

This does not necessarily mean district registers will be restricted to locally based consultants.

4.1.3 Use of prequalification registers

The prequalification registers shall be used when seeking prequalified consultants for engineering projects. Only prequalified engineering consultants shall be engaged as the primary consultant on engineering projects and in design and construct-style infrastructure procurement such as Transport Infrastructure Contract Design and Construct (TIC-DC) and Early Contractor Involvement.

Sub-consultants providing services covered under the categories of this prequalification system must also be prequalified.

Districts must use a consultant's local resources wherever possible. Accordingly, the state-wide register is used where the district register does not adequately cover a specific project need.

4.2 Application for prequalification

Consultants and other organisations (for example, Local Government engineering design units wishing to make competitive offers for engineering projects) which meet the mandatory requirements are eligible to apply for prequalification. Proving their capabilities to the applied categories and levels with sufficient information for the assessments are entirely a responsibility of the applicants.

4.2.1 Initial application

New applications for prequalification may be made at any time. New applications must be made using the *Application Form* (Form C7512). The applicable attachments to the application form are listed below and are to be completed to demonstrate appropriate experience against the nominated category criteria:

- Attachment A Current Projects

- Attachment B Projects completed during Past 3 years' demonstrating relevant experience

- Attachments C – N Technical Experience of Personnel (by category), and

- Attachment P – QMS Controlled Self Assessment - an option for applicants for CE (levels 1, 2), DAI (all levels), ES (all levels), FC (all levels), ITS (levels 1, 2), ME1 (subcategories of ME1.b Numerical modelling and ME1.c Finite element modelling only), TLUM (all levels), TP (levels 1, 2).

Supporting evidence should include:

- Detailed planning / design layouts: site locality plans, drawing indices, longitudinal sections, cross sections (include pavement design), signage and line marking plans, and intersection plans.

- General arrangement drawings, to show the complexity and size of projects.

- For Bridge Design: design calculations, and drawings' Structural Notes. For Bridge Design Level 3: drawings of bridge types such as Super T girder bridges, and box girder bridges.

- Reports relating to the nominated projects.

CVs of nominated personnel are required, including all RPEQs and subconsultants. The department's template (Form C7513) is to be used, available on the following website:

Engineering Consultants webpage.

4.2.2 Renewal of prequalification status

Prequalified consultants are required to apply for renewal of their prequalification levels every three years, unless there is a condition of shorter period. All existing prequalified consultants will be advised via email when they are required to renew their prequalification.

Renewal applications require full and complete information in the following disciplines:

- Cost Estimating (CE)
- Economic Studies (ES)
- Financial / Commercial (FC)
- Intelligent Transport Systems (ITS)
- Traffic Engineering (TE)
- Transport & Land Use Modelling (TLUM), and
- Transport Planning (TP)

Only new information since last application with changes highlighted will be required in the following disciplines:

- Bridge Design (BD)
- Data Analysis & Insights (DAI)
- Geotechnical Engineering (GE)
- Highway Engineering (HE)
- Hydraulic Design (HD), and
- Marine Engineering (ME)

4.2.3 Upgrading of prequalification categories and levels

Prequalified consultants may apply to upgrade their prequalification level at least after six months from the last assessment period. If accepted to upgrade the level, the validity period will continue to remain same as per the last renewal application.

Prequalified Consultant may apply for any new categories at any time. However, if accepted, the validity period will continue to remain same as per the last renewal application.

Applications for upgrading of prequalification levels must contain the same information as required for new applications. Applications for upgrading will be assessed in the same way as new applications.

In particular, consultants seeking an upgrade of their prequalification should acquaint themselves with the characteristics of projects at the higher level being applied for (refer to Section 6 in this document) and be able to demonstrate that on previous projects they have aggregated the requisite experience to meet the assessment criteria corresponding to the level sought.

Consultants should note that it may not be sufficient to simply recruit more experienced key personnel in order to obtain an upgrade. The overall organisation also needs to be able to demonstrate the required company experience including any mandated software.

HD2 and HD3 upgrade applications MUST include hydraulic reports as evidence of capability, for the application to be considered.

Where an organisation recruits additional key personnel with experience at a higher level than the organisation's current prequalification level, the Prequalification Committee may (at its discretion) consider an upgrade and may grant conditional prequalification at a higher level. Any such conditional prequalification would be subject to review following satisfactory completion of the first contract by the organisation at the conditional prequalification level.

4.2.4   Changes to a consultant's organisation

A prequalified consultant is required to immediately advise the department in writing of any change, such as:

- in ABN or legal entity name

- in its management capability, technical skills or available resources, which is likely to affect eligibility for continued registration in any category or level of prequalification

- in their address or contact details

- in insurance or quality assurance details, and

- if any demerits or sanctions are being investigated under the Ethical Supplier Mandate.

Failure to advise of changes may result in a review of an organisation's prequalification status.

4.2.5   Newly formed organisations

Newly formed organisations may apply for prequalification. The assessment of these applications will focus primarily on the capability and experience of the nominated personnel. It is understood that newly formed organisations would have untested management and quality assurance systems.

Any prequalification entitlements considered by the Prequalification Committee will commence at Entry Level (Level One) and for a period of 12 months. This would enable the organisation to gain experience undertaking work as an operational business, and also demonstrate the effectiveness of the organisation's policies, procedures and systems. Another application would be required for an assessment after 12 months, to confirm the prequalification entitlement(s).

4.3   Assessment of applications

Applicants must meet the mandatory requirements before an assessment is made (refer Section 3 of this document). The overall assessment process is shown in Figure 4.3.

Figure 4.3 – Overall process for prequalification assessment and maintenance
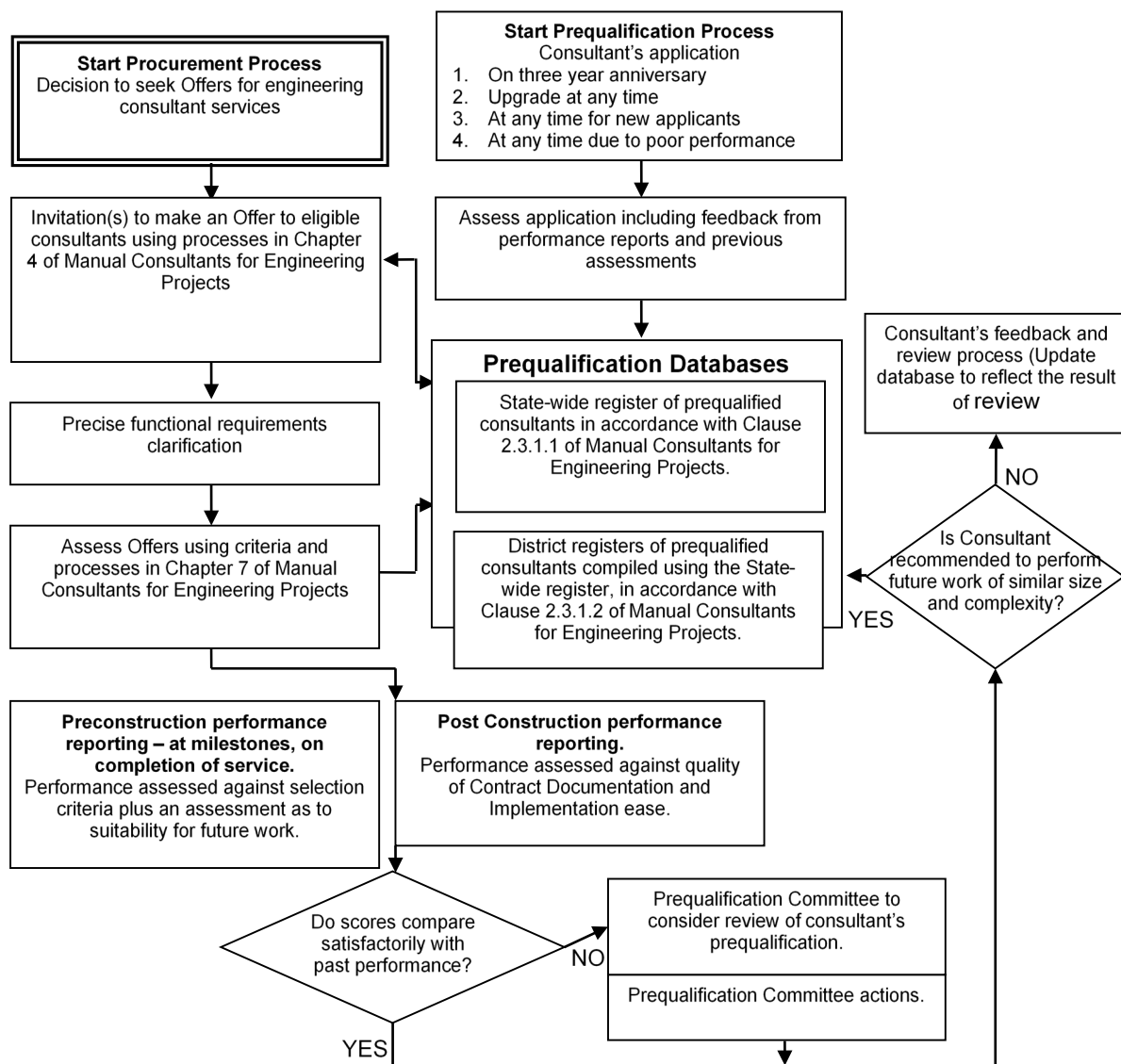
The Prequalification and Contracts Unit is responsible for the processing of applications and will:

a) arrange with the relevant head of discipline or delegate for assessment of the relevant categories and levels applied for

b) arrange for the updating of the prequalification register, and

c) notify the applicant of the assessment results and provide relevant feedback as necessary.

Factors which are considered in an assessment are:

• **Past performance**: on completion of a department contract, a confidential report on the consultant's performance is compiled by the project manager in collaboration with the consultant. These reports may be used by the category assessors and Prequalification Committee when assessing applications and for maintenance of the prequalification system.

• **Availability** of relevant software by the applicant.

• **Technical and management skills and resources**: key individual's skills matched to the prequalification levels, that is, category of work descriptions.

4.4 Notification of assessment results

Applicants will be notified by letter of their approved prequalification level which will nominally remain current for three years, unless there is a condition of shorter period. During this period, a consultant may have its prequalification rescinded or level changed if circumstances warrant (see Section 4.6 of this document). The department usually requires at least six weeks to consider an application.

4.5 Request for review of assessment

Applicants may request a review of an assessment within 20 business days of written notification of the outcome of an application. Requests should be addressed to the Secretary of the Prequalification Committee and emailed to consultantprequal@tmr.qld.gov.au.

There will be no changes to an advised assessment outcome whilst the review process is being conducted.

4.5.1 Appeals against outcome of assessment review

If an applicant is not satisfied with the outcome of an assessment review, an appeal may be made to the Executive Director (Program Management and Delivery) within 20 business days of the department's written notification of the outcome of that review.

An appeal should be addressed to:

> Executive Director (Program Management and Delivery)
> Department of Transport and Main Roads
> GPO Box 1549
> Brisbane Q 4001

and emailed to consultantprequal@tmr.qld.gov.au.

The decision of the Executive Director (Program Management and Delivery) shall be final and binding on the parties.

There will be no changes to an advised assessment outcome whilst the appeal process is being conducted.

4.6 Reviewing, rescinding or downgrading prequalification

The department reserves the right to review a consultant's prequalification at any time and if considered appropriate, rescind the prequalification or reduce the level of prequalification based on:

- unsatisfactory project performance

- unsatisfactory management of a nominated subconsultant

- change in personnel nominated in a Consultant's application without notification to the Principal

- failure to submit renewal application within a reasonable time (60 business days from invitation to renew notice)

- failure to respond satisfactorily to a performance report within a reasonable time (30 days)

- failure to continue to comply with mandatory prequalification requirements, and

- failure to maintain contract prequalification requirements during the term of a contract. Refer to Clause 2.17 in the General Conditions of Contract (*Form C7545*) for details and contract-specific actions.

Before such action is taken, the consultant will be given an opportunity to show cause why the prequalification registration should not be rescinded or reduced. The consultant will also be given details of the matters prompting the request to show cause.

4.7 Sub-consultants and joint ventures for planning and design projects

4.7.1 Sub-consultants

Sub-consultants at the prequalification stage

The nomination of sub-consultants for a category will be considered in the assessment process on a discretionary basis. The application must include evidence demonstrating a proven and established relationship between the applicant and the sub-consultant.

For the categories of Bridge Design, Geotechnical Engineering, Highway Engineering, Hydraulic Design, Intelligent Transport Systems, Marine Engineering and Traffic Engineering, evidence is required for RPEQ signoff by the nominated sub-consultant over a range of projects over a number of years.

Sub-consultants at the offer stage

A consultant may utilise the services of sub-consultants, provided that the sub-consultants are on the register and prequalified to the appropriate level.

Offer invitation documents shall stipulate the project's prequalification categories that may outsourced to a sub-consultant(s). The primary consultant is required to be prequalified in the remaining categories.

The offer must be submitted under the name of the invitee who will be held responsible for the performance of the contract and be the sole departmental contact for the duration of the contract. In this respect, only engineering consultancies may be primary consultants on engineering projects.

4.7.2 Joint Ventures

Joint ventures at the *offer* stage may be considered. Contact the Prequalification and Contracts Unit at consultantprequal@tmr.qld.gov.au for more information.

4.8 Consultant prequalification information – availability of information

The department will maintain, on its website, a list of the names and prequalification categories / levels, of currently prequalified consultants. No responsibility is accepted by the department for any consequences arising from the use of any such information.

5 Confidentiality

Confidential information provided with applications will not be disclosed to any other party except where necessary for the assessment of the application.

6 Prequalification categories

The 13 categories and levels in the department's Engineering Consultant Prequalification System are described in this section. Each level of category includes the lower level of that category except Level 1. Consultants are required to nominate the level for assessment when applying for prequalification.

To attain prequalification, an applicant must have professional personnel with demonstrated competencies in the categories and levels applied for.

Design verification and proof engineering services

Applicants should note that design verification and proof engineering services are not part of the department's Engineering Consultant Prequalification System. Prequalification at the stipulated project level is required as a prerequisite to carrying out these services.

6.1   Bridge Design (BD)

Consultancies applying for prequalification in bridge design are expected to have a strong track record of delivery in relevant subject areas.

This category only applies to road and rail bridges that are delivered by the department.

Temporary structures, formwork, falsework, jacking, driven / mined tunnels, jack box designs for tunnels and bridge structural assessments are NOT part of this prequalification category.

Company eligibility for level BD1 and BD2 is based on road bridge experience held by current RPEQ engineers in the company within the past three years for any of the following clients:

- the department, including demonstrated experience in the use of the department's *Design Criteria for Bridges and Other Structures*

- other state road authorities, demonstrating expertise with the relevant Australian Standards;

- Australian Local Authority, to an Australian Standard where it can be demonstrated the standard is equivalent to the department, and/or,

- another client, where the code specified was not the Australian Standard but the standard and technical standards are of similar complexity, e.g. British Standards.

Eligibility for level BD3 is dependent on successful demonstration of this expertise on the department's bridge design projects for the lower levels, or for other state road authorities using AS/NZS 5100 *Bridge Design*.

There are department delivered projects where the bridges and structures are:

- technically complex

- large projects

- have high monetary value

- have heightened safety requirements, and

- have high impacts on the community.

BD3 prequalification is recognised by the department as an assured means to successfully deliver the design of such projects with high risk profiles.

To obtain prequalification in all levels, the consultant would require sufficient staff to permit all bridges and other structures to be:

- Designed by an engineer who is an RPEQ or an engineer supervised by a suitably experienced RPEQ.

- All designs to be design checked by an engineer who is an RPEQ or supervised by a suitably experienced RPEQ.

The engineers and RPEQ supervisors who undertake the check shall be different to the engineers and RPEQ supervisors who undertake the design.

BD3 design checks would require the work to be completed in a separate office to that of the designer.

The prequalification levels for bridge design are described in Table 6.1.

Table 6.1 – Bridge Design (BD)

Level	Class of Work Description
BD1	- Simple bridges where geometry is substantially predetermined. - Noise barriers, light poles, minor sign supports that do not span over the carriageway, i.e. "off carriageway". - Variable message (VMS) and other sign gantries that do not span over the carriageway, i.e. "off carriageway", sign structures. - Advertising sign structures that do not span over the carriageway, i.e. "off carriageway". - Retaining walls and scour protection. - Drainage structures.
BD2	As for BD1 plus: - Significant urban bridges (excluding complex bridges), major rural bridges and rail overpasses where geometric, geotechnical, or hydraulic complications may occur. - Gantry structures that span over carriageways. - Advertising sign structures that span over the carriageway, i.e. "on carriageway".
BD3	As for BD2 plus: - Complex road and rail bridges and major urban bridges using non-standard structural members. - Major projects that have a lot of road and/or rail bridges. - Additional qualification procedures may be used for particular structures. - Cut and cover tunnels, major civil structures, retaining wall structures.

Refer to Section 8.1 for commentary on how applicants may address BD criteria.

6.2   Cost Estimating (CE)

Consultancies applying for prequalification in cost estimating are expected to have expertise and a strong track record of delivery in the following relevant subject areas relating to cost estimating:

- Delivery of full cost management services for a variety of transport infrastructure project types (for example preparation of elemental cost plans, estimating, life cycle costing (Net Present Value (NPV), cash flows, estimating peer reviews, report writing).

- Ability to undertake first principles cost estimating of transport infrastructure, in accordance with both Australian and Queensland Government requirements.

- Ability to undertake project risk analysis, both qualitative and quantitative assessments.

- Detailed understanding and application of available tools to undertake cost estimating for transport infrastructure projects, both at the project and program level.

Consultants making application to perform work for the department should be aware that experience obtained more than 3 years ago, works delivered to other agencies or in non-transport infrastructure activities will not necessarily demonstrate an ability to effectively undertake the department's cost estimating activities for transport infrastructure projects.

The consultant must have at least one experienced and qualified in-house cost estimator with a proven track record in preparing civil construction estimates and tenders. However, for CE2 and CE3 levels, the consultant should be able to demonstrate of the capability and reliability of the estimating team to handle various complex activities in addition requirement outlined in CE1. Desirable academic or professional qualifications include: Tertiary qualifications in project management, civil engineering, quantity surveying or equivalent civil engineering / surveying qualifications that are acceptable for corporate membership of Engineers Australia or the Australian Institute of Quantity Surveyors.

It is a requirement of the Professional Engineers Act that professional engineering services in Queensland and the design of buildings, plants, machinery or products for use in Queensland, are carried out by a RPEQ, or alternatively by a person who carries out the services under the direct supervision of a RPEQ who is ultimately responsible. As such, where an assessment or interpretation of engineering design, staging, or construction risk is required, that work must be approved by an appropriately qualified RPEQ engineer.

In this category the consultancy is assessed on its demonstrated ability to identify and evaluate cost estimating issues and develop estimates for projects.

The prequalification levels for cost estimating are described in Table 6.2.

Table 6.2 – Cost Estimating (CE)

Level	Class of Work Description
CE1	• Cost estimating for simple transport infrastructure projects related to roads and bridges in various phases of project development (strategic estimates, concept phase estimates, development phase estimates and implementation phase estimates). • Scope: Simple projects at HE1, BD1, GE1, HD1. • Estimating construction contractor's costs, Principal's costs, risk and contingency and escalation. • Application of applied cost estimating methods such as cost planning, global rate estimating, unit rate estimating, first principles estimating, probabilistic estimating. • Issues identification relating to cost estimating and tendering. • Benchmarking and cost comparison with market rates. • Construction strategies and staging. • Application of the department's Project Cost Estimating Manual (PCEM), Infrastructure Cost Estimating Policy, Infrastructure Asset Accounting Policy and Federal Government's Best Practice Cost Estimating Standard for Publicly Funded Road and Rail Construction Guide. • Use of tools required to prepare an estimate (e.g. Microsoft Excel, dedicated estimating software, such as Expert Estimation, Palisade @Risk and relevant resource databases). • Supporting documents (transport infrastructure projects completed within 3 years prior to the application) to demonstrate the capability of CE1 requirement outlined above.
CE2	As for CE1 plus: • Cost estimating for medium complexity projects. • Scope: medium complexity projects at HE2, BD2, GE2, HD2, and rail networks. • Supporting documents (transport infrastructure projects completed within 3 years prior to the application) to demonstrate the capability of CE2 requirement outlined above.

CE3	As for CE2 plus:
	• Cost estimating for complex projects.
	• Scope: complex projects at HE3, BD3, GE3, HD3, bored and immersed tunnels.
	• Supporting documents (transport infrastructure projects completed within 3 years prior to the application) to demonstrate the capability of CE3 requirement outlined above.

Refer to Section 8.2 for commentary on how applicants may address CE criteria.

6.3 Data Analysis & Insights (DAI)

The consultant must have at least one experienced analyst with capabilities in one or more of the following four disciplines:

- **Data Engineering**: Data Engineers architect big data infrastructure that supports strong data governance and can be used by Data Scientists and Analysts. The role can involve designing / developing / testing / maintaining highly scalable data architecture, writing complex queries to optimise the performance within the ecosystem, setting up and/or scheduling ETL (Extract, Transform and Load) tasks, or improving systems by integrating newer data management technologies.

- **Data Analysis**: Data Analysts clean, transform, and analyse quantitative and qualitative data to provide business insights and inform decision making. This often involves engaging with decision makers to understand the questions they are seeking to answer through the analysis. As such, this role often extends beyond purely analytical skills and often involves providing recommendations and conclusions as well as presentation and report writing skills.

- **Data Science**: Data Scientists create algorithms and models that assist with or automate decision making. This is often accomplished through the application of statistical methods, modelling, machine learning, artificial intelligence, programming and analytics. Engagement with other areas of the business to understand existing processes and available data will often also be required.

- **Data Visualisation**: A Data Visualisation specialist builds visualisations that enable intuitive self-service analytics and/or convey stories that provide context and clearly communicate findings and insights. This often involves engaging with end-users to understand the insights they are attempting to extract from data and then working with data analysts, scientists, or engineers to prepare visualisations that service these requirements. Some preparation and analysis of data may also be expected of the visualisation specialist themselves, depending on the size of the project team.

The prequalification levels for data analysis and insights are described in Table 6.3.

Table 6.3 – Data Analysis & Insights (DAI)

Level	Class of Work Description
DAI1	Data **engineering** tasks, such as:
	• Data blending and transformation via automated ETL pipelines that preserve clear data lineage.
	• Assisting in the development, testing, and maintenance of both new and existing data architectures for both cloud and on-premises solutions.
	• Creating and maintaining custom automated and manual ingestion pipelines.

Level	Class of Work Description
	• Contributing to technical documentation of systems including users guides where necessary. Data **analysis** tasks, such as: • Analysing various transport and land use datasets to generate insights to inform decision making. • Data cleansing and transformation via ETL pipelines that preserve clear data lineage. • Building and running data analysis pipelines. • Contributing to reports, presentations and technical notes. • Communicating analysis results, conclusions, and recommendations with technical stakeholders Data **science** tasks, such as: • Data cleansing and transformation via ETL pipelines that preserve clear data lineage. • Building and running models / algorithms • Generating insights and making predictions through machine learning techniques, algorithms and models. • Data visualisation. • Generating reports, presentations and technical notes. • Communicating model strengths, limitations, and scope of application with technical stakeholders. Data **visualisation** tasks, such as: • Developing data visualisations to communicate insights and inform decision making. • Developing self-service analytics for various audiences. • Data cleansing and transformation via ETL pipelines that preserve clear data lineage. • Iterative development of data visualisations with an end-user focus. • Contributing to technical notes and (where required) user guides. • Communicating and demonstrating visualisation tools to end-users and data custodians.
DAI2	As for DAI1 plus: Data **engineering** tasks, such as: • Project managing small teams of up to 3 people. • Engaging with data owners and analysts. • Leading the development, testing, and maintenance of both new and existing data architectures for both cloud and on-premises solutions. • Providing advice to analysts and data owners on fit-for-purposes data architectures. • Ensuring data architecture is secure yet accessible to both internal and external parties as required. • Generating technical documentation of systems including users guides where necessary.

Level	Class of Work Description
	Data **analysis** tasks, such as: • Project managing small teams of up to 3 people. • Analysing various transport and land use datasets to generate critical planning insights to inform decision making. • Generating reports, presentations and technical notes. • Engaging with data owners and decision makers. Data **science** tasks, such as: • Project managing small teams of up to 3 people. • Engaging with data owners and decision makers. • Provide expert technical and specialist advice to inform the development of models and algorithms. • Communicating model strengths, limitations, and scope of application with technical and non-technical stakeholders. Data **visualisation** tasks, such as: • Project managing small teams of up to 3 people. • Generating technical notes and (where required) user guides. • Engaging with data owners and decision makers.
DAI3	As for DAI2 plus: Data **engineering** tasks, such as: • Project managing a multi-disciplinary team of 3 or more people. • Provide expert advice to analysts and data owners on innovative and fit-for-purposes data architectures. • Experience working with protected data. Data **analysis** tasks, such as: • Project managing a multi-disciplinary team of 3 or more people. Data **science** tasks, such as: • Project managing a multi-disciplinary team of 3 or more people. • Provide expert technical and specialist advice to inform the development of models and algorithms. • Building and running advanced models / algorithms. Data **visualisation** tasks, such as: • Project managing in multi-disciplinary teams of 3 or more people. • Coordinating engagement with data owners and decision makers.

Refer to Section 8.3 for commentary on how applicants may address DAI criteria.

6.4   Economic Studies (ES)

Consultancies applying for prequalification in economic studies are expected to have a strong track record of delivery in relevant subject areas.

The following is a list of the of relevant subject areas relating to economic studies in which the consultant is required to have expertise:

- Theoretical principles underpinning transport economic analyses and related sectoral work

- Detailed understanding and application of available tools to undertake economic analysis for transport infrastructure projects, both at the project and program level

- Ability to undertake cost-benefit analyses of transport infrastructure, in accordance with both Australian and Queensland Government reporting requirements

- Understanding of techniques and principles underpinning state and regional economic modelling

- Ability to undertake economic impact analysis methods, techniques and studies, and

- Ability to undertake economic and public policy analysis.

Consultancies are expected to be familiar with a range of methods and guidelines to inform the analysis, whilst being able to draw on internal specialist expertise and be ready to engage relevant analytical methods.

Consultancies are expected to meet Australian and Queensland Government reporting requirements. Economic studies and analysis will require involvement from the Project Evaluation Unit in Portfolio Planning and Investment Division.

Submissions for prequalification are expected to be of a high standard. Consultants are required to provide sufficient evidence to address the criteria outlined in this brochure. Applications should only contain personnel relevant to addressing the criteria outlined in this brochure.

Key points of contact for Economic Studies within the department is the Director (Project Evaluation) and Economics Evaluation Team (Project Evaluation) in Portfolio Investment and Programming Division.

The prequalification levels for economic studies are described in Table 6.4.

Table 6.4 – Economic Studies prequalification levels

Level	Class of Work Description
ES1	- Use of applied economic evaluation methods such as cost benefit analysis (including standard project evaluation methodology and techniques), multi-criteria analysis, strategic merit test, and local investment impact analysis. - This level of prequalification is required for the economic evaluation of rural projects of low complexity. - Examples of projects subject to economic analysis include, but not limited to, overtaking lanes, road widening, sealing unsealed road, and safety related projects. - A recent work sample (within 3 years prior to the application) is required as part of the application to verify relevant experience.
ES2	As for ES1 plus: - Applied analysis involving sub-regional, regional or state-wide economic impact analyses to inform project proposals and development of regional or state-wide road investment strategies. Emphasis is placed on proven economic modelling techniques and understanding of linkages between investment in transport infrastructure and impacts on the broader economy. - Analysis can be of regional, state-wide or national significance, relating to

Level	Class of Work Description
	contribution to economic output and/or improvements to productivity. • A recent work sample (within 3 years prior to the application) is required as part of the application to verify relevant experience.
ES3	The criteria for both ES1 and ES2 is required before an application can be considered for ES3. In addition to ES1 and ES2 the following is required: • Applied economic analysis of major infrastructure projects or infrastructure programs that encompass large-scale infrastructure, which may also consider the impacts on the wider economy. • This level of prequalification is required for the economic evaluation of large multi-modal projects, transport projects of great national significance, and projects or programs that require complex and sophisticated modelling and analysis. • A recent work sample (within 3 years prior to the application) is required as part of the application to verify relevant experience.

Refer to Section 8.4 for commentary on how applicants may address ES criteria.

6.5 *Financial / Commercial (FC)*

Consultancies applying for prequalification in financial / commercial are expected to have a strong track record of undertaking analysis of transport infrastructure.

The following is a list of relevant subject areas in which a financial / commercial specialist would have recent knowledge and experience:

- Theoretical principles underpinning financial analyses and market conditions.

- Awareness of available tools to undertake an analysis of capital, operations and maintenance costs associated with transport infrastructure.

- Ability to develop and assess a range of funding and staging scenarios.

- Awareness of commercial aspects of a range of infrastructure assets, including but not limited to the following:

  - road and bridge projects

  - public transport projects, including bus, heavy rail, light rail, etc

  - multi-modal projects

  - transit oriented developments

  - mixed commercial / residential property developments, and

  - marine / boat harbour development assessments.

- Awareness of project risk analysis, both qualitative and quantitative assessments.

- Ability to undertake value for money and affordability assessments involving variants of private sector involvement models and public sector comparator assessments, and

- Awareness of a range of assessment guidelines, such as the Queensland Government Project Assurance and Value for Money frameworks, and Infrastructure Australia and National Public Private Partnership (PPP) guidelines.

It will be expected that consultants will be familiar with a range of methods and guidelines to inform the analysis, whilst being able to draw on internal specialist expertise and be ready to engage relevant analytical methods and advise accordingly.

To meet Australian and Queensland Government reporting requirements and prioritise investments, Financial and Commercial assessments will require involvement from Project Evaluation Unit in Portfolio Investment and Programming Branch.

Key point of contact for Financial / Commercial assessments within the department is the Director (Project Evaluation) in Portfolio Investment and Programming Branch.

The prequalification levels for financial / commercial are described in Table 6.5.

Table 6.5 – Financial / Commercial prequalification levels

Level	Class of Work Description
FC1	• Applied financial analysis methods, including discounted cash flow techniques, with an emphasis on whole-of-life costs assessments. • Evaluations are to be conducted in accordance with Australian and Queensland Government reporting requirements. • A recent work sample (within 3 years prior to the application) is required as part of the application to verify relevant experience.
FC2	As for FC1 plus: • Applied financial analysis for larger scale transport related infrastructure project assessments. • Analysis is more complex, with broader emphasis on commercial aspects of the project. Analysis should consider market conditions, risk allocation and procurement related issues that may impact on the project (i.e., funding, delivery and timing). • Projects in this category are often of sub-regional, regional and/or national significance in terms of impacts and scale of investment. • A recent work sample (within 3 years prior to the application) is required as part of the application to verify relevant experience.
FC3	In addition to FC1 and FC2 the following is required: • Applied financial analysis on complex transport related infrastructure projects. • The assessment is more comprehensive with an emphasis on commercial and risk aspects of mixed commercial / residential property developments, transit oriented developments and marine / boat harbour assessments, along with road and public transport projects, to inform government investment decision-makers. • A recent work sample (within 3 years prior to the application) is required as part of the application to verify relevant experience.

Refer to Section 8.5 for commentary on how applicants may address FC criteria.

6.6 Geotechnical Engineering (GE)

Consultancies seeking prequalification in geotechnical engineering should demonstrate a strong track record of successfully delivering geotechnical design services for transport infrastructure projects.

Note: Temporary works designs are NOT part of this prequalification category.

Prequalification for GE1 and GE2, the consultant must have a minimum of one registered professional engineer (RPEQ) on staff who can demonstrate expertise in the field of geotechnical engineering. This expertise in geotechnical engineering should have been associated with infrastructure development projects for road authorities.

For renewing and upgrading at the GE3 level, the consultant must have sufficient staff, including, but not limited to, the following:

- A minimum of two RPEQ geotechnical engineers is required: One engineer should be responsible for the design certificate, while the other, independent of the design team, will be responsible for checking and reviewing the design. Both engineers must sign off on the design reports and drawings, and must demonstrate expertise in geotechnical engineering, with a proven track record in infrastructure development projects for road authorities. They should possess a minimum of 15 years of proven industry experience in design and tasks outlined under GE1 to GE3 Class of Work. Additionally, they must demonstrate proficiency in utilising the departments *Geotechnical Design Standard* and other departmental Technical Specifications within the last five years.

- An experienced engineering geologist with proven experience in tasks specified under GE1 to GE3 Class of Work.

- To demonstrate the company's experience, the Consultant Company must showcase successful design experience in GE3 level permanent works (by the current RPEQ geotechnical engineering expertise in the company) on department projects within the last three years. Alternatively, consideration may also be given to large-scale road transport infrastructure projects that have been designed within the last three years, which are geotechnically complex and executed using departmental technical documents (i.e., Technical Specifications, design standards, Standard Drawings, technical notes, etc.) and/or other Australian State Road Authorities' specifications. The nominated project should also have characteristics specifically relevant to the GE3 Class of Work, and Transport and Main Roads GE assessor will make the final decision regarding the suitability of the nominated projects for consideration.

Company eligibility for all levels is based on experience in infrastructure development projects for road authorities.

The prequalification levels for Geotechnical Engineering are described in Table 6.6.

Table 6.6 – Geotechnical Engineering prequalification levels

Level	Class of Work Description
GE1	- Simple foundation (footing and driven pile) analysis including bearing capacity calculation and settlement prediction. - Soil cut slope design and stability analysis (height ≤ 5 m), with static and/or perched water table, using both circular and non-circular slip surfaces. - Embankment (unreinforced) (height ≤ 10 m) design, stability and settlement analysis for embankments founded on cohesive (undrained strength > 75kPa, that is, stiff clays) and non-cohesive materials. - Retaining wall design up to 5 m height - Instrumentation monitoring of ground water table. - Planning of geotechnical site investigation for minor infrastructure projects.

Level	Class of Work Description
GE2	As for GE1 plus: • Geotechnical design of all foundation types, and rock sockets for less than 5 MN axial load including uplift. • Soil cut slope design and stability analysis (height ≤ 10 m). • Rock cut slope design and stability analysis (height ≤ 10 m). • Reinforced slope design. • Embankment design, stability and settlement analysis for all embankment heights on all soil types, including soft soils (< 10 m thick) and design of ground improvements. • Design / Remediation of embankment / culvert on expansive clays. • Retaining wall design up to 10 m. • Reinforced soil structure analysis and design up to 10 m. • Planning, monitoring and interpretation of geotechnical instrumentation for embankments, cuts and structures. • Planning of geotechnical site investigation for major infrastructure projects.
GE3	As for GE2 plus: • Rock sockets for all loads. • Deep excavation design and analysis in both soil and rock, including bored tunnels. • Design of ground improvements for embankment / structure on thick (> 10 m) soft / loose layers. • Soil cut slope design and stability analysis (any height). • Rock cut slope design and stability analysis (any height). • Design of remedial works for soil and rock natural slope failures (landslides). • Design of remedial works on failed cut slopes and embankments. • Geotechnical design of remedial works on movements of structures (including embankments). • Retaining wall and reinforced soil structures (any height). • Embedded retaining wall as well as cut and cover tunnel design.

Refer to Section 8.6 for commentary on how applicants may address GE criteria.

6.7 Highway Engineering (HE)

Highway engineering is a skill required to perform planning and design activities in accordance with the department's planning and design manuals. Engineering consultants making application to perform work for the department should be aware that experience in subdivisional planning and design activities will not necessarily demonstrate an ability to effectively undertake the department's planning and design activities for road infrastructure projects.

The consultant must have a minimum of one registered professional engineer (RPEQ) on staff who can demonstrate expertise in the field of highway engineering.

The prequalification levels for Highway Engineering are described in Table 6.7.

Table 6.7 – Highway Engineering prequalification levels

Level	Class of Work Description
HE1	Please note - a prerequisite for HE1 is Hydraulic Design Level 1. • Highway engineering including the full consideration of public utility plant (PUP), environmental and cultural heritage issues, involving the design for upgrading of existing roads with pavement strengthening, re-sheeting or widening requiring type - sections and nominal details. (All with basic control line setting out, but no grading, for example, rural local roads and asphalt overlays of generally urban areas). • Highway engineering including the full consideration of environmental and cultural heritage issues, involving the widening and overlay of existing rural roads. • Highway engineering including the full consideration of environmental and cultural heritage issues, involving the design of rural roads requiring earthworks balancing, flood-ways, cross sections, drainage, turnouts and minor intersections. (All with calculated control line setting out and grading).
HE2	As for HE1 plus: • Highway engineering including the full consideration of PUP, environmental and cultural heritage issues, involving the assessment of suitable road corridor / alignment options and preparation of detailed planning reports and layouts for a future road upgrading or a new road, including the coordination of alignments and terrain fitting as relevant. • Highway engineering including the full consideration of PUP, environmental and cultural heritage issues, involving the design of rural roads with multiple complexities comprising earthworks balancing, benching for sight lines, flood-ways, cross sections, drainage, detailed intersections and/or grade separation. • Highway engineering including the full consideration of PUP, environmental and cultural heritage issues, involving the widening and overlay of existing urban roads. • Highway engineering including the full consideration of environmental and cultural heritage issues, involving the design of urban roads without complicated design considerations.
HE3	As for HE2 plus: • Highway engineering including the full consideration of PUP, environmental and cultural heritage issues, involving the route location and/or road corridor fixing for major complex highways, motorways, interchange locations and warrants, includes the coordination of alignments and terrain fitting. • Highway engineering including the full consideration of PUP, environmental and cultural heritage issues, involving the planning and design of urban roads and major highways with multiple complexities comprising major channelised intersections or grade separation, major services alterations, stormwater drainage and detailed property accesses. (All with complex control and grade line setting out).

Refer to Section 8.7 for commentary on how applicants may address HE criteria.

6.8   Hydraulic Design (HD)

The consultant must have a minimum of one registered professional engineer (RPEQ) on staff who can demonstrate expertise in the field of hydraulic design.

> Note: Applications for HD2 and HD3 prequalification must include sufficient description of experience and nomination of the software used, in support of these classifications.

> In addition to drawings, upgrade applications MUST include hydraulic reports as evidence of capability, for the application to be considered.

The prequalification levels for Hydraulic Design are described in Table 6.8.

Table 6.8 – Hydraulic Design prequalification levels

Level	Class of Work Description
HD1	• Rainfall runoff calculations (hydrology) for small catchments (area less than 200 km²). • Hydraulics for a single stream and overflows to assess culvert, bridge and floodway requirements and other drainage structures for roads. • Bridge Afflux Calculations. Steady flow backwater modelling, for example, using HEC-RAS software. • Road pavement runoff and aquaplaning.
HD2	As for HD1 plus: • Hydrology for large catchments (area greater than 200 km²). • Mathematical modelling (1-dimensional or 2-dimensional) of unsteady flow in open channel systems including components such as natural streams, flood plains, roads and bridges, man-made channels, reservoirs, dams, weirs and tidal flows. • 2d hydraulic modelling. • Scour calculations. • Time of submergence calculations. • Frequency analysis of flood data records. • 2d hydraulic modelling involving floodplain storage and/or local catchment overland flows.
HD3	As for HD2 plus: • Special investigations, for example, physical hydraulic modelling, 2d modelling of complex floodplains, computational fluid dynamics (CFD) modelling. Special registration procedures apply.

Refer to Section 8.8 for commentary on how applicants may address HD criteria.

6.9   Intelligent Transport Systems (ITS)

The consultant must have a minimum of one registered professional engineer (RPEQ) in Electrical, System Engineering or ITEE (Information, Telecommunication and Electronics Engineering) on staff who can demonstrate expertise in the field of Intelligent Transport Systems (planning, design, construction, Integration, operations and maintenance). The following is a list of subjects in which an experienced engineer would be knowledgeable:

• Road lighting design

• Traffic signals design

• Design of ITS enabling services – electrical, communications, network design etc

• Placement of ITS devices for arterial roads and highways

• Placement of ITS devices (Ramp Signalling, Variable Speed Limit Signs, Variable Message Signs, CCTV, vehicle detection systems, etc) for Managed Motorways

• Systems Engineering concepts – Concept of Operations

- Integration of ITS devices – commissioning and testing planning, operational response, and concept of maintenance, and

- Traffic Management Systems – design of upgrades and enhancements.

In all categories, it is expected that the consultant is able to analyse data and draw conclusions from that analysis.

The prequalification levels for Intelligent Transport Systems are described in Table 6.9.

Table 6.9 – Intelligent Transport Systems prequalification levels

Level	Class of Work Description
ITS1	• Road Lighting design for arterial roads. • Traffic signals design for basic intersections. • Design of ITS enabling services – electrical, network design end communications design and data services. • Placement of ITS devices on arterial roads.
ITS2	As for ITS1 plus: • Road lighting design for highways and complex intersections. • Traffic signals design for complex intersections and interchanges.
ITS3	As for ITS2 plus: • Systems Engineering concepts – Development of Concept of Operations and Operations Design reports. • Placement of ITS devices for Managed Motorways. • Integration of ITS devices into department systems – commissioning and testing planning, and operational responses. • Complex enhancements for systems such as STREAMS, FLIR and SCADA.

Refer to Section 8.9 for commentary on how applicants may address ITS criteria.

6.10 Marine Engineering (ME)

Consultancies applying for prequalification in Marine Engineering (ME) are expected to have expertise and a strong track record of delivery in the following relevant subject areas relating to design and delivery of marine infrastructure and maintenance of marine infrastructure assets.

- Ability to conduct structural inspections on marine structures, timber jetties, concrete jetties, structural aluminium structures, boat ramps, pontoons, and floating walkways.

- Ability to conduct structural inspections and structural engineering assessment of marine structures such as breakwaters, rock revetments and recreational public boating infrastructure.

- Ability to conduct numerical modelling of coastal hydrodynamics to assess the structural performance of marine structures.

- Ability to conduct coastal and fluvial process investigations to adequately assess the impact of infrastructure on coastal/fluvial processes and suitably identify the impact of coastal / fluvial processes on the marine infrastructure.

- Ability to conduct Finite Element Modelling (FEM) and techniques to analyse structural response to various loading conditions on marine structures.

- Ability to design of marine infrastructure using relevant design guidelines, codes and standards and providing engineering certifications.

- Ability to undertake investigations required to support statutory approvals for new infrastructure construction and dredging projects and the ability to prepare these applications.

- Ability to prepare tender documents for marine infrastructure projects.

Consultants making application to perform work for the department should be aware that experience obtained more than 3 years ago will not necessarily demonstrate an ability to effectively undertake the marine engineering services.

The consultant must have at least one experienced qualified engineer with a proven track record in conducting marine infrastructure inspections, design, and construction. Desirable academic or professional qualifications include tertiary qualifications in coastal engineering, civil engineering, that are acceptable for corporate membership of Engineers Australia.

It is a requirement of the Professional Engineers Act that professional engineering services in Queensland and the design of infrastructure, buildings, plants, machinery or products for use in Queensland, are carried out by a RPEQ, or alternatively by a person who carries out the services under the direct supervision of a RPEQ who is ultimately responsible. As such, where an assessment or interpretation of engineering design, staging, or construction risk is required, that work must be approved by an appropriately qualified RPEQ engineer. In this category the consultancy is assessed on its demonstrated ability to conduct inspections of existing marine infrastructure, design of marine infrastructure and numerical modelling of hydrodynamics and FEM modelling and analysis of marine structures.

Points for consultants to note:

There are three subcategories under ME1 category.

1. ME1.a – Marine Engineering tasks

2. ME1.b – Numerical modelling tasks

3. ME1.c – Finite element modelling tasks

Therefore, consultant can request prequalification's on conditional basis to ME1 subcategories based on their experience and qualifications. It is not necessary to comply with subcategories for ME1.b Numerical modelling tasks and ME1.c Finite element modelling tasks to qualify for ME2 and ME3 categories, but they should comply with requirements for ME1.a Marine Engineering tasks.

The prequalification levels (ME1 – ME3) for Marine Engineering are described in Table 6.10.

Table 6.10 – Marine Engineering (ME)

Level	Class of Work Description
ME1	**ME1.a Marine Engineering tasks** such as: • Level 1 – Routine Maintenance structural inspection on Marine Structures such as timber jetties, concrete jetties, structural aluminium structures, boat ramps, pontoons and floating walkways as per the *Structures Inspection Manual* − A visual inspection to check the general serviceability of the structure, particularly for the safety of the users, and to identify any emerging problems.

Level	Class of Work Description
	• Level 2 – Condition Rating structural inspection on Marine Structures such as timber jetties, concrete jetties, structural aluminium structures, boat ramps, pontoons and floating walkways − An inspection to assess and rate the condition of a structure (as a basis for assessing the effectiveness of past maintenance treatments, identifying current maintenance needs, modelling and forecasting future changes in condition and estimating future budget requirements).
	• Preparing structural inspection reports on Marine Structures such as timber jetties, concrete jetties, structural aluminium structures, boat ramps, pontoons and floating walkways as per the requirements of *Structures Inspection Manual*.
	• Preparing of repair, reinstate, demolition estimates as per the recommendations in the structural inspection report.
	• Preparing tender documents for repair works as per Transport and Main Roads *Minor Infrastructure Contracts* or *Small-Scale Minor Infrastructure Contracts*.
	• Providing technical support, contract administration support for implementing the repair projects.
	ME1.b Numerical modelling tasks such as:
	• Conducting desktop wave assessments.
	• Numerical modelling of coastal hydrodynamics (wind, wave and tidal action).
	• Numerical coastal morphological modelling (morphological changes due to wave, and tidal actions).
	• Numerical modelling and assessment of combination of tidal and catchment flow action required for marine infrastructure planning and design.
	ME1.c Finite element modelling tasks such as:
	• Dynamic response analysis of marine structures.
	• Fatigue analysis of marine structures.
	• Finite Element Analysis of marine structures.
ME2	As for ME1.a plus:
	Marine Engineering tasks such as:
	• Conducting Level 3 Special structural inspections on Marine structures such as timber jetties, concrete jetties, structural aluminium structures, boat ramps, pontoons and floating walkways as per the *Structures Inspection Manual* Level 3 inspection is to provide improved knowledge of the condition, load capacity, in-service performance or any other characteristic beyond the scope of other types of inspection. Special inspections may be used to inform / develop the scope of other types of inspection.
	Level 3 inspection categories include:
	− Structural engineering inspection and estimating residual capacity of the structural action.
	− Inspection of type of corrosion, corrosion levels and residual thickness of steel in jetties and piles and aluminium structures.
	− Inspection of concrete decay, cracks, concrete cancer and spalling due to corrosion of embedded metals, chloride ion intrusion, carbonation, dissimilar metal corrosion, alkali-silica reactivity, alkali-carbonate reactivity, aggregate expansion, surface defects, abrasion erosion, overload impacts and chemical attack such as acids and salts. Concrete can be damaged by fire, aggregate expansion, sea water effects, bacterial corrosion, calcium leaching, physical damage and chemical damage (from carbonatation, chlorides, sulphates and non-distilled water).
	− Inspection of timber structures for timber decay due to corrosion of connections, slitting and water intrusion, marine borer attack and attack by other pests.
	− Underwater inspections of structures.

Level	Class of Work Description
	– Preparing structural inspection reports as per the requirements of *Structures Inspection Manual*.
	– Preparing of repair, reinstate, demolition estimates as per the recommendations in the structural inspection report.
	– Preparing tender documents for repair works as per Transport and Main Roads *Minor Infrastructure Contract* (MIC) or *Small Scale Minor Works* (SSMW) Contracts.
	– Providing technical support, contract administration support for implementing the repair projects.
	• Designing of boat ramps in accordance with Transport and Main Roads design criteria and Technical Specifications.
	• Designing of breakwaters, shore protection structures, groynes and beach stabilisation structures.
	• Design of car trailer parking areas, access roads and public amenity structures for boat ramp facilities using Transport and Main Roads guidelines.
	• Designing of pontoons and floating walkways in accordance with Transport and Main Roads design criteria and Technical Specifications.
	• Preparation of relevant statutory approval applications.
	• Preparation of tender documents based on Transport and Main Roads – *Minor Infrastructure Contract* (MIC) and *Transport Infrastructure Contract* (TIC) tender formats.
	• Assessment for compliance to Disability Discrimination Act (DDA) and Disability Standards for Accessible Public Transport (DSAPT) for new and existing public transport facilities.
	• Preparation of 3D digital models.
ME3	As for ME2 plus: **Marine Engineering tasks** such as: • Designing of timber / steel or concrete jetties and wharves. • Designing of sheet pile walls and earth retaining structures for maritime infrastructure. • Designing of ferry terminals and related infrastructure. • Designing of navigational aids and related structures to Transport and Main Roads Technical Specifications. • Design of onshore dredge spoil disposal facility and/or land reclamation. • Preparation of relevant statutory approval applications. • Preparation of tender documents based on Transport and Main Roads - MIC and TIC tender formats. • Assessment for compliance to Disability Discrimination Act (DDA) and Disability Standards for Accessible Public Transport (DSAPT) for new and existing public transport facilities. • Preparation of 3D digital models.

Refer to Section 8.10 for commentary on how applicants may address ME criteria.

6.11 Traffic Engineering (TE)

The consultant must have a minimum of one registered professional engineer (RPEQ) on staff who can demonstrate expertise in the field of traffic engineering. The following is a list of subjects in which an experienced traffic engineer would be knowledgeable:

- Traffic flow theory (road user and vehicle characteristics and roadway and intersection capacity)

- Intersection control (non-signalised and signalised)

- Road safety investigation and analysis

- Traffic impact analysis

- Isolated traffic signal analysis and operation, and

- Traffic signal network analysis and operation.

In all categories, it is expected that the consultant can analyse data and draw conclusions from that analysis.

The prequalification levels for traffic engineering are described in Table 6.11.

Table 6.11 – Traffic Engineering prequalification levels

Level	Class of Work Description
TE1	• Analysis of traffic impacts of minor developments (for example, a single small establishment), covering trip generation calculations, manual distribution, assignment and mode split, design requirements for parking, transit, pedestrians and cycling. • Intersection analysis using computer-based systems (SIDRA is the department's preferred application), deriving all but the most basic signal phasing, establishment of intersection and network design life and consideration of 'back of queue' impacts on design. • Basic intersection design encompassing the location of stop lines, posts, and lanterns. • Report and make recommendations following comparison of options. • Design of traffic control device (signs and line marking) layouts. An exception to this requirement is the development of roadwork Traffic Management Plans and Traffic Guidance Schemes, which can be undertaken by a person who holds a Traffic Management Design authority. • Road safety investigation and analysis. Road Safety Auditors must be registered with the department and recorded at https://www.tmr.qld.gov.au/Safety/Road-safety/Road-safety-auditors.
TE2	As for TE1 plus: • Analysis of traffic impacts of major developments (for example, major shopping centres). • Basic benefit cost analysis of a small TE project.

Level	Class of Work Description
TE3	As for TE2 plus: • Traffic signal network analysis and optimisation of traffic signal timings. • Simulation of small to medium sized traffic networks using computer based systems (for example AIMSUN, Paramics, VISSIM). • Impact analysis for developments having regional impact. • Major traffic engineering projects. • Complex traffic analysis. Note that complex system enhancements encompassing integrated Intelligent Transport Systems (ITS) fall within the ITS category. • Major project evaluation.

Refer to Section 8.11 for commentary on how applicants may address TE criteria.

6.12 Transport & Land Use Modelling (TLUM)

The consultant must have at least one experienced transport or land use / demographic modeller who has worked on model or data development, maintenance and/or application in one or more of the following modelling specialisations:

- **Strategic transport models**, such as four-step multi-modal transport models or activity-based models, that estimate and forecast travel demand across the region.

- **Mesoscopic transport traffic models** that consider a level of traffic detail greater than a strategic model to include geographic zones such as cities, major exit and entry centroid connector links, intersections, traffic generators such as large shopping centres, lane based congestion, time based changes such as on-street parking restrictions in peak hours and reduced speed limits around academic education institutions.

- **Microsimulation / intersection traffic models** focused on simulating movements of individual vehicles on a given road network to help understand the causes and bottlenecks of congestion such as driver behaviour (e.g. lane changing, gap acceptance and weaving).

- **Public transport-specific models** focused on demand forecasting and route scheduling of an integrated public transport network or discrete public transport modes (rail, bus etc).

- **Demographic & land use models**, including regional and small area demographic, employment and enrolment forecasting and allocation models and tools to provide data inputs to transport modelling and transport planning analysis.

Transport or land use / demographic modellers with prequalification levels 2 or 3 would expect to have significant experience in the design, development, maintenance and improvement of models within one of the above specialisations.

The prequalification levels for transport and land use modelling are described in Table 6.12.

Table 6.12 – Transport & Land Use Modelling prequalification levels

Level	Class of Work Description
TLUM1	**Strategic transport modelling** tasks, such as: • Undertaking model development and maintenance activities. • Model application work and providing interpretation and analysis of model results. • Contributing to reports and technical notes on model development or application activities.

Level	Class of Work Description
	Mesoscopic traffic modelling tasks, such as: • Undertaking model development and maintenance activities. • Model application work and providing interpretation and analysis of model results. • Contributing to reports and technical notes on model development or application activities. **Microsim / intersection traffic modelling** tasks, such as: • Undertaking model development and maintenance activities. • Model application work and providing interpretation and analysis of model results. • Contributing to reports and technical notes on model development or application activities. **Public transport modelling** tasks, such as: • Undertaking model development and maintenance activities. • Model application work and providing interpretation and analysis of model results. • Contributing to reports and technical notes on model development or application activities. **Land use / demographic modelling** tasks, such as: • Undertaking data compilation, analysis, model development and maintenance activities. • Analysis and model application work and providing interpretation of results. • Contributing to reports and technical notes on analysis, model development or application activities.
TLUM2	TLUM1 plus: **Strategic transport modelling** tasks, such as: • Lead and undertake a variety of model development and maintenance tasks. • Provide technical advice to inform the design of and improvement to models. • Lead model application work on behalf of Transport and Main Roads. • Actively engage with and manage technical and non-technical stakeholders on behalf of Transport and Main Roads in regard to mesoscopic transport traffic model development or application projects. • Generate reports and technical notes on model development or application activities. **Mesoscopic traffic modelling** tasks, such as: • Lead and undertake a variety of model development and maintenance tasks. • Provide technical advice to inform the design of and improvement to models. • Lead model application work on behalf of Transport and Main Roads. • Actively engage with and manage technical and non-technical stakeholders on behalf of Transport and Main Roads in regard to mesoscopic transport traffic model development or application projects. • Generate reports and technical notes on model development or application activities. **Microsim / intersection traffic modelling** tasks, such as: • Lead and undertake a variety of model development and maintenance tasks. • Provide technical advice to inform the design of and improvement to models.

Level	Class of Work Description
	• Lead model application work on behalf of Transport and Main Roads. • Actively engage with and manage technical and non-technical stakeholders on behalf of Transport and Main Roads in regard to mesoscopic transport traffic model development or application projects. • Generate reports and technical notes on model development or application activities. **Public transport modelling** tasks, such as: • Lead and undertake a variety of model development and maintenance tasks. • Provide technical advice to inform the design of and improvement to models. • Lead model application work on behalf of Transport and Main Roads. • Actively engage with and manage technical and non-technical stakeholders on behalf of Transport and Main Roads in regard to mesoscopic transport traffic model development or application projects. • Generate reports and technical notes on model development or application activities. **Land use / demographic modelling** tasks, such as: • Lead and undertake conduct of or developing population, employment and enrolment forecasting analyses, models, methods and maintenance tasks. • Provide technical advice to inform the design of and improvement to analysis and model methods. • Lead analysis and model application work on behalf of Transport and Main Roads. • Actively engage with and manage technical and non-technical stakeholders on behalf of Transport and Main Roads in regard to land use / demographic analysis or model development or application projects. • Generate reports and technical notes on analysis, model development or application activities.
TLUM3	As for TLUM2 plus: **Strategic transport modelling** tasks, such as: • Lead and manage model development projects. • Provide expert technical and specialist advice to inform the design of and improvement to strategic transport models. **Mesoscopic traffic modelling** tasks, such as: • Lead and manage model development projects. • Provide expert technical and specialist advice to inform the design of and improvement to mesoscopic models. **Microsim / intersection traffic modelling** tasks, such as: • Lead and manage model development projects. • Provide expert technical and specialist advice to inform the design of and improvement to microsim / intersection models. **Public transport modelling** tasks, such as: • Lead and manage model development projects. • Provide expert technical and specialist advice to inform the design of and improvement to public transport models.

Level	Class of Work Description
	Land use / demographic modelling tasks, such as: • Lead, plan, manage and/or conduct a range of projects concerned with small area population, employment and enrolment statistics and projections. • Provide expert technical and specialist advice to inform the development of demographic and land use related spatial data sets relevant to transport modelling and planning. • Analyse and draw conclusions from very large and complex data sets from multiple sources, including identifying data set limitations.

Refer to Section 8.12 for commentary on how applicants may address TLUM criteria.

6.13 Transport Planning (TP)

The Consultant must have at least one experienced transport planner with a proven track record in transport network and/or services planning. In this category the consultancy is assessed on its demonstrated ability to identify and evaluate transport issues, options and priorities, and develop appropriately balanced multi-modal transport strategies.

The following is a list of relevant subject areas in which a transport planner would have recent knowledge and experience:

- collection of relevant data and design of data collection programs

- strategic transport modelling, including application of models and interpretation of outputs

- network and operational planning requirements for all transport modes, including private and freight vehicles, rail, bus, cycle and pedestrians

- travel demand management techniques

- integration of transport and land use

- integration of different jurisdictional networks (one network)

- stakeholder engagement and management, and

- coordination with complementary transport planning activities.

It is expected that consultants apply 'one network' planning principles and are familiar with a range of methods and industry standards to inform planning activities.

The prequalification levels for Transport Planning are described in Table 6.13.

Table 6.13 – Transport Planning prequalification levels

Level	Class of Work Description
TP1	• Planning for simple networks. • Issues identification and data collection for local areas. • Local traffic management planning. • Network options evaluation and strategy development. • Network concept planning. • Prioritisation of transport improvements. • Stakeholder liaison.

Level	Class of Work Description
TP2	As for TP1 plus: • Planning for medium complexity networks at a corridor and area scale. • Multi-modal planning including integration of pedestrian, cycle and passenger transport requirements with road and rail networks. • Applying modelling tools and other techniques to evaluate network options and functional priorities. • Travel demand management. • Stakeholder management and negotiation. • Coordination with allied transport projects.
TP3	As for TP2 plus: • Planning for highly complex multi-modal networks and transport at a regional level. • Freight operation and intermodal transfer. • Passenger transport operations. • Comprehensive travel demand management. • Application of complex transport models and evaluation of modelling outputs. • Planning studies requiring multi-disciplinary approaches. • Network impact assessment and evaluation. • High-level feasibility and implementation assessment. • Complex stakeholder management and community consultation.

Refer to Section 8.13 for commentary on how applicants may address TP criteria.

7   Projects with multiple disciplines

Where a project involves multiple disciplines, all relevant prequalification categories and levels will be specified.

If a consultant is not prequalified at the nominated level for one of the components, advice of a suitably prequalified sub-consultant is required with the offer for consultant services.

8   Addressing prequalification criteria

8.1   Bridge Design

Consultants shall provide documentation to demonstrate that they have systems in place to ensure that all structural designers within their organisation design to the same design criteria and technical guidelines.

They shall demonstrate how this conformity to a consistent design methodology and design criteria is monitored, controlled and audited with their quality systems.

The prequalification levels for bridge design with commentary are described in Table 8.1.

Table 8.1 – Bridge design prequalification levels with commentary

Level	Class of Work Description	Commentary
BD1	• Simple bridges where geometry is substantially predetermined.	• Demonstrated capability to use the department's *Design Criteria for Bridges and Other Structures*, AS/NZS 5100 and the department's *Drafting and Design Presentations Manual, Volume 3: Structural Drafting Standards*.

Level	Class of Work Description	Commentary
		• Structural software to be used shall include grillage analysis package such as ACES and Spacegass, or equivalent. • Demonstrated capability to use Geotechnical Reports and Bore Logs, and Hydraulics Reports in bridge design. • The department recommends attendance by some of the Consultant's design personnel at its " Transport and Main Roads Structures Life Cycle Program (Bridge and Culverts) eLearn Program".
	• Noise barriers, light poles, minor sign supports that do not span over the carriageway, i.e. "off carriageway".	• Demonstrated capability to design in accordance with the relevant department Technical Specifications and Technical Notes, AS/NZS 5100 and Australian Standards.
	• Variable message (VMS) and other sign gantries that do not span over the carriageway, i.e. "off carriageway", sign structures.	• Demonstrated capability to design to the section on gantries and sign structures in the department's *Design Criteria for Bridges and Other Structures*, AS/NZS 5100 and Australian Standards including AASHTO structural fatigue design and WHS requirements.
	• Advertising sign structures that do not span over the carriageway i.e. "off carriageway".	• Demonstrated capability to design in accordance with the section on gantries and sign structures in the department's *Design Criteria for Bridges and Other Structures*, • AS/NZS 5100 and Australian Standards including AASHTO structural fatigue design and WHS requirements.
	• Retaining walls and scour protection	• Capability to use the department's design guidelines for retaining structures in the department's *Design Criteria for Bridges and Other Structures*, AS/NZS 5100, Australian Standards and the *Geotechnical Design Standards – Minimum Requirements*. Understanding the department's guidelines and Standard Drawings for scour protection of bridges. • Proven capability to utilise Hydraulics and Geotechnical Reports to estimate scour depths and to structurally design the bridge structure for scour effects and scour protection, including protection of bridge approaches.
	• Drainage structures	• Proven capability for structural analysis and design of culverts for multiple load cases in accordance with the department's Culvert Design guidelines and AS/NZS 5100.

Level	Class of Work Description	Commentary
BD2	**As for BD1 plus:**	
	• Significant urban bridges (excluding complex bridges), major rural bridges and rail overpasses where geometric, geotechnical, or hydraulic complications may occur.	• Demonstrated application of the department's *Design Criteria for Bridges and Other Structures*, AS/NZS 5100 and the department's *Drafting and Design Presentations Manual, Volume 3: Structural Drafting Standards* to the design of significant urban bridges, major rural bridges, rail bridges, on previous department projects where geometric, geotechnical or hydraulic complications may occur.
	• Gantry and sign structures that span over the carriageway.	• Demonstrated application of the section on gantries and sign structures in the department's *Design Criteria for Bridges and Other Structures*. • AS/NZS 5100 and Australian Standards including AASHTO structural fatigue design and WHS requirements on previous department projects.
	• Advertising sign structures that span over the carriageway, i.e. "on carriageway".	• Demonstrated capability to design in accordance with the section on gantries and advertising sign structures in the department's *Design Criteria for Bridges and Other Structures*, AS/NZS 5100 and Australian Standards including AASHTO structural fatigue design and WHS requirements. • Demonstrated capability to analyse the structural capacity of the existing bridge structure using AS/NZS 5100 and the department's *Design Criteria for Bridges and Other Structures*, for design loads from vehicles, vehicle impact on traffic barriers and advertising signs that are attached to the bridge. • Structural software to be used shall include grillage analysis packages such as ACES and Spacegass or equivalent.
BD3	**As for BD2 plus:**	
	• Complex road and rail bridges and major urban bridges using non-standard structural members	• In addition to BD2 requirements, demonstrated capability to design and draft complex bridges such as box girders and cable stayed bridges. • Demonstrated capability to undertake in-house technical investigation to provide solutions to unusual design situations, unique to the project in hand on previous department projects.

Level	Class of Work Description	Commentary
	• Major projects that have a lot of road and/or rail bridges.	• Demonstrated application and capability on previous department projects to design and draft every bridge in the project to the department's *Design Criteria for Bridges and Other Structures*, AS/NZS 5100 and the department's *Drafting and Design Presentations Manual, Volume 3: Structural Drafting Standards*. • The design and details shall all be consistent and uniform across the project. Demonstrated capability to deliver the design documentation on time on previous department projects.
	• Additional qualification procedures may be used for particular structures.	• In-house engineers who have a proven track record in "hands on" technical investigation to solve complex structural design and analysis problems. • Demonstrated capability to achieve innovative and durable solutions.
	• Cut and cover tunnels, major civil structures, retaining wall structures.	• Demonstrated application and capability on previous department projects to design and draft cut and cover tunnels, major civil structures and retaining walls to the department's *Design Criteria for Bridges and Other Structures*, AS/NZS 5100 and the department's *Drafting and Design Presentations Manual, Volume 3: Structural Drafting Standards*. The design and details shall all be consistent and uniform across the project. Demonstrated capability to deliver the design documentation on time on previous department projects.

8.2 Cost Estimating

Applicants are advised to take note of the following when compiling applications:

- Eligibility for level CE3 is dependent on successful demonstration of this expertise on department projects within the past three years with the following characteristics:

  – technically complex, and

  – value (typically > $100 million construction value).

- CE3 prequalification is recognised by the department as a means to confidently deliver the cost estimate of such projects with high risk profiles.

- Consultants are expected to meet Australian and Queensland Government estimating requirements. Major project estimating will require involvement from the Estimating Unit of Infrastructure Management Division.

- Applications should only contain personnel details relevant to addressing the criteria outlined in this brochure.

The prequalification levels for cost estimating with commentary are described in Table 8.2.

Table 8.2 – Cost estimating prequalification levels with commentary

Level	Class of Work Description	Commentary
CE1	Use of applied cost estimating methods such as cost planning, global rate estimating, unit rate estimating, first principles estimating, probabilistic estimating. This level of prequalification is required for the cost estimation of simple projects, such as rural projects of low complexity.	• Demonstrated experience in estimating transport infrastructure projects (road and / or rail). • Examples of projects may include overtaking lanes, minor Intersection and junction upgrades, road widening, sealing unsealed road, minor structures, and safety related projects.
		• Demonstrated experience (work sample) of applied estimating in the relevant subject areas. • Examples of projects (within three years prior to the application).
		• Demonstrated experience utilising a range of estimating methods.
		• Demonstrated experience utilising tools required to prepare an estimate (e.g. Microsoft Excel, dedicated estimating software, such as Expert Estimation, Palisade @Risk and relevant resource databases).

		• Demonstrated experience and capability to estimate the following aspects of an infrastructure project from first principles:
		  – Environmental works
		  – Traffic management
		  – Public utility plant
		  – Earthworks
		  – Retaining walls
		  – Drainage
		  – Bridges
		  – Pavement
		  – Finishing works
		  – Traffic signage, signals and controls, and
		  – road agency costs (for example, design, contract administration and operational phase costs).

		• Demonstrated familiarity with the Australian Government's cost estimating guidelines, project cost benchmarking, and State government's project cost estimating manual.

Level	Class of Work Description	Commentary
CE2	As for CE1 plus: • Emphasis is placed on proven cost estimating techniques across multiple project phases from project evaluation to project completion. • Estimating is more complex, with broader emphasis on commercial aspects of the project including market conditions, risk allocation and construction staging that may impact on the project estimate. • This level of prequalification is required for the cost estimation of projects such as rural or urban projects of moderate complexity.	• Demonstrated experience in cost estimating utilising more complex estimating methods and techniques. • Examples of projects may include road or rail bridges (BD2, BD3), major roadworks, or Intersection / Junction upgrades (HE2, HE3). • Demonstrated experience (for example, estimate reports) of work that reflects the capability of the Consultant. • Examples of a project (within three years prior to the application). • Demonstrated experience in undertaking detailed project cost estimating in the context of Australian and State policies, for a range of transport infrastructure projects, with a particular emphasis on the State Highway Network. • Demonstrated familiarity with a range of estimating methods, and be able to draw on internal specialist expertise. • Demonstrated experience in the provision of full cost management services, including preparation of regular milestone estimates from project inception through to construction tender, preparation of project cashflows, detailed elemental cost analyses, assistance in tender evaluation, preparation of tender reconciliations, negation and assessment of construction variation claims.
CE3	The criteria for both CE1 and CE2 is required before an application can be considered for CE3. In addition to CE1 and CE2 the following is required: • Applied cost estimating of major infrastructure projects or infrastructure programs that encompass large-scale infrastructure, such as large public transport projects, including bus, heavy rail, light rail, multi-modal projects, transit oriented developments.	• Demonstrated experience in accurate cost estimating of major transport infrastructure projects. • This level of prequalification is required for the cost estimation of large major transport infrastructure projects, and projects or programs that require integrated time, cost and risk schedules across multiple project and/or program elements. • Demonstrated recent experience in undertaking detailed cost estimates of a range of transport infrastructure projects to inform investment prioritisation at the state and/or national level. • Examples of projects may include complex, multi-phase major projects which include road and/or rail bridges structures (BD3), tunnels, complex geotechnical conditions (GE3).

Level	Class of Work Description	Commentary
		• Demonstrated experience in the preparation of first principles and/or unit rate based estimates (or a combination of both methods) and associated reports for projects at strategic, concept, detailed and tender phases incorporating quantity take-offs, cost estimates, risk assessments (inclusive of developing risk registers, facilitating risk workshops, assessment of risk items, calculation of risk values using Monte Carlo simulation software and the like), project schedules, construction methodology and staging, cash flows and the like for complex road and rail infrastructure projects.

8.3   Data Analysis and Insights

Points for consultants to note:

- Please ensure submissions demonstrate a clear distinction between which disciplines of data analysis and insights the consultant has skills and experience in.

- A consultant is not expected to have equivalent level skills / experience across all disciplines of data analysis and insights, in order to be prequalified at a particular level. i.e. a consultancy might be prequalified at level 3 due their high degree of experience and expertise in data science, despite only moderate skills and experience in data visualisation.

The prequalification levels for this category with commentary are described in Table 8.3.

Table 8.3 – Data analysis and insights prequalification levels with commentary

Level	Class of Work Description	Commentary
DAI1	Data **engineering** tasks, such as: • Data blending and transformation via automated ETL pipelines that preserve clear data lineage. • Assisting in the development, testing, and maintenance of both new and existing data architectures for both cloud and on-premises solutions. • Creating and maintaining custom automated and manual ingestion pipelines. • Contributing to technical documentation of systems including users guides where necessary.	• Proficient in SQL and the use of relational databases. • Theoretical knowledge of best practices for data governance. • Proficient in one or more cloud storage solutions, such as: AWS RDS, AWS S3, AWS Redshift, Google BigQuery, Azure SQL Database, or similar. • Proficient in one or more cloud ETL solutions: AWS Glue, AWS Lambda, Google Cloud Dataflow, Google Cloud Data Fusion, or similar. • Proficient in one or more programming languages including, but not limited to: Hadoop, MapReduce, Hive, Pig, Data streaming, NoSQL, SQL, R, Python, Ruby, C, Perl, Java, Scala. • Experience at creating reliable and efficient ETL pipelines to accommodate very large data sets. • Experience designing, building, and optimising data storage solutions for analytics.

Level	Class of Work Description	Commentary
		• Experience architecting distributed computing systems. • Experience working with geospatial data.
	Data **analysis** tasks, such as: • Analysing various transport and land use datasets to generate insights to inform decision making. • Data cleansing and transformation via ETL pipelines that preserve clear data lineage. • Building and running data analysis pipelines. • Contributing to reports, presentations and technical notes. • Communicating analysis results, conclusions, and recommendations with technical stakeholders.	• Proficient in SQL and the use of relational databases. • Theoretical knowledge of descriptive statistics. • Proficient using one or more of the following analysis tools or programming languages: Microsoft Excel, Tableau, Alteryx, SSAS, python, SPSS, SAS, STATA, R, or similar. • Experience using one or more data visualisation software packages such as Tableau, PowerBI, Qlick, Neo4j, or similar. • Experience working with geospatial data and in the use of GIS software such as QGIS, ArcGIS, MapInfo or similar. • Experience preparing and cleansing data for use in analyses. • Experience in communicating, presenting or explaining analysis exercises and outcomes to technical audiences.
	Data **science** tasks, such as: • Data cleansing and transformation via ETL pipelines that preserve clear data lineage. • Building and running models / algorithms. • Generating insights and making predictions through machine learning techniques, algorithms and models. • Data visualisation. • Generating reports, presentations and technical notes. • Communicating model strengths, limitations, and scope of application with technical stakeholders.	• Proficient in SQL and the use of relational databases. • Theoretical knowledge of statistical modelling, machine learning, and artificial intelligence. • Proficient in python or proficient in R and at least one object-oriented programming language. • Proficient in one or more modelling / analysis software packages, such as: Microsoft Excel, Tableau, Alteryx, SSAS, SPSS Modeler, SAS Miner, STATA, Python, R, or similar. • Experience working with geospatial data and in the use of GIS software such as QGIS, ArcGIS, MapInfo or similar. • Experience preparing and cleansing data for use in models / algorithms.

Level	Class of Work Description	Commentary
		• Experience developing and deploying models / algorithms designed to solve specific business needs. • Experience presenting and explaining model strengths, limitations, and scope of application to colleagues within the project team.
	Data **visualisation** tasks, such as: • Developing data visualisations to communicate insights and inform decision making. • Developing self-service analytics for various audiences. • Data cleansing and transformation via ETL pipelines that preserve clear data lineage. • Iterative development of data visualisations with an end-user focus. • Contributing to technical notes and (where required) user guides. • Communicating and demonstrating visualisation tools to end-users and data custodians.	• Proficient in one or more of the following data visualisation software packages including (but not limited to) Tableau, PowerBI, Qlick, Spotfire, Web GIS, or Neo4j • Proficient in one or more of the following data preparation software packages such as (but not limited to) Alteryx, Knime, Microsoft Excel, Tableau Prep, Python, or R • Experience preparing and transforming data so that it is optimised for visualisation
DAI2	As for DAI1 plus: Data **engineering** tasks, such as: • Project managing small teams of up to 3 people. • Engaging with data owners and analysts. • Leading the development, testing, and maintenance of both new and existing data architectures for both cloud and on-premises solutions. • Providing advice to analysts and data owners on fit-for-purposes data architectures. • Ensuring data architecture is secure yet accessible to both internal and external parties as required. • Generating technical documentation of systems including users guides where necessary.	• 3+ years' experience working as a data engineer. • Experience in leading projects. • Strong theoretical knowledge of best practices for data governance. • Experience engaging with data owners, analysts, and data scientists to translate business needs into fit-for-purpose data architecture solutions. • Experience establishing and maintaining network security that is just permissive enough in both on-prem and cloud environments. • Experience working within or alongside analytics teams including data scientists, analysts, and visualisation specialists. • Experience preparing technical documentation on solution architecture. • Experience working with geospatial data.
	Data **analysis** tasks, such as: • Project managing small teams of up to 3 people. • Analysing various transport and land use datasets to generate critical planning insights to inform decision making.	• 3+ years' experience as a data analyst. • Experience in leading projects. • Experience in analysing and generating insights from transportation datasets. • Strong theoretical knowledge of descriptive statistics.

Level	Class of Work Description	Commentary
	• Generating reports, presentations and technical notes. • Engaging with data owners and decision makers.	• Experience engaging with data owners and decision makers to translate business needs into analysis tasks. • Experience preparing and cleansing data for use in analyses. • Experience presenting and explaining analysis exercises to technical and non-technical stakeholders. • Experience in writing succinct reports outlining the analyses undertaken, conclusions, and recommendations. • Experience facilitating group discussions around interpretations and identifying recommendations from analysis conclusions. • Experience using visualisations to communicate conclusions and provide a rationale for recommendations.
	Data **science** tasks, such as: • Project managing small teams of up to 3 people. • Engaging with data owners and decision makers. • Provide expert technical and specialist advice to inform the development of models and algorithms. • Communicating model strengths, limitations, and scope of application with technical and non-technical stakeholders.	• 3+ years' experience as a data scientist. • Experience in leading projects. • Strong theoretical knowledge of statistical modelling, machine learning, and artificial intelligence. • Experience engaging with data owners and decision makers to translate business needs into data science solutions. • Experience presenting and explaining model strengths, limitations, and scope of application to technical and non-technical stakeholders.
	Data **visualisation** tasks, such as: • Project managing small teams of up to 3 people • Generating technical notes and (where required) user guides • Engaging with data owners and decision makers	• 3+ years' experience as a data visualisation expert. • Experience in visualising and drawing insights from transportation datasets. • Significant experience preparing and transforming data so that it is optimised for visualisation. • Proficient in SQL and the use of relational databases. • Experience working with geospatial data in visualisations. • Theoretical and practical knowledge of user experience and graphic design principles, including elements of web development and graphic design software. • Experience in designing and iteratively developing visualisations that are intuitive and draw attention to key insights.

Level	Class of Work Description	Commentary
		• Experience communicating and demonstrating visualisation tools to end-users and data custodians both through presentations and creation of user-guides (if required). • Experience engaging with data owners and decision makers to translate business needs into fit-for-purpose data visualisations through iterative development.
DAI3	As for DAI2 plus: Data **engineering** tasks, such as: • Project managing a multi-disciplinary team of 3 or more people. • Provide expert advice to analysts and data owners on innovative and fit-for-purposes data architectures. • Experience working with protected data.	• 5+ years' experience as a data engineer. • Proficient in a variety of cloud storage solutions, such as: AWS RDS, AWS S3, AWS Redshift, Google BigQuery, Azure SQL Database, or similar. • Proficient in a variety of cloud ETL solutions: AWS Glue, AWS Lambda, Google Cloud Dataflow, Google Cloud Data Fusion, or similar. • Proficient in multiple programming languages including, but not limited to: Hadoop, MapReduce, Hive, Pig, Data streaming, NoSQL, SQL, R, Python, Ruby, C, Perl, Java, Scala. • Extensive experience engaging with data owners, analysts, and data scientists to translate business needs into fit-for-purpose data architecture solutions. • Extensive experience establishing and maintaining network security that is just permissive enough in both on-prem and cloud environments. • Extensive experience at creating reliable and efficient ETL pipelines to accommodate very large data sets. • Extensive experience designing, building, and optimising data storage solutions for analytics. • Extensive experience architecting distributed computing systems. • Extensive experience working within or alongside analytics teams including data scientists, analysts, and visualisation specialists. • Extensive experience preparing technical documentation on solution architecture.
	Data **analysis** tasks, such as: • Project managing a multi-disciplinary team of 3 or more people.	• 5+ years' experience as a data analyst. • Significant experience in analysing and generating insights from transportation datasets.

Level	Class of Work Description	Commentary
		- Proficient in a variety of analysis tools or programming languages: Microsoft Excel, SPSS, SAS, STATA, Tableau, Alteryx, SSAS, python, R, or similar. - Extensive experience engaging with data owners and decision makers to translate business needs into analysis tasks. - Extensive experience preparing and cleansing data for use in analyses. - Extensive experience presenting and explaining analysis exercises to technical and non-technical stakeholders. - Extensive experience in writing succinct reports outlining the analyses undertaken, conclusions, and recommendations.
	Data **science** tasks, such as: - Project managing a multi-disciplinary team of 3 or more people. - Provide expert technical and specialist advice to inform the development of models and algorithms. - Building and running advanced models / algorithms.	5+ years' experience as a data scientist. - Proficient in a variety of modelling / analysis software packages, such as: Microsoft Excel, Tableau, Alteryx, SSAS, SPSS Modeler, SAS Miner, STATA, Python, R, or similar. - Extensive experience engaging with data owners and decision makers to translate business needs into data science solutions. - Extensive experience preparing and cleansing data for use in models / algorithms. - Extensive experience developing and deploying models / algorithms designed to solve specific business needs. - Extensive experience presenting and explaining model strengths, limitations, and scope of application to technical and non-technical stakeholders.
	Data **visualisation** tasks, such as: - Project managing in multi-disciplinary teams of 3 or more people. - Coordinating engagement with data owners and decision makers.	5+ years' experience as a data visualisation expert. - Significant experience in leading data visualisation projects, preferably for government. - Significant experience in designing and iteratively developing visualisations that are intuitive and draw attention to key insights.

8.4   Economic Studies

Consultancies applying for prequalification in economic studies are expected to have a strong track record of delivery in relevant subject areas.

The following is a list of the of relevant subject areas relating to economic studies in which the consultant is required to have expertise:

- Theoretical principles underpinning transport economic analyses and related sectoral work.

- Detailed understanding and application of available tools to undertake economic analysis for transport infrastructure projects, both at the project and program level.

- Ability to undertake cost-benefit analyses of transport infrastructure, in accordance with both Australian and Queensland Government reporting requirements.

- Understanding of techniques and principles underpinning state and regional economic modelling.

- Ability to undertake economic impact analysis methods, techniques and studies, and

- Ability to undertake economic and public policy analysis.

Consultancies are expected to be familiar with a range of methods and guidelines to inform the analysis, whilst being able to draw on internal specialist expertise and be ready to engage relevant analytical methods.

Consultancies are expected to meet Australian and Queensland Government reporting requirements. Economic studies and analysis will require involvement from the Project Evaluation Unit of Portfolio Planning and Investment Division.

Submissions for prequalification are expected to be of a high standard. Consultants are required to provide sufficient evidence to address the criteria outlined in this brochure. Applications should only contain personnel relevant to addressing the criteria outlined in this document.

Key points of contact for Economic Studies within the department is the Director (Project Evaluation) and Economics Evaluation Team (Project Evaluation) in the Portfolio Investment and Programming Division.

The prequalification levels for economic studies with commentary are described in Table 8.4.

Table 8.4 – Economic Studies prequalification levels with commentary

Level	Class of Work Description	Commentary
ES1		Consultant or analyst with a proven track record in cost benefit analysis / economic evaluation of transport infrastructure projects.
		Consultants should provide evidence (work sample) of **applied** analysis in the relevant subject areas.

Level	Class of Work Description	Commentary
	• Use of applied economic evaluation methods such as cost benefit analysis (including standard project evaluation methodology and techniques), multi-criteria analysis, strategic merit test, and local investment impact analysis. • This level of prequalification is required for the economic evaluation of rural projects of low complexity. • Examples of projects subject to economic analysis include, but not limited to, overtaking lanes, road widening, sealing unsealed road, and safety related projects. • A recent work sample (within 3 years prior to the application) is required as part of the application to verify relevant experience.	Consultants are expected to have a thorough understanding and capability to articulate the following aspects of an analysis: • traffic data and traffic modelling required for an analysis • economic modelling assumptions • tools required to conduct analysis (e.g., excel spreadsheets, dedicated analysis tools, and relevant databases) • discounted cash flow analysis and use of appropriate discount rates • road agency costs (e.g., capital costs, whole of life costs, and residual values) • road user costs savings (e.g., travel time cost savings, vehicle operating costs savings, accident costs savings, externalities cost savings) • range of economic indicators (e.g., net present value, benefit-cost ratio, net benefit investment ratio, internal rate of return, first year rate of return) • options analysis and use of net present value and incremental benefit-cost ratio to rank options • appropriate sensitivity tests to be conducted (e.g., impacts to costs or benefit factors), and • Compile technical reports.
ES2	As for ES1 plus: • Applied analysis involving sub-regional, regional or state-wide economic impact analyses to inform project proposals and development of regional or state-wide road investment strategies. Emphasis is placed on proven economic modelling techniques and understanding of linkages between investment in transport infrastructure and impacts on the broader economy. • Analysis can be of regional, state-wide or national significance, relating to contribution to economic output and/or improvements to productivity. • A recent work sample (within 3 years prior to the application) is required as part of the application to verify relevant experience.	Consultant or analyst with a proven track record in economic impact assessments and broader economic evaluation methods and techniques. Consultants should provide defensible evidence (work sample or reference) of work that has contributed to the development of investment proposals and strategies to Australian and Queensland Government infrastructure bodies in relevant subject areas. Consultants should be able to demonstrate recent experience in undertaking detailed economic analysis in the context of state / national policy, reform or industry studies to inform a range of transport infrastructure outcomes, with a particular emphasis on sectoral analysis.

Level	Class of Work Description	Commentary
ES3	The criteria for both ES1 and ES2 is required before an application can be considered for ES3. In addition to ES1 and ES2 the following is required: • Applied economic analysis of major infrastructure projects or infrastructure programs that encompass large-scale infrastructure, which may also consider the impacts on the wider economy. • This level of prequalification is required for the economic evaluation of large multi-modal projects, transport projects of great national significance, and projects or programs that require complex and sophisticated modelling and analysis. • A recent work sample (within 3 years prior to the application) is required as part of the application to verify relevant experience.	Consultant or analyst with a proven track record in cost benefit analysis / economic evaluation of major transport infrastructure projects. Consultant or analyst with a proven track record in economic impact assessments and broader economic evaluation methods and techniques. Consultants should provide defensible evidence (for example work sample) of having practiced cost-benefit analysis with particular reference to complex project and program level evaluations and regional investment impact analyses. Consultants are expected to demonstrate recent experience in undertaking detailed economic analysis of a range of transport infrastructure projects to inform investment prioritisation at the state and/or national level. Consultants should provide defensible evidence (for example work sample) of work that has contributed to the development of policy or investment submissions to either: national investment bodies, transport forums; federal commissions of inquiry; infrastructure / tax / pricing / regulatory reviews (for example, ACCC / Productivity Commission inquiries) in relevant subject areas.

8.5 Financial / Commercial

Consultancies applying for prequalification in financial / commercial are expected to have a strong track record of undertaking analysis of transport infrastructure.

The following is a list of relevant subject areas in which a financial / commercial specialist would have recent knowledge and experience:

- Theoretical principles underpinning financial analyses and market conditions.

- Awareness of available tools to undertake an analysis of capital, operations and maintenance costs associated with transport infrastructure.

- Ability to develop and assess a range of funding and staging scenarios.

- Awareness of commercial aspects of a range of infrastructure assets, including but not limited to the following:

    - road and bridge projects

    - public transport projects, including bus, heavy rail, light rail, etc

    - multi-modal projects

    - transit oriented developments

    - mixed commercial / residential property developments, and

    - marine / boat harbour development assessments.

- Awareness of project risk analysis, both qualitative and quantitative assessments.

- Ability to undertake value for money and affordability assessments involving variants of private sector involvement models and public sector comparator assessments, and

- Awareness of a range of assessment guidelines, such as the Queensland Government Project Assurance and Value for Money frameworks, and Infrastructure Australia and National Public Private Partnership (PPP) guidelines.

It will be expected that consultants will be familiar with a range of methods and guidelines to inform the analysis, whilst being able to draw on internal specialist expertise and be ready to engage relevant analytical methods and advise accordingly.

To meet Australian and Queensland Government reporting requirements and prioritise investments, Financial and Commercial assessments will require involvement from Project Evaluation of Portfolio Investment and Programming Branch.

Key point of contact for Financial / Commercial assessments within the department is the Director (Project Evaluation) within the Portfolio Investment and Programming Branch.

The prequalification levels for Financial / Commercial with commentary are described in Table 8.5.

Table 8.5 – Financial / commercial prequalification levels with commentary

Level	Class of Work Description	Commentary
FC1	- Applied financial analysis methods, including discounted cash flow techniques, with an emphasis on whole-of-life costs assessments. - Evaluations are to be conducted in accordance with Australian and Queensland Government reporting requirements. - A recent work sample (within three years prior to the application) is required as part of the application to verify relevant experience.	Consultant or analyst with recent experience in discounted cash flow analysis and project evaluation methodologies.
		Consultants should be able to provide evidence of having applied financial analysis skills and experience in providing outputs that supports investment decision-making. Consultants should be able to develop a financial analysis methodology, listing the below aspects: - financial modelling assumptions - appropriate discount rates - discounted cash flow analysis of capital and whole of life costs - a range of financial indicators (e.g., Net Present Costs, Net Present Value, Internal Rate of Return) - any scenarios or sensitivity tests to be conducted (e.g., early works packaging, staging analysis, varying escalation or contingency factors), and - compile technical reports.

Level	Class of Work Description	Commentary
FC2	As for FC1 plus: • Applied financial analysis for larger scale transport related infrastructure project assessments.	Consultant or analyst with a proven track record in discounted cash flow analysis and project evaluation methodologies. Consultant or analyst with proven track record in risk and/or commercial analysis.
	• Analysis is more complex, with broader emphasis on commercial aspects of the project. Analysis should consider market conditions, risk allocation and procurement related issues that may impact on the project (i.e., funding, delivery and timing). • Project in this category are often of sub-regional, regional and/or national significance in terms of impacts and scale of investment. • A recent work sample (within three years prior to the application) is required as part of the application to verify relevant experience.	Consultants should be able to provide evidence of having applied financial and commercial analysis skills and experience in providing advice that supports investment decision-making. In addition to FC1, consultants should also be able to demonstrate recent experience in undertaking detailed risk and commercial assessments for a range of transport infrastructure projects, to inform Value for Money and Affordability assessments. As part of these assessments, consultants should have recent experience in advising on market conditions (e.g., cost of debt / equity, competition, cost of materials, inflationary effects, risk allocation and pricing, etc) and procurement and delivery strategies that may impact on the project timing, cash-flows and financing mechanisms. Advisors may also be sought on procurement and delivery strategies involving partnership arrangements with the private sector, including methods to explore value uplift and innovation opportunities, appropriate risk transfer strategies, and their impact on project timing, cash flows, financing and innovation.
FC3	In addition to FC1 and FC2 the following is required: • Applied financial analysis on complex transport related infrastructure projects. • The assessment is more comprehensive with an emphasis on commercial and risk aspects of mixed commercial / residential property developments, transit oriented developments and marine / boat harbour assessments, along with road and public transport projects, to inform government investment decision-makers. • A recent work sample (within three years prior to the application) is required as part of the application to verify relevant experience.	Financial modelling consultant or analysts with a proven track record in discounted cash flow analysis and project evaluation methodologies within the relevant subject area. Risk and/or commercial consultant or analyst with proven track record in the fields of transport, property and marine related infrastructure assessments for both private and publicly funded projects.
		Consultants should be able to provide evidence of having applied financial and commercial analysis skills and experience in providing advice that supports investment decision-making. In addition to FC2, consultants should be able to demonstrate recent experience in undertaking detailed risk and commercial assessments for a range of transport infrastructure projects, with a particular emphasis on value capture issues for residential and commercial land-uses and/or marine / boat harbour assessments, in addition to road and public transport projects assessments.

8.6   Geotechnical Engineering

The department expects that the consultant should have demonstrated experience shown in Table 8.6.

Table 8.6 – Geotechnical Engineering prequalification levels with commentary

Level	Class of Work Description	Commentary
GE1	• Simple foundation (footing and driven pile) analysis including bearing capacity calculation and settlement prediction.	• Designing simple foundation for small bridge, culvert, noise barrier walls, sign post etc by simple hand calculations.
	• Soil cut slope design and stability analysis (height ≤ 5 m), with static and/or perched water table, using both circular and non-circular slip surfaces.	• Analysing cut slope using limit equilibrium slope stability software such as SLOPE / W.
	• Embankment (unreinforced) (height ≤ 10 m) design, stability and settlement analysis for embankments founded on cohesive (undrained strength > 75 kPa, that is, stiff clays) and non-cohesive materials.	• Stability and settlement analysis of embankment by simple hand calculations and/or using charts.
	• Retaining wall design up to 5 m height.	• Designing gravity and cantilever types retaining walls.
	• Instrumentation monitoring of ground water table.	• Ability to monitor and interpret ground water records from different types of piezometers.
	• Planning of geotechnical site investigation for minor infrastructure projects.	• Planning and managing different types of geotechnical investigation such as Borehole, Test pit and Penetrometer tests for minor infrastructure projects. • Ability to assign appropriate laboratory tests from the field investigation.
GE2	**As for GE1plus:**	**Demonstrated experience in the following:**
	• Geotechnical design of all foundation types, and rock sockets for less than 5MN axial load including uplift.	• Designing shallow footing and different types of deep foundations (such as driven, bored, tube and rock socket) for major infrastructure projects.
	• Soil cut slope design and stability analysis (height ≤ 10 m).	• Analysing cut slope using limit equilibrium slope stability software such as SLOPE / W for complex geology.
	• Rock cut slope design and stability analysis (height ≤ 10 m).	• Analysing static and kinematic slope stability for complex geology.
	• Reinforced slope design.	• Designing insitu slope stabilisation (e.g. soil nails or rock dowels) and reinforced embankment as per design standard such as BS8006.

Level	Class of Work Description	Commentary
	• Embankment design, stability and settlement analysis for all embankment heights on all soil types, including soft soils (< 10 m thick) and design of ground improvements.	• Stability analysis based on limit equilibrium methods. • Settlement analysis based on Terzaghi one-dimensional consolidation theory. • Estimating secondary consolidation (creep) settlement. • Designing varies type of ground improvement techniques. • Designing sidelong embankments.
	• Design / Remediation of embankment / culvert on expansive clays.	• Designing of embankment, pavement and culvert on expansive clays. • Designing of remedial treatment for distress structures such as embankment, pavement and culvert on expansive clays.
	• Retaining wall design up to 10 m.	• Designing different types of retaining walls such as Gabion, Boulder, RC and Soil nail walls.
	• Reinforced soil structure analysis and design up to 10 m.	• Internal and external design of RSS wall.
	• Planning, monitoring and interpretation of geotechnical instrumentation for embankments, cuts and structures.	• Planning, monitoring and interpretation of geotechnical instrumentation such as settlement marker, settlement plate, inclinometer, extensometer and different types of piezometers.
	• Planning of geotechnical site investigation for major infrastructure projects.	• Planning and managing different types of geotechnical investigation such as Borehole, Test pit and Penetrometer tests for major infrastructure projects including investigation for major bridge foundations, retaining walls, culverts, cuts and embankments. • Investigating in soft clay, reactive clay, different types of soils and rocks. • Ability to assign appropriate laboratory testing from the field investigation.
GE3	**As for GE2 plus:**	**Demonstrated extensive experience in the following:**
	• Rock sockets for all loads.	• Designing rock sockets, preferably the design method due to Pells (1999): "State of practice for the design of socketed piles in rock".
	• Deep excavation design and analysis in both soil and rock, including bored tunnels.	• Designing cut and cover tunnels and bored tunnels in both soil and rock including soft clay.
	• Design of ground improvements for embankment / structure on thick (> 10 m) soft / loose layers.	• Designing different types of ground improvement techniques such as stage construction, counter berms, surcharge, wick drain, dynamic compaction and pile raft for thick soft or loose layers.
	• Soil cut slope design and stability analysis (any height).	• Analysing cut slope using limit equilibrium slope stability software such as SLOPE / W for cut height greater than 10 m.

Level	Class of Work Description	Commentary
	• Rock cut slope design and stability analysis (any height).	• Analysing static and kinematic slope stability for cut height greater than 10 m.
	• Design of remedial works for soil and rock natural slope failures (landslides).	• Designing different types of remedial works such as re-profiling (with earthfill / rockfill), and retaining wall systems.
	• Design of remedial works on failed cut slopes and embankments.	• Designing different types of remedial works such as re-shaping, re-profiling (with earthfill / rockfill), netting and/or retaining wall systems.
	• Geotechnical design of remedial works on movements of structures (including embankments).	• Designing of remedial treatment for distress structures such as embankment, pavement, bridge and culvert on problematic soil / rock or unforeseen ground conditions.
	• Retaining wall and reinforced soil structures (any height).	• Designing different types of retaining walls such as Gabion, RC, RSS and Soil nail walls.
	• Embedded retaining wall as well as cut and cover tunnel design.	• Designing embedded retaining walls preferably as per BS8002.

Applications should also include project examples for each class of works with company and personnel contributions. Details to be included, but not limited to, project name, location, cost, duration, description of structure, geotechnical conditions (soil type, thickness etc), other engineering issues, design details, construction issues and mitigation measures implemented.

8.7   Highway Engineering

Applicants are advised to take note of the following when compiling their Highway Engineering applications.

- Consultants shall provide documentation to demonstrate that they have systems in place to ensure that all highway engineers and designers within their organisation design to the same design criteria and technical guidelines. They shall demonstrate how this conformity to a consistent design methodology and design criteria is monitored, controlled and audited with their quality systems.

- The department will consider the location of consultant's offices, and location of RPEQs, compared to the geographic area(s) of nominated operation. Refer to Section B and H of the application document (Form C7512).

- Applications for HE2 and HE3 prequalification must include sufficient software in support of these classifications. It is expected that software packages such as ARNDT, RISC would be required to cover the likely range of department projects at these levels. Refer Section I Engineering Software of the application document (Form C7512).

- The consultants must provide details to demonstrate how the requirements of Section 3.4 Registered Professional Engineer of this document will be implemented, especially how direct supervision and RPEQ sign off is managed.

- The department will consider the number of RPEQs available compared to the consultant's total available HE staff numbers.

- The department will consider the experience and capability of non-engineers, for example road designers.

- Applications for HE2 and HE3 prequalification must include sufficient description of experience in support of nominated classification for each project. Applications should include detailed project descriptions with examples for each class of works with company and personnel contributions. Details to be included, but not limited to, project name, location, cost, duration, description of road type, other engineering issues, design details, construction issues and mitigation measures implemented. Refer Attachment A and B.

- The skills and experience of key personnel, especially RPEQ's, must be appropriate for the HE level being requested. RPEQ's should be experienced and have supervised projects at or close to HE level requested. Refer Attachment G of the Application document (Form C7512).

- Consultants need to detail relevant engineering skills and experience in the CVs for highway engineers and designers, especially RPEQs, and clearly detail what engineering / design work they were actually responsibly for.

- Drawing requirements:

  – Drawings for department projects should reflect the department's *Drafting and Design Presentation Standards Manual*.

  – HE1 applicants should submit as many of their drawings as possible, to demonstrate their capability and experience.

  – HE2 and HE3 applicants should submit:

    ▪ Site Locality Plan (for context purposes)

    ▪ Drawing Index (for context purposes)

    ▪ General Arrangement / Layout plans and Detail plans

    ▪ Submit any other relevant information for HE2 and HE3 level projects, such as sight distance calculations, aquaplaning calculations, vehicle swept path checks, reports etc.

    ▪ Longitudinal sections

    ▪ Cross sections (include pavement design)

    ▪ Signage and line marking plans, and

    ▪ Intersection plans.

8.8 Hydraulic Design

Applicants are reminded that upgrade applications MUST include hydraulic reports as evidence of capability, for the application to be considered.

The prequalification levels for hydraulic design with commentary are described in Table 8.8.

Table 8.8 – Hydraulic design prequalification levels with commentary

Level	Class of Work Description	Commentary
HD1	- Rainfall runoff calculations (hydrology) for small catchments (area less than 200 km²). - Hydraulics for a single stream and overflows to assess culvert, bridge and floodway requirements and other drainage structures for roads. - Bridge Afflux Calculations. Steady flow backwater modelling, for example, using HEC-RAS software. - Road pavement runoff and aquaplaning.	- Understanding of the application of appropriate procedures in the department's *Road Drainage Manual* and Australian Rainfall and Runoff. - Understand the principles of calculating design floods for small catchments throughout Queensland and how to apply this to calculating flows through bridges, culverts and other road drainage infrastructure. - Demonstrated capability to apply appropriate hydraulic design software, including rainfall – runoff models, regional flood frequency and HEC-RAS. - Demonstrated capability to prepare hydraulic design reports for bridges and culverts in roads. - Understand the assessment of observed hydraulic data and its application to road design projects. Data may include both formal data programmes from agencies such as DNRM and BoM as well as anecdotal flood data and observations.
HD2	As for HD1 plus: - Hydrology for large catchments (area greater than 200km²). - Mathematical modelling (1-dimensional or 2-dimensional) of unsteady flow in open channel systems including components such as natural streams, flood plains, roads and bridges, man-made channels, reservoirs, dams, weirs and tidal flows. 2d hydraulic modelling. - Scour calculations. - Time of submergence calculations. - Frequency analysis of flood data records. 2d hydraulic modelling involving floodplain storage and/or local catchment overland flows.	- Demonstrated capability to analyse larger catchments than apply for HD1. - Demonstrated skills in application of unsteady 1d, quasi-2d or 2d hydraulic analysis to tidal flows and applications involving floodplain storage and/or local catchment overland flows. - Demonstrated skills in the application of flood frequency analysis for both at-site and regional procedures. - Understand and apply the scour concepts outlined in the department's *Bridge Scour Manual* and Austroads *Guide to Bridge Technology Part 8, Chapter 5: Bridge Scour* (2018). - Ability to prepare hydraulic designs for floodways and design scour protection measures for floodway design. - Understand and apply hydrologic analysis to joint probability assessments for tidal boundaries and tributary flows. - Ability to apply time of submergence calculations for road design projects. - Ability to assess road surfaces for aquaplaning issues.
HD3	As for HD2 plus: Special investigations, for example, physical hydraulic modelling, 2d modelling of complex floodplains), computational fluid dynamics modelling (CFD). Special registration procedures apply.	- Demonstrated capability in the application of advanced 2D hydraulic modelling to road and bridge projects. - Demonstrated experience in the analysis of road embankments across floodplains and in areas of complex flow distribution.

Level	Class of Work Description	Commentary
		• Understand the principles of physical hydraulic modelling. • Ability to analyse hydraulic issues for road links as well as individual crossings. • Demonstrated skills in assisting in consultation with stakeholders and the community in matters related to flood and drainage issues. • Demonstrated ability to prepare review reports and act as an expert witness in complex matters involving hydraulic issues for road infrastructure projects. • Demonstrated capability in the application of CFD modelling to road and bridge / culvert projects (not mandatory for HD3 but will be highly regarded).

Consultants need to demonstrate relevant corporate skills and experience as well as show the CVs for staff with relevant skills and experience.

The experience must be appropriate to drainage for road infrastructure, rather than general skills in drainage design, though these more general skills will be useful as secondary skills.

The consultant needs to demonstrate that they have licences for software suitable for hydraulic design of road infrastructure.

8.9 Intelligent Transport Systems

The prequalification levels for intelligent transport systems prequalification with commentary are described in Table 8.9.

Table 8.9 – Intelligent Transport Systems prequalification levels

Level	Class of Work Description	Commentary
ITS1	• Road Lighting design for arterial roads • Traffic signals design for basic intersections • Design of ITS enabling services – electrical, network design end communications design and data services • Placement of ITS devices on arterial roads.	• Development of road lighting and traffic signal concept and design for arterial roads including development of concept of operations, construction operations and maintenance. • Design of ITS enabling services – electrical, network design end communications design and data services including placement of ITS devices on arterial roads • Traffic signal network analysis and optimisation of traffic signal timings and corridors.
ITS2	As for ITS1 plus: • Road lighting design for highways and complex intersections • Traffic signals design for complex intersections and interchanges.	As for ITS1 plus: • Complex road lighting design for highways, interchanges and brownfield arterial corridors. • Traffic signals design for brownfield or complex intersections. and interchanges. • Optimisation of protective treatments for vulnerable road users, and high risk movements.

Level	Class of Work Description	Commentary
		• Development of business case and options analysis documentation for ITS infrastructure. • Road safety investigation and analysis for ITS infrastructure.
ITS3	As for ITS2 plus: • Systems Engineering concepts – Development of Concept of Operations and Operations Design reports. • Placement of ITS devices for Managed Motorways. • Integration of ITS devices into department systems – commissioning and testing planning, and operational responses. • Complex enhancements for systems such as STREAMS, FLIR and SCADA.	As for ITS2 plus: • Systems Engineering concepts – Development of Concept of Operations and Operations Design reports. • Placement of ITS devices for Managed Motorways. • Integration of ITS devices into department systems – commissioning and testing planning, and operational responses. • Complex multi-discipline integration of signals and lighting systems with civil road design. • Complex enhancements for systems such as STREAMS, FLIR and SCADA. • Complex system enhancements for traffic signal management. • Traffic signal network analysis and performance optimisation of traffic signal timings using TRANSYT or TRANSYT-7F (TRANSYT-7F is the department's preferred application). • Major ITS engineering projects and evaluation. • Complex ITS network analysis and management.

8.10 Marine Engineering

Points for consultants to note:

There are 3 subcategories under ME1 category.

1. ME1.a – Marine Engineering tasks

2. ME1.b – Numerical modelling tasks

3. ME1.c – Finite element modelling tasks

Therefore, consultant can request prequalification's on conditional basis to ME1 subcategories based on their experience and qualifications. It is not necessary to comply with subcategories for ME1.b Numerical modelling and ME1.c Finite element modelling to qualify for ME2 and ME3 categories, but they should comply with requirements for ME1.a Marine Engineering tasks.

The prequalification levels for Marine Engineering with commentary are described in Table 8.10.

Table 8.10 – ME prequalification levels

Level	Class of Work Description	Commentary
ME1	**ME1.a Marine Engineering** tasks such as: • Level 1 – Routine Maintenance structural inspection on Marine Structures such as timber jetties, concrete jetties, structural aluminium structures, boat ramps, pontoons and floating walkways as per the *Structures Inspection Manual* − A visual inspection to check the general serviceability of the structure, particularly for the safety of the users, and to identify any emerging problems. • Level 2 – Condition Rating structural inspection on Marine Structures such as timber jetties, concrete jetties, structural aluminium structures, boat ramps, pontoons and floating walkways − An inspection to assess and rate the condition of a structure (as a basis for assessing the effectiveness of past maintenance treatments, identifying current maintenance needs, modelling and forecasting future changes in condition and estimating future budget requirements). • Preparing structural inspection reports on Marine Structures such as timber jetties, concrete jetties, structural aluminium structures, boat ramps, pontoons and floating walkways as per the requirements of *Structures Inspection Manual*. • Preparing of repair, reinstate, demolition estimates as per the recommendations in the structural inspection report.	• Demonstrated capability to use Transport and Main Roads *Structures Inspection Manual*. • Demonstrated capability of providing sufficient staff for the structural inspection with relevant experience on inspecting marine structures such as timber jetties, concrete jetties, structural aluminium structures, boat ramps, pontoons and floating walkways exposed to tidal and wave actions. • At least one member of each project team is RPEQ accredited in the relevant field.

Level	Class of Work Description	Commentary
	• Preparing tender documents for repair works as per Transport and Main Roads Minor Infrastructure Contracts or Small-Scale Minor Infrastructure Contracts. • Providing technical support, contract administration support for implementing the repair projects. • Numerical modelling and assessment of combination of tidal and catchment flow action required for marine infrastructure planning and design.	
	ME1.b Numerical modelling tasks such as: • Conducting desktop wave assessments • Numerical modelling of coastal hydrodynamics (wind, wave and tidal action) • Numerical coastal morphological modelling (morphological changes due to wave, and tidal actions)	• Demonstrated capability of using 1D, 2D and 3D numerical modelling software for wave, flow and morphological modelling. Demonstrated experience in using Deltares, DHI, Tuflow and SWAN modelling software. • Demonstrated capability of conducting desktop analysis of wave propagation, decay and dissipation using coastal engineering fundamentals. • At least one member of each project team is RPEQ accredited in the relevant field.
	ME1.c Finite element modelling tasks such as: • Dynamic response analysis of marine structures • Fatigue analysis of marine structures • Finite Element Analysis of marine structures.	• Demonstrated capability of using structural modelling software such as SPACE GASS,ETABS, SAP2000, STAADPRO. • Demonstrated capability of using Finite Element software packages Sim Scale, deal.II or various open source FEM models.
ME2	**As for ME1.a plus:**	Demonstrated experience in the following:
	Marine Engineering tasks such as: • Conducting Level 3 Special structural inspections on Marine structures such as timber jetties, concrete jetties, structural aluminium structures, boat ramps, pontoons and floating walkways as per the *Structures Inspection Manual* Level 3 inspection is to provide improved knowledge of the condition, load capacity, in-service performance or any other characteristic beyond the scope of other types of	• Demonstrated experience in the following: • Demonstrated capability to use Transport and Main Roads *Structures Inspection Manual*. • Demonstrated capability of providing sufficient staff for the Level 3 structural inspection with relevant experience on inspecting marine structures such as timber jetties, concrete jetties, structural aluminium structures, boat ramps, pontoons and floating walkways exposed to tidal and wave actions. • At least two member of each project team is RPEQ accredited in the relevant field for supervising and reviewing works. • Demonstrated capability to design in accordance with the relevant Transport and Main Roads Guidelines, Design Criteria and Technical Specifications.

Level	Class of Work Description	Commentary
	inspection. Special inspections may be used to inform/develop the scope of other types of inspection. Level 3 inspection categories include: – Structural engineering inspection and estimating residual capacity of the structural action. – Inspection of type of corrosion, corrosion levels and residual thickness of steel in jetties and piles and aluminium structures. – Inspection of concrete decay, cracks, concrete cancer and spalling due to corrosion of embedded metals, chloride ion intrusion, carbonation, dissimilar metal corrosion, alkali-silica reactivity, alkali-carbonate reactivity, aggregate expansion, surface defects, abrasion erosion, overload impacts and chemical attack such as acids and salts. Concrete can be damaged by fire, aggregate expansion, sea water effects, bacterial corrosion, calcium leaching, physical damage and chemical damage (from carbonatation, chlorides, sulphates and non-distilled water). – Inspection of timber structures for timber decay due to corrosion of connections, slitting and water intrusion, marine borer attack and attack by other pests – Underwater inspections of structures – Preparing structural inspection reports as per the requirements of *Structures Inspection Manual*.	• Demonstrated capability to design marine structures in accordance with Australian and International Standards. • Demonstrated capability to use Transport and Main Roads MIC and TIC tender formats. • Demonstrated capability to design in accordance with Disability Standards for accessible public transport and related guidelines and Technical Specifications. • Proven capability for structural analysis and design of marine infrastructure. • Demonstrated capability in the preparation of Statutory approvals required for marine infrastructure projects. • Demonstrated capability in the use of 3D modelling software. • Familiarity with design of structures using composite technology. • Demonstrated capability of handling development applications for marine infrastructure projects through state and federal regulatory agencies.

Level	Class of Work Description	Commentary
	− Preparing of repair, reinstate, demolition estimates as per the recommendations in the structural inspection report. − Preparing tender documents for repair works as per Transport and Main Roads Minor Infrastructure Contracts or Small-Scale Minor Infrastructure Contracts. − Providing technical support, contract administration support for implementing the repair projects. • Designing of boat ramps in accordance with Transport and Main Roads design criteria and Technical Specifications. • Designing of breakwaters, shore protection structures, groynes and beach stabilisation structures. • Design of car trailer parking areas, access roads and public amenity structures for boat ramp facilities using Transport and Main Roads guidelines. • Designing of pontoons and floating walkways in accordance with Transport and Main Roads design criteria and Technical Specifications. • Preparation of relevant statutory approval applications. • Preparation of tender documents based on Transport and Main Roads-MIC and TIC tender formats. • Assessment for compliance to DDA (Disability Discrimination Act) and DSAPT (Disability Standards for Accessible Public Transport) for new and existing public transport facilities. • Preparation of 3D digital models.	

Level	Class of Work Description	Commentary
ME3	**As for ME2 plus:**	• Demonstrated experience in the following:
	Marine Engineering tasks such as: • Designing of timber / steel or concrete jetties and wharves. • Designing of sheet pile walls and earth retaining structures for maritime infrastructure. • Designing of ferry terminals and related infrastructure. • Designing of navigational aids and related structures to relevant Australian and International Standards. • Design of onshore dredge spoil disposal facility and/or land reclamation. • Preparation of relevant statutory approval applications. • Preparation of tender documents based on Transport and Main Roads-MIC and TIC tender formats. • Assessment for compliance to DDA (Disability Discrimination Act) and DSAPT (Disability Standards for Accessible Public Transport) for new and existing public transport facilities. • Preparation of 3D digital models.	• Demonstrated capability to design in accordance with the relevant Transport and Main Roads Guidelines, Design Criteria and Technical Specifications. • Demonstrated capability to design marine structures in accordance with Australian and International Standards. • Demonstrated capability of design of dredging campaigns, dredge disposal sites. • Demonstrated capability to use Transport and Main Roads MIC and TIC tender formats. • Demonstrated capability to design in accordance with Disability Standards for accessible public transport and related guidelines and Technical Specifications. • Proven capability for structural analysis and design of marine infrastructure. • Demonstrated capability in the preparation of Statutory approvals required for marine infrastructure projects. • Demonstrated capability in the use of 3D modelling software. • Familiarity with design of structures using composite technology. • Demonstrated capability of handling development applications for marine infrastructure projects through state and federal regulatory agencies. • Sufficient RPEQ qualified staff to supervise works, peer review, and certify the design and construction works.

8.11 Traffic Engineering

The prequalification levels for traffic engineering with commentary are described in Table 8.11.

Table 8.11 – Traffic engineering prequalification levels with commentary

Level	Class of Work Description	Commentary
TE1	• Analysis of traffic impacts of minor developments (for example, a single small establishment), covering trip generation calculations, manual distribution, assignment and mode split, design requirements for parking, transit, pedestrians and cycling.	• The department expects that Traffic Impact Assessments will be undertaken using the tools outlined here, and that the consultant will have experience with simple calculations for trip generation, manual distribution, assignment and mode split; simple crash investigation; size and design requirements for parking, transit, and active transport needs (pedestrians, cycling).

Level	Class of Work Description	Commentary
	• Intersection analysis using computer-based systems (SIDRA is the department's preferred application), deriving all but the most basic signal phasing, establishment of intersection and network design life and consideration of 'back of queue' impacts on design. • Basic intersection design encompassing the location of stop lines, posts, and lanterns. • Report and make recommendations following comparison of options.	• The department is looking for the appropriate use of intersection analysis tools, primarily SIDRA. While spreadsheet tools based on either Austroads' Guide to Traffic Management (GTM) or TRB's Highway Capacity Manual (HCM) are a feasible means with which to undertake the analysis, evidence of competency will need to be supported with substantial worked examples. • The intersection design elements that the department is looking for encompasses locating stop lines and posts / lanterns, and basic signal phasing. The key reference here is the GTM along with the department's *Road Planning and Design Manual* (RPDM). Link: RPDM. • Electrical cabling design and its associated documentation fall within the Intelligent Traffic Systems (ITS) category.
	• Design of traffic control device (signs and line marking) layouts. Familiarity with the design requirements of AS 1743 and AS 1744 for sign design.	• The department is looking for consultants with sound knowledge of the application of traffic control devices, in accordance with GTM / RPDM, Austroads' *Guide to Road Design* (GRD), and the Queensland *Manual of Uniform Traffic Control Devices* (MUTCD).
	• Road safety investigation and analysis.	• The department is looking for familiarity with, and application of, Austroads' *Guide to Road Safety, Part 8 (Treatment of Crash Locations)*. Such analysis may involve accessing data from the department's WebCrash (link: Webcrash) application and developing / recommending treatments to improve safety. Road Safety Auditors must be registered with the department and recorded at https://www.tmr.qld.gov.au/Safety/Road-safety/Road-safety-auditors.
TE2	**As for TE1 plus:**	
	• Analysis of traffic impacts of major developments (for example, major shopping centres).	• As above in TE1, with an increased use of outputs from transport planning tool (for example, EMME) to assess traffic impacts and design. • Note that, depending on its scope, an assessment may need to comply with the department's *Guide to Traffic Impact Assessment*. • The department is looking for the ability to undertake an analysis of small networks where queues spillback from one intersection to another using SIDRA (manually adjusting for queue interaction) or TRANSYT-7F.

Level	Class of Work Description	Commentary
		• The department is looking for experience in assessing the interaction and implications of different types of traffic control; the impacts of lane balancing; and the integration with urban design, public transport stations / stops and active transport facilities along the length of the road (not just at intersections). • The department will accept broader application of traffic engineering principles as a demonstration of meeting this requirement. For example, knowledge and application of on-road cycling facilities and on-road public transport priority; evaluation of performance based on persons rather than vehicles and implementation of treatments reflecting the findings.
	• Basic benefit cost analysis of a small TE project.	• Ability to estimate "conceptual design" project cost and derive the $ benefits of the project through traffic analysis tools.
TE3	**As for TE2 plus:**	
	• Traffic signal network analysis and optimisation of traffic signal.	• Where this class of work includes the development of new STREAMS time of day plans, the consultant will need to demonstrate some familiarity with STREAMS. This would include getting flow and cycle time data from STREAMS and making sure the output is in the correct format to go back into STREAMS. The department will look for evidence that its procedures and guidelines for this analysis have been followed.
	• Simulation of small to medium sized traffic networks using computer based systems (for example AIMSUN, Paramics, VISSIM)	• The department is looking for experience in the use and application of microscopic and mesoscopic simulation tools (such as SATURN), and the development / adjustment of O/D matrix data. AIMSUN is the department's preferred micro-simulation tool. Note that the department is currently considering mandating AIMSUN for micro-simulation.
	• Impact analysis for developments having regional impact.	• An assessment at this TE level will need to comply with the department's *Guide to Traffic Impact Assessment*. Link: [Traffic Impact Assessment]().
	• Major traffic engineering projects.	• The department is looking for the ability to consider multiple factors – over-saturated links, significant pedestrian activity, active transport, passenger transport, where merging and weaving behaviours become an important factor, and bottleneck analysis.
	• Complex traffic analysis. Note that complex system enhancements encompassing integrated Intelligent Transport Systems (ITS) fall within the ITS category.	
	• Major project evaluation.	• The department is looking for the ability to undertake weave and merge-diverge analysis as per Highway Capacity Manual (HCM 2010) or use of HCS.

Level	Class of Work Description	Commentary
		• Please note that complex system enhancements encompassing integrated Intelligent Transport Systems (ITS) fall within the ITS category.

8.12 Transport & Land Use Modelling

Points for consultants to note:

- Please ensure submissions demonstrate a clear distinction between which disciplines of transport and land use modelling the consultant has skills and experience in.

- A consultant is not expected to have equivalent level skills / experience across all disciplines of transport and land use modelling, in order to be prequalified at a particular level. i.e. a consultancy might be prequalified at level 3 due their high degree of experience in mesoscopic modelling, despite only moderate experience in strategic modelling.

The prequalification levels for Transport and land use modelling with commentary are described in Table 8.12.

Table 8.12 – Transport and land use modelling prequalification levels with commentary

Level	Class of Work Description	Commentary
TLUM1	**Strategic transport modelling** tasks, such as: • Undertaking model development and maintenance activities. • Model application work and providing interpretation and analysis of model results. • Contributing to reports and technical notes on model development or application activities.	• Experience in model development and application for the urban and regional city-wide models. • Experience working with one or more of the following modelling software packages: EMME, VISUM, or Cube.
	Mesoscopic traffic modelling tasks, such as: • Undertaking model development and maintenance activities. • Model application work and providing interpretation and analysis of model results. • Contributing to reports and technical notes on model development or application activities.	• Experience in traffic or transport modelling. • Experience working with one or more of the following modelling software packages: AIMSUN, SATURN, DYNAMEQ and VISUM / VISSIM modelling software.
	Microsim / intersection traffic modelling tasks, such as: • Undertaking model development and maintenance activities. • Model application work and providing interpretation and analysis of model results. • Contributing to reports and technical notes on model development or application activities.	• Experience in traffic engineering or transport modelling. • Experience working with one or more of the following modelling software packages: AIMSUN, VISSIM and SIDRA modelling software.

Level	Class of Work Description	Commentary
	Public transport modelling tasks, such as: • Undertaking model development and maintenance activities. • Model application work and providing interpretation and analysis of model results. • Contributing to reports and technical notes on model development or application activities.	• Experience in public transport modelling and analysis. • Experience with public transport datasets (for example, General Transit Feed Specification (GTFS) and Smart Card ticketing data for Public Transport).
	Land use / demographic modelling tasks, such as: • Undertaking data compilation, analysis, model development and maintenance activities. • Analysis and model application work and providing interpretation of results. • Contributing to reports and technical notes on analysis, model development or application activities.	• Experience in regional and small area analysis, projection and spatial allocation of population, employment and enrolment data. • Experience with human geography related data sets (for example, ABS data, cadastre, land use data, visitor overnight location and tourism data) and economic datasets (including labour force, state and national accounts, tourism accounts, trade and other related datasets). • Proficient in one or more of the following analysis tools or programming languages: Microsoft Excel, Alteryx, python or similar. • Experience working with geospatial data and in the use of GIS software such as QGIS, ArcGIS, MapInfo or similar. • Experience with using relational databases.
TLUM2	As for TLUM1 plus: **Strategic transport modelling** tasks, such as: • Lead and undertake a variety of model development and maintenance tasks. • Provide technical advice to inform the design of and improvement to models. • Lead model application work on behalf of Transport and Main Roads. • Actively engage with and manage technical and non-technical stakeholders on behalf of Transport and Main Roads in regard to mesoscopic transport traffic model development or application projects. • Generate reports and technical notes on model development or application activities.	• 3+ years' experience working as a transport modelling professional. • Experience in leading model development projects, preferably for government. • Experience in programming or other data-science skillsets. • Experience in leading modelling application projects, preferably for government.

Level	Class of Work Description	Commentary
	Mesoscopic traffic modelling tasks, such as: • Lead and undertake a variety of model development and maintenance tasks. • Provide technical advice to inform the design of and improvement to models. • Lead model application work on behalf of Transport and Main Roads. • Actively engage with and manage technical and non-technical stakeholders on behalf of Transport and Main Roads in regard to mesoscopic transport traffic model development or application projects. • Generate reports and technical notes on model development or application activities.	• 3+ years' experience working as a traffic modelling professional. • Experience in leading model development projects, preferably for government. • Experience in model development for the wider area traffic network. • Experience in options analysis and business case modelling. • Experience in programming or other data-science skillsets. • Experience in leading modelling application projects, preferably for government.
	Microsim / intersection traffic modelling tasks, such as: • Lead and undertake a variety of model development and maintenance tasks. • Provide technical advice to inform the design of and improvement to models. • Lead model application work on behalf of Transport and Main Roads. • Actively engage with and manage technical and non-technical stakeholders on behalf of Transport and Main Roads in regard to mesoscopic transport traffic model development or application projects. • Generate reports and technical notes on model development or application activities.	• 3+ years' experience working as a traffic modelling professional. • Experience in leading model development projects, preferably for government. • Experience in programming or other data-science skillsets. • Experience in model development for the urban corridors and traffic impact assessments. • Experience in options analysis and business case modelling. • Experience in pedestrian modelling with microsimulation models. • Experience in leading modelling application projects, preferably for government.
	Public transport modelling tasks, such as: • Lead and undertake a variety of model development and maintenance tasks. • Provide technical advice to inform the design of and improvement to models. • Lead model application work on behalf of Transport and Main Roads. • Actively engage with and manage technical and non-technical stakeholders on behalf of Transport and Main Roads in regard to mesoscopic transport traffic model development or application projects. • Generate reports and technical notes on model development or application activities.	• 3+ years' experience working as a transport modeller. • Experience working with one or more of the following modelling software packages: EMME, CUBE, AIMSUN, VISUM / VISSIM, SATURN, RailSys. • Experience in coding, database design and management, cloud-computing or other data-science skillsets. • Experience in visualising and presenting public transport observed and modelled data for both modelling and transport planning audiences. • Experience with transit network planning software such as Remix. • Experience in leading modelling application projects, preferably for government.

Level	Class of Work Description	Commentary
	Land use / demographic modelling tasks, such as: • Lead and undertake conduct of or developing population, employment and enrolment forecasting analyses, models, methods and maintenance tasks. • Provide technical advice to inform the design of and improvement to analysis and model methods. • Lead analysis and model application work on behalf of Transport and Main Roads. • Actively engage with and manage technical and non-technical stakeholders on behalf of Transport and Main Roads in regard to land use / demographic analysis or model development or application projects. • Generate reports and technical notes on analysis, model development or application activities.	• 3+ years' experience working as a small area population or employment modelling, forecasting professional. • Experience in leading and implementing innovative and best practice methodologies and projects for the analysis, projection and allocation of population, employment and enrolment data, including methodology and model development. • Technical expertise (including associated software, geospatial and analytical tools) in demographic analysis and data development relevant to transport modelling, including small area demographic projections, geospatial analysis, statistical analysis, and assimilation of land use planning information. • Experience with human geography related data sets (for example, ABS data, cadastre, land use data, visitor overnight location and tourism data) and economic datasets (including labour force, state and national accounts, tourism accounts, trade and other related datasets) and dealing with disparate datasets (from different sources), in different formats and data cleansing.
TLUM3	As for TLUM2 plus: **Strategic transport modelling** tasks, such as: • Lead and manage model development projects. • Provide expert technical and specialist advice to inform the design of and improvement to strategic transport models.	• Significant experience in leading model development and application projects, preferably for government. • 7+ years' experience in model development and application strategic transport models.
	Mesoscopic traffic modelling tasks, such as: • Lead and manage model development projects. • Provide expert technical and specialist advice to inform the design of and improvement to mesoscopic models.	• Significant experience in leading model development and application projects, preferably for government. • 7+ years' experience in model development and application for urban and large scale traffic models.
	Microsim / intersection traffic modelling tasks, such as: • Lead and manage model development projects. • Provide expert technical and specialist advice to inform the design of and improvement to microsim / intersection models.	• Significant experience in leading model development and application projects, preferably for government. • 7+ years' experience in model development and application for complex urban network models.

Level	Class of Work Description	Commentary
	Public transport modelling tasks, such as: • Lead and manage model development projects. • Provide expert technical and specialist advice to inform the design of and improvement to public transport models.	• Significant experience in leading model development and application projects, preferably for government. • 7+ years' experience in public transport modelling or analysis.
	Land use / demographic modelling tasks, such as: • Lead, plan, manage and/or conduct a range of projects concerned with small area population, employment and enrolment statistics and projections. • Provide expert technical and specialist advice to inform the development of demographic and land use related spatial data sets relevant to transport modelling and planning. • Analyse and draw conclusions from very large and complex data sets from multiple sources, including identifying data set limitations.	• Significant experience in leading and implementing innovative and best practice methodologies and projects for the analysis, projection and allocation of population, employment and enrolment data. • 7+ years' technical expertise (including associated software, advanced geospatial and analytical tools) in demographic analysis and data development relevant to transport modelling, including small area demographic projections, geospatial analysis, statistical analysis, and assimilation of land use planning information. • 7+ years' experience with human geography related data sets (for example, ABS data, cadastre, land use data, visitor overnight location and tourism data) and economic datasets (including labour force, state and national accounts, tourism accounts, trade and other related datasets) and dealing with large disparate datasets (including pulling data together from different sources), in different formats and data cleansing.

8.13 Transport Planning

Points for consultants to note:

• Please ensure the submission addresses the classes of work outlined in Table 6.13 and demonstrates a clear understanding of the distinction between traffic engineering and transport planning:

  – Traffic Impact Analysis, Traffic Management and Operation Plans are considered Traffic Engineering, not Transport Planning.

  – Detailed infrastructure design, even for large projects, is considered Traffic Engineering / Highway Engineering, not Transport Planning.

• TP2 and TP3 level projects must demonstrate multi-modal planning in a corridor / network context and consider broader network options and impacts – not just a solution for single link / intersection / interchange (considered Traffic engineering / Highway Engineering).

- For TP2 and TP3 prequalification, the consultant needs to demonstrate consideration / evaluation of multi-modal requirements (potentially including private vehicles, freight, train, tram, bus, ferry, rideshare, cycles and walking) to determine the need for infrastructure upgrades / changes and its preferred form and function.

- Two new prequalification categories have been introduced – Data Analysis & Insights, and Transport & Land Use Management. TP3 prequalification no longer requires demonstrated capability to develop and refine complex transport models. Notwithstanding this, TP2 and particularly TP3 prequalification still require evidence of ability to effectively apply analytical tools and interpret modelling outputs to inform planning activities.

- Where the consultant is not wholly responsible for a nominated the project, the consultant is to clearly indicate what aspect of the project they worked on and the cost of the transport planning component. Providing the overall contract or construction value will not be deemed appropriate. On multi-disciplinary projects, the consultant is to indicate what percentage of the fees were associated with transport planning.

- For TP1 and TP2 prequalification relating to data collection, the consultant needs to describe their ability to develop and deliver data collection methodologies to meet project requirements.

The prequalification levels for transport planning with commentary are described in Table 8.13.

Table 8.13 – Transport Planning prequalification levels with commentary

Level	Class of Work Description	Commentary
TP1	• Planning for simple networks.	• Examples may include options analysis of rural / low traffic volume roads and subdivision design including undertaking multi-criteria analysis against factors such as safety, access, environment, community impacts, mix of, and potential conflict between traffic types and flood immunity.
	• Local traffic management planning.	• Examples should demonstrate successful integration of various transport modes at a given location or precinct.
	• Transport data collection.	• Examples may include design and implementation of traffic surveys or determination of necessary count locations to inform planning.
	• Network concept planning.	• Examples may include network concepts (road, public transport and active networks) for small master planned communities or large sub-divisions requiring an internal road hierarchy. • This does not include road / intersection design.
	• Prioritisation of transport improvements.	• Examples may include Options Analysis.
	• Stakeholder liaison	• Examples may include the identification of, and engagement with, key stakeholders to inform planning.

Level	Class of Work Description	Commentary
TP2	**As for TP1 plus:**	
	• Planning for medium complexity networks at a corridor or area scale.	• Examples must be for projects at corridor or area scale – not single intersections or road links.
		• Examples should show how corridor function was determined and how it was applied to identify preferred transport outcome and infrastructure form.
		• Examples should demonstrate how include corridor / area strategies address identified transport problem(s) and the recommended infrastructure and/or non-infrastructure initiatives.
		• Examples should demonstrate how I, state, regional and/or local policy contexts were considered.
		• Examples should include instances where non-infrastructure solutions were also assessed.
		• Examples should take account of social, environment and economic outcomes.
	• Applying modelling tools and other evaluation techniques.	• Examples may include demonstrated ability to develop and assess modelling scenarios to evaluate benefit / impact of plans / transport options.
		• Examples may demonstrate understanding of strengths and weaknesses of available models and application of fit-for-purpose models and evaluation methodologies.
		• This does not include Traffic Impact Assessment or Road Safety Audits
	• Travel Demand Management.	• Examples should demonstrate identification, evaluation and implementation of non-infrastructure initiatives to reduce demand on target networks (and potentially reducing scope of infrastructure upgrades). This may include initiatives to encourage: reduced travel; use of a different route; travel at a different time or use of a different mode.
	• Stakeholder management	• Examples may include the identification of stakeholders and development / application of specific strategies to keep them informed of planning progress or elicit input to inform planning to reduce projects risk.

Level	Class of Work Description	Commentary
TP3	**As for TP2 plus:**	
	• Regional level multi-modal transport planning for complex networks.	• Examples may include planning for very large areas with extensive multi-modal networks. Planning should demonstrate an ability to balance competing modal demands and prioritise network improvements using sophisticated evaluation techniques such as multi-modal modelling, multi-criteria analysis and benefit cost assessment. • Examples may include preparation of Integrated Regional Transport Plans, passenger transport network plans, freight studies or larger planning studies incorporating broad scale transport models.
	• Freight operations.	• Examples should demonstrate a detailed understanding of freight operational requirements and operating conditions and interdependencies with intermodal terminals and land use. • Examples should demonstrate an understanding of viable freight operations.
	• Passenger transport operations.	• Examples may demonstrate a detailed understanding of passenger transport operational requirements and operating conditions, passenger demand and interdependencies with other modes / networks. • Examples should demonstrate an understanding of viable passenger transport operations.
	• Complex stakeholder management and community consultation.	• Examples should demonstrate the ability to develop and implement community consultation strategies and tactics to effectively engage diverse communities. • Examples should demonstrate a comprehensive understanding of consultation techniques and familiarity with a range of engagement tools and approaches. • Examples should demonstrate effective application of consultation techniques to fulfil project requirements, reduce project risk, value-add to the planning process and promote community acceptance / ownership of planning outputs.