

SPECIFICATION

This Contract uses ACT Standard Specification for Urban Infrastructure Works Edition 1 Revision 0 October 2002 (ACT Standard Specification):

The text of the ACT Standard Specification is not included in this document. The ACT Standard Specification may be obtained from:

Roads ACT
Department of Territory & Municipal Services
Level 7, Macarthur House
12 Watlie Street, Lynnham ACT 2602
Phone: 6207 6868

NSW RTA QA Specifications

The following specifications shall over-ride the Standard ACT specifications

QA SPEC	CQ21	GUIDE FOR CONTRACTORS ON SURVEY PROCEEDURES
QA SPEC	G2	GENERAL REQUIREMENTS
QA SPEC	G35	ENVIRONMENTAL PROTECTION (MANAGEMENT PLAN)
QA SPEC	Q7	QUALITY SYSTEM (TYPE 7)
QA SPEC	R39	DRAINAGE MATS
QA SPEC	132	SAFETY BARRIER SYSTEMS
QA SPEC	R116	ASPHALT
QA SPEC	B59	BORED CAST-IN-PLACE REINFORCED CONCRETE PILES
QA SPEC	B80	CONCRETE WORK FOR BRIDGES
QA SPEC	B110	MANUFACTURE OF PRETENSIONED PRECAST CONCRETE MEMBERS
QA SPEC	B113	POST-TENSIONING OF CONCRETE
QA SPEC	B115	PRECAST CONCRETE MEMBERS (NOT PRE TENSIONED)
QA SPEC	B150	ERECTION OF PRETENSIONED PRECAST CONCRETE MEMBERS
QA SPEC	B170	SUPPLY AND INSTALLATION OF VOID FORMERS
QA SPEC	B200	FABRICATION OF MAJOR STEEL STRUCTURAL MEMBERS
QA SPEC	B264	ERECTION OF BARRIER RAILINGS AND MINOR COMPONENTS
QA SPEC	B280	UNREINFORCED ELASTOMETRIC BEARING PADS AND STRIPS
QA SPEC	B281	LAMINATED ELASTOMETRIC BEARINGS
QA SPEC	B282	CONFINED ELASTOMETRIC (POT TYPE) BEARINGS
QA SPEC	B284	INSTALLATION OF BRIDGE BEARINGS
QA SPEC	B310	COMPRESSION JOINT SEALS
QA SPEC	B312	COLD APPLIED ELASTOMETRIC JOINT SEALANTS
QA SPEC	B315	ELASTOMETRIC STRIP SEAL EXPANSION JOINTS
QA SPEC	B344	BITUMINOUS WATERPROOF MEMBRANE FOR CONCRETE BRIDGE DECKS

The text of these specifications is not included in this document and are available from the NSW RTA website.

AND

the following Technical Exception Clauses.

The Technical Exception Clauses supplement or replace requirements specified in the Standard Specification and shall be read in conjunction with that document. Where there is inconsistency between the ACT Standard Specification and the Technical Exception Clauses, the Technical Exception Clauses shall prevail to the extent of the inconsistency.

Page 88

TECHNICAL EXCEPTION CLAUSES

CONTENTS

SECTION A GENERAL

SECTION 1 PROVISION FOR TRAFFIC

SECTION 2 EARTHWORKS

SECTION 3 UNDERGROUND SERVICES

SECTION 4 FLEXIBLE PAVEMENT CONSTRUCTION

SECTION 6 CONCRETE KERBS, FOOTPATHS AND MINOR WORKS

SECTION 8 INCIDENTAL WORKS

SECTION 10 ROAD SIGNS

SECTION 14 STREET LIGHTING

SECTION 15 MAJOR CONCRETE WORKS

RTA SPECIFICATIONS

Page 90

Page 89

SECTION A GENERAL

A.01 ACCEPTANCE OF SITE

The Contractor shall take full responsibility for the site and accept it in its present condition.

A.02 SAFETY

At all times carry out the works in a safe manner and conform to any statutes, regulations, orders, etc. relating to persons and/or property on or neighbouring the site, and assume full responsibility for all claims, injury or damage arising from the works.

A.03 EXISTING UTILITIES

Before commencing work on the site the Contractor must verify the location of all existing utilities on site in the presence of the Superintendent and obtain clearances from asset owners/maintainers.

The Contractor must notify the Superintendent immediately upon the discovery of utilities or obstructions not shown on the Design Documents or identified by inspection.

The Contractor must immediately notify the Superintendent in the event of damage to any water, electric, drainage, sewerage, telecommunications, control cables or other utilities in the area. The Contractor must also repair, divert, relocate, cut, seal, disconnect or make safe as required by the relevant authority.

Check all levels and locations of irrigation supply pipes, stormwater drains and pits, conduits and associated pits, electrical supply, water supply, irrigation supply etc. to which connection will be required.

Inform the Superintendent of any variations from the levels given and any difficulties in maintaining the required grades of pipelines.

Existing utilities which new utilities are to pass under, over or connect to are to be potholed by the Contractor at least 2 days in advance of the proposed works to determine that levels are correct. The cost of potholing is to be allowed for the rates generally.

Allow for the cost of any necessary repairs in the event of damage to all services.

A.04 SETTING OUT

Page 91

The Contractor shall set out the Works to the lines, levels and dimensions shown in the Contract Documents or directed by the Superintendent from ACT Survey Office permanent marks and bench marks in the area (this is a Witness Point). Should the Contractor move or destroy a mark it shall establish a new mark at the location directed by the Superintendent and to the standards of the Australian Survey and Land Information Group (AuSLIG), and this work shall be carried out by a registered surveyor.

If there is an inconsistency between setout information provided and survey marks, they shall be brought to the attention of the Superintendent and no works are to proceed until the resolution of the discrepancy.

The Superintendent may be required to check the setting out of all or any part of the Works.

The Contractor shall provide, without extra charge, all necessary assistance, labour and materials or staging which the Superintendent may require for checking the setting out or verifying completed work. Work shall be suspended for such times as are necessary for checking the lines, permanent marks and levels of any part of the Works.

The ultimate responsibility for the accuracy of the setting out from the permanent marks and bench marks shall rest entirely with the Contractor.

The Contractor shall provide a certificate from a registered surveyor to show that the Works have been constructed in accordance with the lines and levels shown on the Drawings within the specified tolerances.

Drawing and setting out information will only be provided in hard copy form. If the Contractor requests the Principal's Consultant to provide information in a format other than Portable Document Format (PDF), the Principal's Consultant will require the Contractor to consent to and acknowledge, by signing the attached agreement below.

DIGITAL INFORMATION CONSENT AND ACKNOWLEDGEMENT FORM

Providing Party (insert company name): AECOM

It is the Providing Party's policy to only provide information in hard copy form. If a party requests (Requesting Party) the Providing Party to provide information in a format other than Portable Document Format (PDF), the Providing Party requires the Requesting Party to consent to and acknowledge the following terms and conditions before the Providing Party provides the requested digital information. Accordingly, please sign and return this consent and acknowledgment form (Form) to receive the Digital Information. The Providing Party provides digital information in accordance with these terms and conditions.

The Requesting Party acknowledges and agrees:
the Digital Information is only provided for the Requesting Party's internal consideration and use;
the Digital Information may not be a true, accurate, current or certified representation of the corresponding hard copy document;
a hard copy document takes precedence over any corresponding Digital Information;
translation of the Digital Information to another format may result in loss of information;
the Providing Party is not responsible for any errors or omissions in or any misuse or misinterpretation of the Digital Information; and
the Digital Information is not to be used for the preparation of shop drawings.

The Requesting Party warrants:

Shared Services Procurement – Tender for Construction Projects using a Lump Sum (AS2124) Delivery System
Template Version 11.2 of 28 July 2011

Page 92

All surfaces outside the area of the nominated works disturbed during the construction of the works shall be reinstated to at least the condition existing prior to the commencement of work

A.07 CO-ORDINATION OF WORK

Before commencing work, check with controlling authorities that the location and details of existing or proposed services in or adjacent to the road reserve as shown in the documents are up to date. Liaise with those Authorities when they carry out work, which affects or is in conjunction with the works of this Contract. The contractor is responsible for any damage to services. Where required, co-ordinate with other Contractors carrying out adjacent contracts.

A.08 COSTS OF TESTING

The Contractor shall allow for all costs of testing and pay all required fees for services connections to achieve Operational Acceptance.

A.09 PAY ITEMS

Descriptions of pay items are included at the end of each specification part. Where an inconsistency occurs between the method of measurement in the specification and that detailed in the Schedule of Rates or Schedule of Prices the measurement indicated in the schedules shall prevail.

A description of pay items for works carried out in accordance with sections of the RTA QA Specification are included at the end of the relevant RTA section.

A.10 MEASUREMENT AND PAYMENT OF GENERAL ITEMS

General

Payments will be made against specific Preliminary items where such items are listed in the Bill of Quantities. Charges under these headings shall represent all expenditures which are not proportional to be measured quantities of work carried out and which are not included in the loading for sundry costs, general overhead and profit. Where such items are not specifically billed, their costs shall be included in rates generally.

It is not mandatory for the Contractor to price Preliminary items separately. Allowance for such charges may be included against rates generally. Where this is done, the words "No separate charge" shall be entered against items for fixed and time related charges.

Items 01P1 and 01P2 Contractor's and Superintendent's Site Facilities

These items shall be lump sum.

it shall only use the Digital Information for the purpose for which it was prepared;
it shall only rely on approved hardcopy format drawings and documents received from the Providing Party;
it shall not provide the Digital Information (or any part thereof including the metadata) to any other party without the Providing Party's express written consent (which the Providing Party may withhold in its sole and absolute discretion);
its agents, employees, subcontractors and any third party to whom the Digital Information is provided to in accordance with this Form agree to and comply with this Form (mutatis mutandis); and
it shall ensure it has the appropriate software (including the correct version) and hardware to consider and use the Digital Information.

The Requesting Party indemnifies, releases and holds the Providing Party harmless from and against all claims, loss, expense and liability, both direct and indirect, of whatsoever nature and however arising from or in connection with the Digital Information and any electronic or physical corruption to computer generated or electronically remitted information, software or hardware associated with the use, dissemination or receipt of the Digital Information.

The Providing Party makes no warranty or representation of any kind, either expressed or implied, including (without limitation) any warranty of merchantability or fitness for purpose in relation to the Digital Information (or any part thereof including metadata) or software or hardware associated with the use, dissemination or receipt of the Digital Information.

Signed for and on behalf of (insert name of Requesting Party) _____ by an authorised representative.

Name _____ Signature _____ Title _____ Date _____

A.05 DIVERSION AND CARE OF WATER

The Contractor shall design, construct and maintain all diversion conduits, drains, sumps and other temporary diversion and protective works which are necessary for construction of the works and to prevent ingress of water into the existing pavement base and sub-base materials.

The Contractor shall be responsible for and shall repair, at his expense, any damage to pavement or any other parts of the Works caused by his failure to protect the Works in accordance with the requirements of this Clause.

The Contractor shall remove all water from the site of surface works and shall keep excavations free of water while excavating, preparing foundations, and while placing embankment materials, backfill or concrete or as otherwise required for completing the works.

A.06 RESTORATION OF DISTURBED SURFACES

Shared Services Procurement – Tender for Construction Projects using a Lump Sum (AS2124) Delivery System
Template Version 11.2 of 28 July 2011

Page 93

These items shall cover all costs, including statutory fees relating to site establishment including the construction of a site compound with 2.1m high chain mesh fencing and gates, connection and installation of temporary utilities, construction and maintenance of temporary roads and hardstanding, supply and erection of 2 No. project signs as specified in Clause 9.01 of the General Conditions of Contract, provision and construction of temporary buildings and amenities, including equipment, furniture and the like, together with maintenance and removal of the same on completion and the restoration of the areas involved to at least the pre-construction condition.

Item 01P3 Day Works

This item is a Provisional Sum and will be used where necessary to cover the costs Day Works instructed by the Superintendent.

Items 01P4 and 01P5 Temporary and Permanent Environmental Protection Works.

These items shall be lump sums

These items include the construction, maintenance and subsequent removal of all temporary environmental safeguards, dilapidation reports, the design of temporary structures, obtaining a licence under the relevant environmental acts and regulations, subsequent removal and the reinstatement of disturbed areas as specified together with cleaning, repair and servicing of temporary structures and all other activities required to meet the requirements of environmental legislation and guidelines during construction, landscape consolidation and the Defects Liability Period.

Also included in these are measures prescribed in the documents in addition to temporary structures including timing, order of work and other measures required for effective environmental safeguards during construction, e.g. tree protection.

Allow for the cost of laboratory testing in the rates generally.

Allow for the removal of silt, excess excavation (spoil) during construction and use and the subsequent removal of the erosion control and sedimentation measures when directed and the reinstatement of disturbed surfaces.

Pay Item 01P6 Work-As-Executed Drawings and Asset Surveys

This shall be a Lump Sum item.

The Contractor shall be supplied with a set of the latest construction drawings in AutoCAD format. The Contractor shall modify the drawings to reflect the as-constructed works. The WAE drawings shall be in the electronic format specified, shall reflect the as constructed works and be suitable for achieving Operational Acceptance by the Authorities.

The Design Agent (AECOM) will provide drafting services to the Contractor for preparation of the WAE drawings. However, the Contractor shall be responsible for managing the input, preparation, review and certification of the WAE drawings.

Allow for the completion and submission of an Asset Schedule in the format required by TaMIS

Item 01P8 Survey Control

This Item shall be a lump sum

This pay item shall include all costs associated with the setup and maintenance of survey controls for the setting out of the works and verification that the works have been constructed in accordance with the lines and levels shown on the Drawings within the specified tolerances. The survey controls shall be maintained for the duration of the Contract.

Pay Item 01P10 Coordination of utilities construction

This shall be a Lump Sum item.

This pay item shall include all costs associated with the liaison, coordination and programming of work schedules with all the utility Authorities (Actew, Jemena, ActewAGL, Telstra, TransACT, Icon).

Pay Item 01P11 Co-ordination with adjacent contracts

This shall be a Lump Sum item.

This pay item shall include all costs associated with the liaison, coordination and programming of work schedules with all contractors and builders working on adjacent sites

Pay Item 01P12 Compliance and audit testing

This shall be a Provisional Sum item.

These tests are to be carried out only as directed by the Superintendent. These are not meant to replace the testing to be undertaken by the Contractor as part of their Quality Assurance system for the project.

Pay Item 01P13 Arboriculturist

This Item shall be a lump sum

This item shall cover all costs associated with the engagement by the Contractor of qualified arboriculturist to oversee, direct and advise the contractor on work procedures adjacent to trees and their root systems

SECTION 1: PROVISION FOR TRAFFIC

1.02 STANDARDS

DELETE

1st paragraph

SUBSTITUTE

Work carried out and testing performed under this Section of the Specification shall comply with the requirements of the following Standards, Legislation, References and Publications and their successors to the extent that they are relevant and not overridden by the Specification.

Legislation

DELETE

Occupational Health and Safety Act 1989

SUBSTITUTE

Work Safety Act 2008

1.04 GENERAL

1.04.1 Construction Operations

2nd paragraph

DELETE

3rd dot point

Occupational Health and Safety Act 1989

SUBSTITUTE

Work Safety Act 2008

1.06.2 Temporary Traffic Management Plan

(c) A signpost layout plan

ADD 4th dot point

- Location of variable message electronic signs and messages to be displayed.

1.06.3 Side Tracks

ADD

This clause shall apply to temporary roads constructed as part of the Temporary Traffic Management arrangements.

SECTION 1: PROVISION FOR TRAFFIC

CONTENTS

1.04 GENERAL

1.04.1 Construction Operations

1.04.2 Temporary Traffic Management Plan

1.06 OBSTRUCTIONS AND SIDE TRACKS

1.06.2 Side Tracks

STANDARD SPECIFICATION FOR URBAN INFRASTRUCTURE WORKS

SECTION 2: EARTHWORKS

CONTENTS

2.01 SCOPE

2.02 STANDARDS

2.03 PROTECTION OF THE WORKS

2.03.2 Protection of Earthworks

2.03.4 Protection of Completed Earthworks

2.03.6 Vibration

2.04 CLEARING AND GRUBBING

2.04.1 General

2.04.2 Care of Trees

2.04.4 Chipping of Cleared Vegetation

2.05 EXCAVATION

2.05.1 General

2.05.3 Use of Explosives

2.05.4 Disposal of Surplus Spoil

2.05.8 Maintenance of Excavation

2.07 SUB-GRADE PREPARATION

2.07.1 Sub-grade Levels

2.07.2 Cut Sub-grade

2.07.5 Clay Sub-grade

2.07.6 Unsuitable Sub-grade Materials

2.07.8 Sub-grade Test Pits

2.07.9 Confirmation of Cut and Fill CBR Values

2.09 ACCEPTANCE

2.09.6 Setting Out

2.10 MEASUREMENT AND PAYMENT

SECTION 2: EARTHWORKS

2.01 SCOPE

ADD

The Contractor shall employ at its own cost a recognised Geotechnical Engineering Consultant with appropriate qualifications and experience to provide advice and recommendations on methods to be employed to achieve the intent of this Specification and confirm sub-grade strengths.

The Contractor shall accept the site in its existing condition and shall make all due allowances for preparing and establishing the encountered ground to the condition specified for the construction of the various works specified in the Contract.

Allow for the excavation and filling in all classes of materials.

The volume of earthworks shall be measured by survey. The Contractor is to provide adequate survey information to demonstrate actual earthworks quantities.

2.02 STANDARDS

Insert after "following" in 2nd line 1st paragraph "current".

ADD

AS 2870 Residential Slabs and Footings
AS 3798 Guidelines on Earthworks for Commercial and Developments Residential

2.03 PROTECTION OF THE WORKS

2.03.2 Protection of Earthworks.

ADD new paragraph

The Contractor shall design, construct and maintain all diversion conduits, drains, sumps and other temporary diversion and protective works which are necessary for construction of the works and to prevent ingress of water into the existing pavement base and sub-base materials. The Contractor shall be responsible for and shall repair, at its expense, any damage to pavement or any other parts of the Works caused by its failure to protect the Works in accordance with the requirements of this Clause.

The Contractor shall remove all water from the site of surface works and shall keep excavations free of water while excavating, preparing foundations, and while placing embankment materials, backfill or concrete or as otherwise required for completing the Works.

2.03.4 Protection of Completed Earthworks

ADD

Should permanent grassing not be practicable, due to seasonal constraints, the disturbed areas shall be stabilised until permanent grassing can be carried out by the application of bitumen emulsion, at a rate of 0.5 L/m² to 0.7 L/m². During this period of seasonal constraint, temporary grassed areas shall be sown and bitumen straw mulched.

Payment for temporary grassing shall be included in the rates for All grassing as nominated in Clause 9.05.1 of the Specification

ADD new clause

2.03.5 Vibration

Limit all vibration from impact hammering and the like, to a peak particle velocity (ppv) of 5mm per second with 10% not to exceed 10mm/second.

Monitor vibrations using appropriate equipment. Engage all necessary specialist monitoring services to ensure vibration does not exceed the specified limits.

2.04 CLEARING AND GRUBBING

2.04.1 General

DELETE 4th paragraph

SUBSTITUTE

The limits of clearing shall be limited to minimum areas required to construct the works or as noted otherwise on the tree retention plan.

ADD

2.04.2 Care of Trees

DELETE Clause

SUBSTITUTE

All trees not shown for removal are to be retained. These trees represent a valuable asset to the Canberra community. Consequently, the Contractor shall take all care to ensure trees not scheduled for removal are protected from damage at all times.

HOLD POINT 2.1A

Process Held: Commencement of Work

Submission Details: Prior to the commencement of any work on the site, including site establishment, the Contractor shall provide a Work Method Statement (WMS) detailing; its understanding of the sensitivity of trees; methods of working adjacent to trees (laterally and vertically); and details of tree protection measures.

Release of Hold Point: The Superintendent will check the WMS for compliance to the Specification prior to authorising release of the Hold Point.

Display a sign in a prominent position at each entrance to the site, warning that trees and plantings are to be protected during the contract. Remove on completion.

Page 101

Use road sign type sans serif letters, 100mm high, in red on a white background, to AS 1744.

Where work is required adjacent to trees to be retained they shall be protected from damage as follows.

For high value mature existing trees provide an Exclusion Zone consisting of temporary protective enclosures fabricated from F62 reinforcing mesh 1800mm high wired to 2400mm long start pickets, driven 600mm into the ground, spaced 1800mm apart or chainmesh and tubular frame panels supported on precast concrete feet erected 2.0m minimum from the tree drip line.

Existing immature tree plantings shall be protected with a Type T fence.

Where excavations are to be made near trees immediately outside the fenced Exclusion Zone, add continuous 900mm high corrugated galvanised steel sheeting, bedded 150mm into the ground, wired to the enclosure.

Should it be necessary to install underground services within the Exclusion Zone of a tree to be retained the services shall be installed by thrust boring techniques as so as to minimise disturbance to the tree roots.

Where work is to be performed adjacent to trees, give notice and obtain instructions from the Contractor's arboriculturist.

All trees to be retained have a damages liability in accordance with ACT Tree Protection Legislation.

Do not remove topsoil from, or add topsoil to, the area within the Exclusion Zone of the trees.

Protection of root systems is also very important. Procedures for excavation for pavements are set-out in the following specification Clauses and must be adhered to so that impacts on tree root systems are minimised.

Use hand methods to locate, expose and cleanly remove the roots on the line of excavation. If it is necessary to excavate within the drip line, use hand methods such that root systems are preserved intact and undamaged.

Do not cut tree roots exceeding 50mm diameter. Where it is necessary to cut tree roots, use means such that the cutting does not unduly disturb the remaining root system. Immediately after cutting, apply a bituminous fungicidal sealant to the cut surface to prevent the incursion of rot or disease.

Backfill to excavations around tree roots with a mixture consisting of three parts by volume of topsoil and one part of well rotted compost with a neutral pH value, free from weed growth and harmful materials. Place the backfill layers, each of 300mm maximum depth, compacted to a dry density similar to that of the original or surrounding soil. Do not backfill around tree trunks to a height greater than 300mm above the original ground surface. Immediately after backfilling, thoroughly water the root zone surrounding the tree.

Do not compact the ground under trees. If compaction occurs, obtain advice from the Contractor's arboriculturist on methods of rectification.

During the grubbing of tree stumps care must be exercised at all times to minimise the impact of grubbing on root systems of trees to be retained.

2.04.5 Chipping of Cleared Vegetation

Delete Clause

SUBSTITUTE

The Contractor shall mulch the foliage and branches <100mm diameter from all vegetation to be removed with the exception of the following:

- i) Vegetation displaying evidence of disease or weed infestation; and/or
- ii) Weed species

Mulch from eucalyptus trees is to be kept separate from mulch from pine trees.

Obtain Superintendents approval prior to removal and mulching of existing vegetation.

Mulch particle size shall not have 2 orthogonal dimensions exceeding 75mm and 50mm.

Mulch shall be free of soil, stones, twigs and other extraneous matter.

Mulched material shall be stockpiled on site at a location directed by the Superintendent. The stockpile height shall not exceed 1.5 metres. Apply water to the stockpile as required to reduce the build up of heat within the material.

The stockpiled materials shall be used for mulched planting beds as required for the landscape components of the project. All unused materials shall be delivered to the nearest PCL Depot.

2.05 EXCAVATION

2.05.1 General

ADD new paragraphs

Notwithstanding the requirements of the following clauses, carry out excavation work as nominated in Clause 2.05.1 exercising all care to minimise the impact on the root systems of existing trees.

2.05.2 Stripping and Stockpiling of Topsoil

ADD after 1st paragraph

Topsoil not required for reinstatement works shall be removed and disposed of off-site as it is excavated.

2.05.3 Use of Explosives

DELETE references to explosive use

Page 103

SUBSTITUTE

The use of explosives on this project is prohibited.

Limit all vibration from impact hammering and the like, to a peak particle velocity (ppv) as listed in Table 2.1.

Monitor vibrations using appropriate equipment. Engage all necessary specialist monitoring services to ensure vibration does not exceed the specified limits.

2.05.4 Disposal of Surplus Spoil

DELETE Clauses 1 to 5. Retain Hold Point
SUBSTITUTE

All excavated materials not required for subsequent filling operations shall be removed and disposed of off-site as it is excavated.

All materials such as demolished concrete, pavements, concrete pipes, organic matter unsuitable for landscape works and materials classified as unsuitable for use in fills shall be removed from site and disposed of at an approved recycling depot or otherwise legally disposed of as it is exhumed or demolished.

ADD new clause

2.05.8 Maintenance of Excavation

- (i) No water shall be allowed to accumulate in any excavation. The ground surface around all excavation shall be so graded that surface water is diverted away from the excavation. It is essential that all excavations be kept as dry as possible.
- (ii) Temporary shoring shall be provided and removed as necessary.
- (iii) Temporary drains shall be provided, removed and re-used as required.
- (iv) Pumps shall be provided during the progress of the excavations and so arranged that pools of water cannot collect on any part of the excavated ground.

If rain occurs over weekend or holidays, the Contractor must provide pumps and operators to keep the excavations clear of water during these periods also.

2.07 SUB-GRADE PREPARATION

2.07.1 Sub-grade Levels

ADD
Sub-grade assessment will include proof rolling as nominated in AS 3798 at the Contractor's expense.

ADD

Pay Item 204P1 Clearing and Grubbing
AMEND the unit of measurement to be a lump sum item. Allow in the item for the grubbing of existing tree stumps as encountered during the construction of the works.

ADD
Pay Item 204P1.1 Removal of Nominated Trees

This unit of measurement shall be a lump sum.

Pay item 205P2 General Earthworks
DELETE 'natural' from 1st paragraph and SUBSTITUTE 'existing'.

In Paragraph 4 the 'designed floor level' includes the boxing level of pavements

2.07.8 Sub-grade Test Pits

Excavate test pits shown in the Geotechnical Investigation Report and backfill to underside of road pavement materials with select fill (complying with Clause 2.06.2) compacted to 95% MMDD.

ADD

2.07.9 Confirmation of Cut and Fill Sub-grade CBR Values

HOLD POINT 2.9

Process Held: Confirmation of CBR values in cut and fill sub-grades.

Submission Details: Provide CBR test results of all cut and fill sub-grades confirming the requirements shown on the drawings have been achieved.

Release of Hold Point: The Superintendent will consider the submitted test results and may direct further action prior to authorizing the release of the Hold Point.

2.09 ACCEPTANCE

ADD

2.07.9 Setting Out

Set out the whole of the works in accordance with the drawings in such a manner that markings (whatever used) are not lost during construction or mistaken in a way to cause inaccuracies.

Where no figured dimensions are given, notify Superintendent immediately to arrange for instruction.

It is incumbent on the Contractor to see that the intent of the design is constructed faithfully as possible.

2.10 MEASUREMENT AND PAYMENT

ADD

Pay Item 203P1 Protection of the Works
This shall be a Lump Sum item.

This pay item shall include all activities associated with the protection of the works, which may include site fences, sediment and erosion control measures and protection of existing trees. This rate shall include maintenance of the fence for the full term of the contract.

SECTION 3: UNDERGROUND SERVICES

CONTENTS

- 3.01 SCOPE
- 3.02 STANDARDS
- 3.03 EXCAVATION AND BACKFILLING
 - 3.03.2 Excavation
 - 3.03.3 Use of Explosives
- 3.05 STORMWATER DRAINAGE
 - 3.05.1 Materials
 - 3.05.2 Pipe Bedding
 - 3.05.3 Drainage Structures
 - 3.05.5 Conformance Criteria
 - 3.05.6 Acceptance by Stormwater Authority
 - 3.05.7 Connection to Existing Downstream System
- 3.06 SUBSOIL DRAINS
 - 3.06.1 Materials
 - 3.06.5 Conformance Criteria
 - 3.06.6 Drainage Blanket
- 3.07 CONDUITS
 - 3.07.6 Cable Pits
- 3.11 MEASUREMENT AND PAYMENT

SECTION 3: UNDERGROUND SERVICES

3.03 EXCAVATION AND BACKFILLING

3.03.2 Excavation

ADD after last paragraph

(i) Water in Trenches

If a spring of water or water seepage is encountered in the trench foundation it shall be sealed off by grouting or by means accepted by the Superintendent.

If the Superintendent determines that any material has been damaged by water, or earth-fill has been excessively moistened by inflowing water or springs in the foundation, the said material or earth-fill shall be removed from the work and replaced with material approved by the Superintendent by the Contractor at his own expense.

Where groundwater is permanently above the bottom of the trench the ground water table shall be lowered to below the bottom of the trench. Lowering of the water table shall be continuously maintained for the duration of the pipelaying operations including backfilling and compaction. Well-points and/or bore-hole pumps or any other approved method may be used. The Contractor shall submit details of the method he proposed to use to the Superintendent for his approval at least two (2) weeks prior to working in any affected area.

Where pumping equipment is used for dewatering and for catch and diversion drain outlets, the means of discharge shall be located and controlled so as not to cause erosion or damage to the environment and shall be to the approval of the Superintendent. Pump water to the SRP.

All costs associated with the control and/or with removal of water from excavations shall be met by the Contractor.

Open excavations and open ends of pipework are to be left in a safe and secured state outside working hours, all to the satisfaction of the Superintendent.

3.03.3 Use of Explosives

DELETE Clause

SUBSTITUTE

The use of explosives on this project is prohibited.

3.03.6 (iv) Construction Traffic

ADD

Where the Contractor proposes to move heavy construction plant and vehicles over pipe or box culvert structures before the minimum cover requirements detailed in Table 3.1 have been achieved, the Contractor shall design and provide protective measures for each crossing.

Rates for pipes and culverts shall be deemed to include all costs associated with providing temporary protection for construction traffic.

3.05 STORMWATER DRAINAGE

3.05.3 Drainage Structures

(ii) Covers

2nd Paragraph

ADD at end of sentence

Heavy duty cast iron covers and frames shall be Class D and comply with AS 3996.

(ix) Sealing Existing Pipes

ADD

Unless noted otherwise pipes shall be sealed with Grade N15 concrete. The concrete shall extend a minimum of 300mm into the pipe.

Conformance Criteria

(i) Materials

b) Bedding

3.05.6 Acceptance by Stormwater Authority

(i) Final Inspection

ADD

A closed circuit television (CCTV) inspection is required of all stormwater pipe lines and the associated VHS video cassette and SEWRAT data supplied as EXAMINER report on a CD-R computer disc plus one hard copy. Any defects detected by the CCTV inspection are to be rectified prior to requesting final inspection.

ADD

3.05.8 Backfilling of Redundant Stormwater Trenches

Where redundant stormwater structures and pipes are removed the redundant trench shall be cleaned of all loose excavated material and backfilled to the underside of the select fill shown on the drawings with cement stabilised sand compacted to a Density Index of 70%.

3.06 SUBSOIL DRAINS

3.06.1 Materials

i) Pipes

DELETE reference to Class 1000

SUBSTITUTE SN20

ADD

Where shown on the drawings, transverse subsoil drains shall be constructed of solid walled PVC-U pipe of similar diameter and quality to the longitudinal subsoil drains.

3.11 MEASUREMENT AND PAYMENT

Pay Item 303P4 – Existing Services Location

DELETE 1st paragraph

SUBSTITUTE

The unit of measurement shall be lump sum for each service type

Pay Item 305P19 – Demolish Existing Structures

The unit of measurement is per structure removed for headwalls, sumps and manholes.

The pay item includes removal of existing structures and disposal of materials offsite, and backfilling on the excavation.

ADD

Pay Item 305P20 – Exhume Existing Pipes

The unit of measurement is per linear metre of stormwater pipe exhumed.

The pay item includes all excavations to enable the removal of existing stormwater pipes, the exhuming of existing pipes and their removal from site and backfilling of the trench as specified.

ADD

Pay Item 305P21 – Connection of Pipes to Existing Structure

The unit of measurement is per pipe connection to an existing structure for all structure types.

The pay item includes all excavation, materials, structure geometry modifications at junction, and making good.

ADD

Pay Item 305P23 – Seal Existing Pipes

The unit of measurement shall be per end of stormwater or other pipe sealed. Unless noted otherwise pipes shall be sealed with Grade N15 concrete. The concrete shall extend a minimum of 300mm into the pipe.

This pay item shall include setting out, excavation, control of surface runoff, shoring, dewatering, disposal of surplus spoil, formwork, supply and placement of concrete, backfilling and compaction around the structure in accordance with the specifications drawings.

Pay Item 306P1 – Subsoil Drains

ADD

The pay item shall include provision and placement of no fines concrete capping where specified including all materials and formwork if required.

SECTION 4: FLEXIBLE PAVEMENT CONSTRUCTION

CONTENTS

- 4.03 BASE, SUBBASE AND SELECT MATERIAL
 4.03.1 General
 4.03.2 Materials
 4.06 MEASUREMENT AND PAYMENT

Page 112

$SC = S_{mean} + ks$
 where S_{mean} is the arithmetic mean of the degree of saturation test results
 s is the standard deviation of the degree of saturation test results
 k is the acceptance constant from Table 4.42

The degree of saturation of each sample shall be calculated as:

$$S = \frac{1}{\frac{1}{Pd} - \frac{1}{APD}}$$

where S = degree of saturation (%)
 w = moisture content (%)
 Pd = in situ dry density (t/m^3)
 APD = apparent particle density (t/m^3)

The apparent particle density must be measured once for every different source of base course material. The field density and moisture content must be measured over the full thickness of the base course layer. Field wet density and field moisture content may be measured using any method accepted for compaction testing. Field moisture content may also be measured using a nuclear surface moisture-density gauge operating in direct transmission mode, provided that the gauge is calibrated for such measurements in accordance with AS 1289.5.8.1 and that at least one test in each lot is undertaken in parallel using a drying oven in accordance with AS 1289.2.1.1 to check the calibration.

4.04.11 Spraying and Covering (i) Review of Nominated Application Rates

2nd paragraph, 3rd line

INSERT after 1st sentence: "In the case of primersealing and sealing of traffic lanes, the design shall also be amended if required for actual Ball Penetration values on the prime for the lot to be surfaced. The Design Ball Penetration value shall be the average of all tests for the lot, carried out at a frequency of 5 tests per 250 lane-m, but not less than 5 total."

INSERT new paragraph after 2nd paragraph:

"In the case of primersealing and sealing of traffic lanes, a pavement surface non-conformance shall occur under either of the following conditions:

- The Design Ball Penetration value is greater than 4.0mm where a seal will be covered with asphalt less than 100mm thick;
- An embedment allowance of -0.3 L/m² or more is indicated in RTA Form 395K Figure 2 where the seal will not be covered by asphalt.

Unless an alternative is accepted by the Superintendent, a pavement surface non-conformance shall require reconstruction of the top 100mm of the base course and re-priming prior to testing for construction of the seal. The cost of any work required as a result of a pavement surface non-conformance shall be borne by the contractor."

Page 114

SECTION 4: FLEXIBLE PAVEMENT CONSTRUCTION

4.04 PRIMING, PRIMER-SEALING AND SEALING

- 4.04.3 Materials
 (iv) Bitumen
 INSERT at end of first paragraph: "Polymer modified bitumen for sealing shall comply with the requirements of the current issue of RTA QA Specification 3252 Polymer Modified Binder."
- 4.04.8 Rates of Application of Primer, Primer-binder, Binder and Aggregate
- 1st paragraph, 2nd line
 DELETE: "RTA Form 395, 359B, 395C or 395D"
 SUBSTITUTE: "RTA Form 395A or 395K"
- 1st paragraph after Hold Point 4.5
 INSERT at end of paragraph:
 "Where a seal is to be covered by asphalt as part of the Works, the volume of cutter oil to be added to the binder for the seal shall be the value obtained from the Sprayed Bituminous Surfacing Cutback Chart in RTA Form 382 or 2%, whichever is lesser. Cutter oil shall not be used for the first coat of a double/double seal where the second applications is sprayed on the same day or soon after the first application."
- 4.04.10 Conditions for Spraying
- INSERT new sub-Clause:
 (iii) Degree of Saturation of Unbound Granular Base Course
 This Clause applies to priming of the traffic lanes of pavements with a Traffic Category of 1 or 2A, with an unbound granular base course and with surfacing comprising either a seal or asphalt less than 150mm thick.
- The degree of saturation of unbound granular base course for each lot to be primed shall be represented by the characteristic value of the degree of saturation of the individual samples taken from the base course of the lot to be primed. The degree of saturation for the lot must not be greater than 65% prior to priming. If the degree of saturation for the lot exceeds 65% then the base course must be dried-back prior to priming and retested. The following conditions apply to measurement and calculation of the degree of saturation of the lot.
- The degree of saturation test must be carried out within a period of twenty four hours prior to the priming. Should rainfall occur after testing and before priming, the test must be repeated.
- The number of individual samples in the lot shall be 1 (one) per 50 lane-m, with a minimum of 3 (three).
- The characteristic value (SC) of the degree of saturation of the individual samples of the lot shall be calculated as:

Page 113

Hold Point 4.6, Submission Details, 3rd line

INSERT after the word "details": ", if applicable all Ball Penetration test values and the Design Ball Penetration value,"

(viii) Rolling

Last paragraph

INSERT at end of paragraph: "For a seal which will be covered by asphalt, the cover aggregate at every point on the surface must be rolled with similar pneumatic tired multi-wheel rollers as above at not less than 8 (eight) passes within one-hour of spraying and not less than 8 (eight) passes in the following hour. There must be sufficient rollers on site and in use to complete the specified minimum amount of rolling as a continuous operation with successive spray runs."

4.05 ASPHALTIC CONCRETE SURFACING

- 4.05.3 Materials
 (vii) Binder
 (a) Bitumen

INSERT at end of paragraph: "Class AR320 bitumen shall comply with the requirements of Clause 4.04.3(iv)."

4.05.4 PROPERTIES OF ASPHALT

- (v) Dense Graded Asphalt
 (a) Proportions of Constituents for AC

DELETE 1st sentence

SUBSTITUTE: "Dense graded asphalt shall meet the requirements given in this subclause and Table 4.29 for "Moderate Duty" AC or Table 4.30 for "Heavy Duty" AC."

ADD

- (viii) AC20 High Bitumen Content (AC20 HBIT)
 AC20 High Bitumen Content material and construction shall meet all the requirements of Dense Graded Asphalt (AC) Heavy Duty designation AC20-HD except that:
- The binder shall be Class AR320 bitumen
 - Binder content shall be 1% by mass higher than the AC20-HD mix
 - Volumetric properties shall be derived for the specified increase in binder content

4.05.5 MANUFACTURE OF ASPHALT

- (iii) Temperatures of Bitumen, Aggregates and Asphalt
 Table 4.38

Page 115

ADD after Class 320 in third column
"Class AR320 or Multigrade"

4.05.10 PLACING AND FINISHING OF ASPHALT

(iii) Asphalt Paving Temperature
Table 4.39
ADD after Class 170 & Class 320 Bitumen in first column
"Class AR320 or Multigrade"

4.05.13 CONFORMANCE CRITERIA

(ii) Tolerances
(f) Finished Surface Level where Specified
Table 4.45
ADD after Corrective Course in first column
"or Base Course"

4.06 MEASUREMENT AND PAYMENT

Pay Item 403P4 - Match to Existing Pavement
ADD
The pay item shall include saw cutting and milling of the existing pavement of all types.

Pay Item 404P1 - Supply and Spray Primer Binder
DELETE
4.04P1.1 AMC00
4.04P1.1 AMC0
4.04P1.1 AMC1
4.04P1.1 AMC2
4.04P1.1 AMC3
4.04P1.1 AMC4
4.04P1.1 Field Cutback Primer/ Primerbinder

SUBSTITUTE
4.04P1.1 AMC00
4.04P1.2 AMC0
4.04P1.3 AMC1
4.04P1.4 AMC2
4.04P1.5 AMC3
4.04P1.6 AMC4
4.04P1.7 Field Cutback Primer/ Primerbinder

Pay Item 403P1 - Base Material
DELETE 1ST paragraph
SUBSTITUTE
The unit of measurement shall be the theoretical calculated cubic metres based on the thickness layer multiplied by the plan pavement area.

Pay Item 403P2 Sub-Base Material
DELETE 1ST paragraph

Page 116

SECTION 8: INCIDENTAL WORKS

CONTENTS

- 8.03 GROUTED STONE PITCHING
 - 8.03.2 Bedding
- 8.04 FENCING
 - 8.04.3 General Fence details
- 8.07 TIMBER EDGING
- 8.08 DECOMPOSED GRANITE GRAVEL PAVING
- 8.14 MEASUREMENT AND PAYMENT
- 8.15 CYCLIST REST RAILS
- 8.16 GRAFITTI PROTECTION TO WALLS

Page 118

SUBSTITUTE

The unit of measurement shall be the theoretical calculated cubic metres based on the thickness layer multiplied by the plan pavement area.

ADD

Pay Item 403P3.3 Select Material, Min. CBR 10%
The unit of measurement shall be the compacted volume of imported select fill in cubic metres measured in place. The volume shall be determined by calculation from survey.

This pay item shall include all activities associated with supply and placing of imported select fill in embankments.

This pay item shall include all activities associated with the excavation of material from the borrow site and the construction of embankments, the haulage of material and any pretreatment such as breaking down or blending material or drying out material containing excess moisture.

Pay Item 405P3 Dense Graded Asphalt (AC) in Intermediate Courses
DELETE 1ST paragraph
SUBSTITUTE

The unit of measurement shall be theoretical calculated tonnes based on the thickness layer multiplied by the plan pavement area multiplied by a density of 2.4 tonnes per cubic metre.

Pay Item 405P4 Dense Graded Asphalt (AC) in Wearing Course
DELETE 1ST paragraph
SUBSTITUTE

The unit of measurement shall be theoretical calculated tonnes based on the thickness layer multiplied by the plan pavement area multiplied by a density of 2.4 tonnes per cubic metre.

Pay Item 405P11 Fine Gap Graded Asphalt (FGG) in Wearing Course
DELETE 1ST paragraph
SUBSTITUTE

The unit of measurement shall be theoretical calculated tonnes based on the thickness layer multiplied by the plan pavement area multiplied by a density of 2.4 tonnes per cubic metre.

ADD

Pay Item 408 P1 - Rehabilitation of Existing Pavements with Dense Graded Asphalt
The unit of measurement shall be tonnes of asphalt placed in accordance with the drawings and specifications, confirmed by weighbridge docket.

This pay item shall include all operations involved in the excavation and disposal of existing materials, supply spreading and compaction of the asphalt in patches constructed on the existing road.

Page 117

SECTION 8: INCIDENTAL WORKS

8.02 STANDARDS

ADD

AS 2758.4 Aggregate for Gabion Baskets and Wire Mattresses

8.03 GROUTED STONE PITCHING

8.03.1 Materials

ADD

The colour of rock used in all stone pitching work shall be Mugga Quarry bluestone.

Rock used for the stone facing of the reconstructed Retaining Wall No.11 shall be recycled stone from the demolition of the existing wall, cleaned of all mortar residue and reused.

The finish on the new wall shall match that of the existing wall in all respects.

8.03.3 Bedding

For all stone pitching, irrespective of the slope on which it is installed, the stone shall be embedded into a minimum 75 mm thick concrete blinding layer of characteristic compressive strength of 20 MPa at 28 days.

The sub-grade over which the concrete bedding is placed shall be compacted to 90% MMDD.

The stone shall be embedded into the concrete base to a minimum depth of 25m.

8.04 FENCING

8.04.3 General Fence Details

ADD

Fencing within the median at bridges shall be constructed using PD1 fencing.

Refer to Standard Drg No. GW/SDF/DC/12 for details.

8.04 DECOMPOSED GRANITE GRAVEL PAVING

ADD

Colour

Decomposed granite gravel materials used for median and paving beneath G4 guardrails shall be yellow/brown in colour.

Stabilisation

The decomposed granite gravel used in medians and beneath G4 guardrail shall meet the requirements criteria nominated above and shall be stabilised with Polyroad PR11L dry polymer at an application rate of 2% by mass.

Page 119

The dry polymer material shall be spread using a spreader truck and incorporated using a stabiliser machine.

The moisture content of the mixed material shall not exceed those nominated in Clause 4.03.3 for the construction of base and subbase and select materials.

The stabilised material shall be compacted to a minimum density of 95% MMDD.

Other conformance criteria shall be as nominated in Clause 4.03.4.

The contractor shall prepare a Work Method Statement (WMS) outlining the procedures to be followed in spreading and incorporating the dry polymer. The WMS shall include procedures to prevent the polymer from entering the adjacent traffic lanes and Lake Burley Griffin as airborne particles and via stormwater runoff.

8.11 MORTARED STONE WALLS

8.11.1 Materials

ADD

The colour of rock used in all mortared stone walls work shall be Mugga Quarry bluestone.

Stone size shall have average dimensions of 200 mm x 300 mm.

8.14 MEASUREMENT AND PAYMENT

ADD

Pay Item 804P1.5 - Cycle Rest Rail

The unit of measurement shall be per rest rail constructed.

This pay item shall include the supply of all hardware and installation as detailed, including reflective tape and footings.

ADD

Pay Item 804P1.6 - Cycleway Grab Rail

The unit of measurement shall be per rest rail constructed.

This pay item shall include the supply of all hardware and installation as detailed, including reflective tape and footings.

ADD

Pay Item 804P1.7 - Cycleway Safety Rail

This shall be a metres constructed.

This pay item shall include the supply of all hardware and installation and painting and finishes to the existing guard rail and the new cycle safety rail as detailed.

Pay Item 816P1 Graffiti Protection to Walls

The unit of measurement shall be the square metre of graffiti protection installed in accordance with the drawings and Specification.

ADD

8.15 CYCLIST REST RAILS

Page 120

HOLD POINT 8.18

Process Held: Application of graffiti treatment to walls

Submission Details: At least (1) week prior to the proposed commencement of the thrust boring, the Contractor shall provide the Superintendent with details of application methods.

Release of Hold Point: The Superintendent will review the submitted documentation prior to authorizing the release of the Hold Point.

Graffiti coating shall be applied to surfaces immediately after completion of construction/erection of the surface.

Page 122

Cycle rest rails shall be manufactured and installed in accordance with the TaMS standard drawings and Section 8.04 of the Standard Specification.

Cyclist rails on concrete barriers shall be manufactured and installed in accordance with the drawings and RTA QA Specification B264.

8.16 GRAFFITI PROTECTION TO WALLS AND BRIDGEWORKS

Graffiti protection shall be Surfashield TS or approved equivalent sacrificial coating.

If alternative coatings are proposed, Product Data Sheets and current Materials Safety Data Sheets detailing the properties of the alternative products shall be provided to the Superintendent for approval. Any alternative anti-graffiti coating system used shall be a sacrificial coating and carry a guaranteed "Graffiti Removal" life of not less than five years from the date of application. On request by the Superintendent, the Contractor shall provide test samples or panels accompanied with NATA certification of colour, gloss, thickness and adhesion.

All dust, dirt, grease and oil contaminants, including remnants of curing membranes, and any other surface contaminants shall be removed by non-destructive means followed by water washing. The surface to be treated shall be prepared in accordance with AS 2311 and the manufacturer's published recommendation for the anti-graffiti coating system. The substrate shall be free of all graffiti, graffiti shadows, paints or any other surface contaminants which would be visible through the coating unless the substrate is intentionally painted.

All coatings and treatments shall be applied in accordance with good painting practice and in accordance with the manufacturer's specifications.

Anti-graffiti coatings shall NOT be applied under the following conditions:

- (a) the site of work is exposed to a wind speed exceeding 20km/hr;
- (b) where wind borne debris may contaminate the uncured surface of the freshly applied coating;
- (c) when the ambient temperatures exceeds 35°C or is below 15°C;
- (d) when the relative humidity exceeds 85%;
- (e) when there is any chance of rain spatter, or run off, including leakage through deck joints, contaminating the surface and adversely affecting the adhesion to the substrate;
- (f) where the surface temperature of the substrate is less than 3°C above the dew point or exceeds 40°C;
- (g) where the substrate surface is wet or damp.

The finished coating system shall be of uniform thickness, and appearance and shall be free of any defects that may impair the performance or appearance of the coating for the life of the coating.

Graffiti coatings shall be applied to walls to 2.5m above finished ground height or easy foothold and on the top of surfaces likely to be attacked from above.

Graffiti coatings are to be applied to the abutments and wingwalls of all bridges.

Page 121

SECTION 9: LANDSCAPING

CONTENTS

9.01 SCOPE

9.02 STANDARDS

9.05 TOPSOILING

9.05.1 General
9.05.2 Topsoil Quality

9.06 GRASSING

9.06.1 Grass Seed

9.11 CONSOLIDATION

9.11.1 General
9.11.2 Placing of Works on Consolidation
9.11.11 Handover

9.12 MEASUREMENT AND PAYMENT

9.13 SCHEDULE OF HOLD POINTS

9.15 REINSTATEMENT

Page 123

SECTION 9: LANDSCAPE

9.01 SCOPE

ADD

All unpaved areas disturbed by work associated with the Contract and other areas where shown on the drawings or where directed on site by the Superintendent shall be reinstated and grassed and bitumen straw mulched as specified.

All areas outside those specified to be cleared and grubbed or restored that are disturbed by the Contractor during the execution of the works shall be topsoiled and grassed with the Dryland Grass mix nominated in Table 9.7 by the Contractor at no additional cost to the Principal. The Contractor shall seed these areas using hydroseeding techniques as nominated in the Specification at its expense.

Scarify areas to be grassed to a depth of 150mm. Scarifying in root zone of existing trees shall be as directed by the Superintendent. Rake area to remove grass, clumps and deleterious materials.

The Contractor shall complete all the documented works including protection of the works, clearing and grubbing, tree removal, excavation, trimming sub-grades to falls, supplying and spreading of topsoil and other surface finishes, planting and disposal of surplus materials at the nominated rubbish tip specified in Clause 2.05.4 of the Technical Exception Clauses.

Landscape requirements outlined on plan, legend and the details shall take precedence over the specification if there is any variation in description.

9.02 STANDARDS

ADD

- AS4419 Soils for landscaping and garden
- AS4454 Compost, Soil Conditions and Mulches
- AS4428 Nursery Stock
 - Part 1: Specification for trees and Shrubs
 - Part 10: Specification for Ground Cover Plants
- BS4429 Code of Practice for General Landscape Operations (Excluding Hard Surfaces)

ADD

i) Interpretation

Definitions:

Bad ground: Ground unsuitable for the purposes of the works, including fill liable to subsidence, ground containing cavities, faults or fissures, ground contaminated by harmful substances and ground which is or becomes soft, wet or unstable.

Site topsoil: Soil excavated from the site that has the following characteristics:

- Contains organic matter
- Supports plant life

Page 124

Site topsoil must be free of rocks and deleterious matter and, in the case of topsoil for grassed areas, free of vegetative spoil.

Additional appropriate fertilizer may be required according to the plant species at planting.

The Contractor shall arrange and meet all costs for conducting laboratory testing of samples for the properties listed in the Table 9.1, including pH, salts, drainage and nutrients.

Agricultural lime shall be incorporated into the top 100mm of topsoil, where pH adjustment is indicated by laboratory testing, to adjust the pH to the required level and applied at a rate as determined by the soil testing.

If using additives to raise topsoil to the required standard, ensure compliance with the relevant test criteria.

Prior to delivery of topsoil, a minimum of 5kg of material per sample is required and a minimum of fourteen days should be allowed for testing prior to submitting conforming sample

ii) Placing Imported Topsoil

Spread the topsoil on the prepared subsoil and grade evenly, making the necessary allowances to permit the following:

- Required finished levels and contours may be achieved after light compaction.
- Grassed areas may be finished flush with adjacent hard surfaces such as kerbs, paths, roads and existing ground.

Where diesel oil, cement or other phytotoxic material has been spilled on the subsoil or topsoil, excavate the contaminated soil, dispose of it off the site, and replace it with site soil or imported topsoil to restore design levels.

Finishing: Feather edges into adjoining undisturbed ground.

(i) Consolidation of Imported Topsoil

Compact lightly and uniformly in 150 mm thick layers. Avoid differential subsidence and excess compaction and produce a finished topsoil surface that has the following characteristics:

- Finished to design levels as per drawings.
- Smooth and free from stones or lumps of soil.
- Graded to drain freely, without ponding, to catchment points.
- Graded evenly into adjoining ground surfaces.
- Ready for planting.

(ii) Aeration of Imported Topsoil

Areas compacted due to placement machinery or trucks must be decompacted prior to planting or seeding. Deep ripping as specified in 'Soil Placement – Vegetation Areas'. Where there is more than one topsoil layer compacted, this decompaction must be conducted for each layer.

Page 125

- Free from unwanted matter

Unwanted matter (in topsoil):

- Stones over 75 mm diameter
- Clay lumps
- Weeds and tree roots
- Sticks and rubbish
- Material toxic to plants.

Imported topsoil:

- Fine - Clay loam, fine sandy loam, sandy clay loam, silty loam, loam
- Medium - Sandy loam, fine sandy loam
- Coarse - Sand, loamy sand.

Topsoil mixture: Topsoil and compost or other additives, thoroughly mixed before placing.

9.05 TOPSOILING

9.05.1 General DELETE 3rd paragraph SUBSTITUTE

Site topsoil shall be installed to all planting areas indicated on the plans in the Landscape documentation. It is assumed, for the purposes of tender, that the topsoil requirement can be provided from material recovered from the site plus amendments and additives.

Where the grassed areas are not able to be covered sufficiently with clean topsoil that is recovered from site, then imported topsoil shall be used.

Topsoil source schedule

Location	Soil type	Mixture
All	Site topsoils	To comply with Clause 9.05.4 Spreading On-site Topsoil

9.05.2 Topsoil Quality

ADD

i) Imported Topsoil

Imported topsoil as delivered must comply with the Topsoil properties nominated in Table 9.1.

Page 125

(iii) Topsoil Depths of Imported Topsoil

Spread topsoil to the following typical depths, allowing for consolidation to finished levels as shown in the Topsoil application schedule.

Imported Topsoil Application Schedule

Location	Type	Depth (mm)
General	Site topsoils or Imported Topsoil Type 2	200
All other Vegetation areas	Site soils or Imported Topsoil Type 2	150

iii) Surplus Imported Topsoil

General: Spread surplus topsoil on designated areas on site, if any; otherwise, dispose off site.

Designated areas: As directed by Superintendent.

9.06 GRASSING

9.06.1 Sowing and Subsequent Treatment

DELETE first paragraph

SUBSTITUTE

All grassing shall be installed using hydroseeding techniques as specified in Clause 9.08, Hydroseeding Grass.

9.11 CONSOLIDATION

9.11.1 General

DELETE second paragraph

SUBSTITUTE:

The Consolidation Period shall be 13 weeks following date of Practical Completion certificate. Maintenance shall mean the continued care of the plant material and grassing areas within the Contract area to promote healthy and vigorous growth by implementing accepted horticultural practices, as well as rectifying any defects that become apparent in the works under normal conditions and according to the season.

The activities specified for the consolidation period shall also apply to extended maintenance periods.

REPLACE "program" in 3rd Paragraph with "plan"

ADD

The work during the consolidation period shall include watering as necessary.

Page 127

The Contractor shall produce a Consolidation Plan. The Consolidation Plan shall include a weekly plan of action. The Consolidation Plan works shall not be limited to the listed works in the 3rd paragraph

9.11.3 Works During Consolidation

DELETE text of sub-clause
SUBSTITUTE

The consolidation program shall include, but shall not be limited to the following:

i) Replacement of Defective / damaged or Dead Plant Material

The Contractor shall replace, at their cost, (transport and installation) all plants that are unhealthy, damaged or dead. Replacements shall be of a similar size and quality and identical provenance to the plant which has failed, unless otherwise directed by the Superintendent.

ii) Ground Repair and Grass Re-establishment

The Contractor shall be responsible for the repair and replacement of the ground conditions on site. This shall include filling and smoothing of any damage caused by machinery or any work during the planting and maintenance phase; and the replacement and establishment of grass disturbed during the construction and maintenance phase. Re-grassing should only be done outside the mulch area of each tree. The Contractor shall replace any grass in each individual plot with the mix specified by the Superintendent, the grass mix may vary from plot to plot and the Superintendent will direct the contractor in the application method and location.

iii) Weed Control

All planted and mulched areas shall be kept free of weeds by spraying with a selective herbicide. The Contractor shall notify the Superintendent 48 hours prior to the application for approval.

All chemicals shall be used in accordance with the manufacturer's instructions and shall be approved by the Superintendent. Any 'off target' damage shall be made good by the Contractor at its expense.

The Contractor shall determine and nominate when treatments are considered to be needed and shall obtain the prior approval of the Superintendent to proceed with the treatment.

iv) Pest and Disease Control

Inspect pests, fungus and disease shall be controlled by the appropriate treatment. All chemicals shall be used in accordance with the manufacturer's instructions and shall be made good by the Contractor at his expense. The Contractor shall nominate when he considers that treatments are needed and shall obtain the approval of the Superintendent to proceed with the treatment.

v) Adjustments to Stakes and Ties

Page 128

Executed Quality Records shall comply with Territory and Municipal Services' Standard Requirements for Documentation – Document 0028. A completed Asset Description/Data sheet shall be provided as in form P1, Annexure 9.6.

Work As Executed drawings shall include one film set and one print set and one full set of DWG or DXF format drawings and one full set PDF or DWF format drawings depicting landscaping services including trees, grassed areas, shrub beds, log barriers, bollards, drinking fountains, play equipment, rubbish bins, park seals, barbecues, edging, toilets and the locality/site.

The Work As Executed digital data is to be supplied to TaMS on CD-ROM in a format compatible with AutoCAD R2002. All drawings submitted shall contain the Microfilm Reference Number, and are to be dated and signed by the relevant authority.

TaMS shall place the works onto Consolidation.

The start date of consolidation period will be advised after TaMS has reviewed and accepted the above submissions.

The inspection at the commencement of the Consolidation does not imply that the work will automatically be handed over upon expiration of that period or that the ACT Government accepts that the works are fit for use.

The Contractor remains responsible to ensure that the maintenance and protection of the works is carried out in accordance with the Consolidation Plan. During the consolidation period, maintenance records, inspection and test plans and other appropriate documentation shall support the Consolidation Plan.

9.11.4 Handover

DELETE
Entire Clause but retain Hold Point 9.13

ADD

The Superintendent shall request TaMS to undertake the Final Handover inspection of landscape works. Irrespective of the thirteen weeks minimum period of consolidation the Contractor shall continue to bear the responsibility of the maintenance until the Superintendent issues a Final Certificate on advice from TaMS. The Superintendent shall formally submit the following documentation to TaMS when requesting the Final Handover inspection,

- Compliance Certification,
- Maintenance Records, certifying that the Consolidation has been completed in accordance with the Consolidation Plan.

The Superintendent shall prepare and submit compliance certification indicating that all defects, omissions and non-conformances as listed have been rectified in accordance with the plans and current TaMS's Design Standards for Urban Infrastructure, Edition 1, Revision 0 and the Standard Specification for Urban Infrastructure Works, Edition 1, Revision 0.

The Contractor shall submit Maintenance Records to the Superintendent for submission.

Page 130

The Contractor shall check that trees are supported properly at all times to secure the plant material and that ties are not causing injury to the tree.

vi) Mulched Basins

Mulch surfaces shall be maintained for an even clean surface, at monthly intervals up until Final Completion. Mulch which is trampled, kicked or moved over adjacent surfaces to be raked back, and removed from adjacent surfaces. Make good watering basins as required.

vii) Watering

Trees are to be maintained free of water stress at all times, and the Contractor is to establish and maintain a rigorous inspection regime to ensure that this requirement is met. The Contractor shall seek approval from the Superintendent prior to altering the watering frequency.

viii) Grassing Maintenance

Schedule mowing events as required to maintain dryland grass between 75-150mm range or as directed by the Superintendent.

The Superintendent shall inspect the works to determine whether the landscape works have been completed fully in accordance with the plans. The Superintendent shall prepare a defect list and inspection report.

The Superintendent shall request an inspection of the works by TaMS when the landscape works are ready to be placed on consolidation.

The following documentation shall accompany the request for inspection, Compliance Certification:

- Site Inspection Report and Defects List,
- Consolidation Plan, and
- Works as Executed Quality Records.

The Superintendent shall prepare the Compliance Certification. The compliance certification shall clearly state that the landscape works have been completed fully in accordance with the plans and have complied with the current ACT Government Design Standards for Urban Infrastructure, Edition 1, Revision 0 and the Standard Specification for Urban Infrastructure Works, Edition 1, Revision 0. Clear documentation of any works completed at variance to the plans is required in the Compliance Certification.

The Superintendent shall submit the inspection report and defect list.

The Contractor shall supply the Consolidation Plan to the Superintendent for submission.

The Contractor shall supply Work-As-Executed Quality Records to the Superintendent for submission. The Work-As-Executed drawings shall document in a clear and precise manner, any work done at variance to the plans. Work As

Page 129

The Superintendent will be advised after TaMS has reviewed and accepted the above submissions and undertaken a final handover inspection of the landscape works.

The Superintendent shall await advice from TaMS that the works are acceptable for handover before issuing a Final Certificate for landscape works. The issue of a Final Certificate for landscape works by the Superintendent shall confirm the successful handover of landscape works to TaMS.

9.12 MEASUREMENT AND PAYMENT

ADD

Pay Item 905P3 - Herbicide treatment to planting beds, tree basins and dryland grassed areas including maintaining weed free

The unit of measurement shall be per item.

This pay item shall include the all works associated with herbicide treatment by glyphosate spraying or physical removal, follow up inspections to determine if weed growth is active including retreatment as necessary to maintain the site weed free for the duration of the Contract until commencement of Consolidation.

Pay Item 906P2 - Restoration Grassing

The unit of measurement shall be per item.

This pay item shall include all works associated with topsoiling, weed management, cultivation, grassing and bitumen straw mulching and maintenance of all disturbed non paved areas in the project within the property or to its adjoining verges including supply of all materials as necessary, labour and site works as specified for the relevant tasks nominated in Pay Items 905P1, 905P2, 905P1 and 908P1 for the duration of the Contract.

Pay Item 909P4 - Planting

The unit of measurement shall be per number.

The rate for planting shall include the supply and planting of the specified plants or their pro-rata substitutes at the nominated ratio, all selling out, excavation of the planting position, planting, fertiliser and water gel application, any temporary storage, the collection and disposal of all empty plant containers, and the replacement of all dead or missing plants relating to the 80% + ratio in accordance with the nominated conditions of compliance.

Pay Item 908P1 - Bitumen and Straw Mulching

ADD

Include in this pay item allowance for cleaning bitumen overspray to the satisfaction of the Superintendent.

Pay Item 909P1 Planting

ADD the following:

Page 131

The rate for planting shall include the supply and application of 'Hydrocell', 'Ban-Rot' and/or other soil treatment additives which may be specified

Pay Item 910P2 - Mulching to spot planting basins

The unit of measurement shall be per number.

The rate for mulching shall include the supply and placing of the specified mulch at the nominated extent, formation of and maintaining of an effective watering basin of the nominated size in a weed free condition.

Pay Item 911P1 - Consolidation

ADD

This pay item shall also include the progressive and continuous addition of data to the Consolidation Plan that confirms that the tasks have been completed in accordance with the Plan. This pay item shall also include the extension of the consolidation period beyond 13 weeks at the Contractors cost.

Pay Item 917P2 - Landscape Works as Executed Plans

The unit of measurement shall be per item.

This pay item shall include the all works associated with the Contractor adapting the design plans provided electronically by the Landscape Architect to prepare Works as Executed plans in formats required by relevant Government Authorities including provision on CD and/or microfilm. The task by the Contractor to Include for all site review of landscape works; counting, measuring and noting necessary changes and then amending the drawing files as issued for Construction.

9.13 SCHEDULE OF HOLD POINTS

The proposed hold points specific to this project are:

Hold Points	Clause	Description
9.6	9.05.2	Supply of Topsoil
9.7	9.05.3	Spreading topsoil to grass areas
9.9	9.09.5	Planting
9.10	9.09.12	Supply and installation of root control barriers
9.11	9.10.1	Supply and placement of mulch
9.12	9.11.2	Placing the works on consolidation
9.13	9.11.4	Handover of works
9.14	9.11.3	Three Monthly Inspection
9.15	9.14.1	Supply of Jute Mesh

Page 132

Page 133

SECTION 10: ROAD SIGNS

CONTENTS

10.04 MATERIALS

10.04.6 Posts

10.10 INSTALLATION

10.10.1 Location

10.10.2 Mounting Height

10.10.3 Supports

10.10.4 Footings

SECTION 10: ROAD SIGNS

10.04 MATERIALS

AMEND the reference to Standard Drawing STD-15 to DS9-15

10.10 INSTALLATION

10.10.01 Location
AMEND the reference to Standard Drawing STD-11 to DS9-15

10.10.02 Mounting Height
AMEND the reference to Standard Drawing STD-11 to DS9-11

10.10.03 Supports
AMEND the reference to Standard Drawing STD-15 to DS9-15

10.10.04 Footings
AMEND the reference to Standard Drawing STD-15 to DS9-15

10.13 MEASUREMENT AND PAYMENT

Pay Item 1010P3 - Modifications to Existing Signs

DELETE the first sentence and replace with:

The unit of measurement shall be each sign modified as described in the schedule of rates.

Page 134

Page 135

SECTION 11: PAVEMENT MARKING

CONTENTS

- 11.08 ERADICATION OF PAVEMENT MARKINGS
- 11.16 MEASUREMENT AND PAYMENT

SECTION 11: PAVEMENT MARKING

11.08 ERADICATION OF PAVEMENT MARKING

ADD new paragraphs

The Contractor shall ensure that appropriate methods are used to remove raised pavement markers and bitumen based glue pad.

The glue pad fixing shall be removed flush with the pavement surface.

Any indentations formed in the asphaltic concrete surface during the removal of raised pavement markers shall be filled with asphalt filler to finish flush with the asphalt surface.

The Contractor shall determine the optimum method of patching indentations through discussions with Australian Asphalt Pavement Association (AAPA).

Temporary line markings shall be removed in a manner that ensures the redundant markings are not visible in all weather conditions.

11.16 MEASUREMENT AND PAYMENT

Pay Item 1108P1 - Eradication of Redundant Pavement Markings

ADD new paragraphs

This item shall include the eradication of all existing pavement marking necessary for the works even if the marking is not detailed on the drawings.

Pay Items 111P2.3 and 111P2.4

AMEND pay item to read each

ADD

Pay Item 1111P2.5 - Bicycle Payment Arrows

The unit of measurement shall be per each marking

Pay Item 1111P2.6 - Coloured Surface Coatings for Cycleways

The unit of measurement shall be square metres installed

SECTION 14: STREET LIGHTING

CONTENTS

- 14.02 REFERENCE DOCUMENTS
- 14.04 LIGHTING COLUMNS
 - 14.04.1 Columns
 - 14.04.2 Lamps
 - 14.04.3 Streetlight Control Panel
 - 14.04.4 Streetlighting Control Cubicle
- 14.05 ERECTION AND INSTALLATION
 - 14.05.1 Laying of Conduits
 - 14.05.2 Removal and Disposal of Streetlighting Columns and Light Globes
- 14.07 RELOCATION OF EXISTING STREET LIGHTING COLUMNS

SECTION 14: STREET LIGHTING

14.02 REFERENCE DOCUMENTS

Australian Standards

ADD

AS1178 1986 Concentric Wire Neutral cable – XLPE cable for electricity supply at working voltages of 0.6/1 kV

AS 4026 Electric cables – For underground residential distribution systems

Authority Guidelines

DELETE *COR 10.1.P1

SUBSTITUTE *EN 4.4 PO 4 *

14.04 LIGHTING COLUMNS

14.04.1 Columns

ADD

Lighting columns shall be direct buried where shown on the drawings. Direct buried light poles shall have an epoxy protection coating equivalent to Durebild STE covering the base of the column to a level 150mm above ground surface level. Each pole shall have a separate earthing system.

ADD after paragraph 2

The Contractor shall supply evidence as required by ActewAGL of full scale impact testing, carried out by an organisation acceptable to ActewAGL from which the adequacy and suitability of the pole as being impact absorbent can be assessed.

Typical of the performance required is that for frontal impact of a vehicle of 1200kg mass impacting at 60km/h, the pole will produce decelerations, measured at the vehicle floor pan, no greater than 10g averaged over any 50 mill sec period, nor greater than 10g for any period longer than 10 mill sec.

The point of impact is to be not more than 1/4 width of the vehicle from the longitudinal centre line of the vehicle. In impacting the pole, the vehicle must be brought to rest by the pole in a controlled manner. Any pitch, yaw or roll shall be such that the vehicle will not overturn or spin away from the pole.

The Superintendent further reserves the right to accept any pole type where satisfactory evidence indicates that the above requirements are substantially, but not precisely met.

All streetlighting columns must be delivered in one piece. Columns delivered in sections to be slip fitted together will not be accepted. Columns which are manufactured in slip fit sections must have these sections securely welded or bolted together before delivery. Columns made with more than two slip fit sections will not be accepted

All columns shall be indelibly marked 100mm above ground level, slip base columns being marked 50mm above the base flange, with item reference, as detailed below. Outreach arms shall be marked 100mm from spigot entry end. The marking shall be of letters and numerals at least 10mm high and neat and legible. The layout shall be as per the following example. The use of marking pens will *not* be accepted.

10.5m EA (Description of Item, eg 10.5 m Energy Absorbing Column)
7/2001 (Month and Year of manufacture)
123456 (Manufacturer's Serial Number)
XYZ Ltd (Name of the Manufacturer)

Slots forming part of Impact Absorbing construction shall not be open. Sealing by galvanising layer is acceptable.

10.5m columns shall not bow when supporting the specified outreach arms and luminaires. The spigot shall be designed to hold the weight of the outreach arm and luminaire under extreme wind conditions applicable to the ACT region.

The minimum wall thickness of the buried portion of the columns shall not be less than 3mm.

Internal ducts in columns and outreach arms shall be free of burrs and sharp edges to prevent damage to electrical wiring.

DELETE 12 kg in 4th paragraph
SUBSTITUTE 15kg

i) Outreach Arms

ADD

The removable outreach arm shall be secured to the column spigot by six corrosion resistant 12mm B.S.V. x 25mm long "Unbrako" set screws with knurled cup point to ensure no relative movement between outreach arm and column spigot.

The top three setscrews shall be socket headed of such a size to take a 6mm Allen Key.

The bottom three setscrews shall be square or hexagon headed.

A 20mm diameter vent hole shall be provided in the underside top of the outreach arm.

The spigots on the end of the outreach arms are to fix and support the lanterns. The spigots shall be of the sizes specified and may be manufactured from a suitable sized pipe welded to the end of the outreach arm, i.e. they need not be swagged.

For the 4.5m outreach arms the spigot shall be 115mm long by 42.9mm outside diameter set at an angle of 5 degrees above horizontal.

These outreach arms shall comply with the following ActewAGL drawing:

794-25-01 3.0,3.7 & 4.5 metre Streetlight Outreach Arm

Page 140

ADD

14.04.7 Streetlight Control Cubicle

In order to comply with the Department of Urban Services and ActewAGL requirements the Contractor shall supply and install a Streetlight control cubicle at the location specified in the construction drawing. The cubicle shall incorporate two compartments to terminate ActewAGL cables and the streetlight control panel.

The following ActewAGL drawings provide the generic ActewAGL design specification for the contract and are listed here as a reference.

796-8-06 Streetlight Control Cubicle
794-99-07 Concrete Footing for Streetlight Control Cubicle

The Contractor shall provide the detail drawing of the control cubicle and the concrete footing details for Superintendent's approval prior to commence work on site.

14.05 ERECTION AND INSTALLATION

14.05.3 Laying of Conduits

14.05.4 DELETE "COR 10.1.P1"
SUBSTITUTE "EN 4.4 PO 4"

14.07 MEASUREMENT AND PAYMENT

Pay Item 1404P3 Relocate Existing Lighting Column
The unit of measurement shall be per lighting column of each height relocated.

This pay item shall be inclusive of all work and materials required for the removal and re-installation of the columns including the removal, cabling and re-erection.

Pay Item 1407P1 Removal and Disposal of Redundant Lighting Columns
The unit of measurement shall be per lighting column removed.

The pay item shall include all work involved in removing the column and disposing of unwanted materials at approved locations off site.

Pay Item 1406P1 Streetlighting Fees and Coordination Costs
DELETE existing text
SUBSTITUTE

Item 1406P1.1 is a provisional sum to cover fees for ActewAGL to connect power to the streetlighting. The contractor shall liaise with ActewAGL and arrange payment of the fees.

Outreach arms shall be of tubular metal construction as detailed in the specification drawings.

ii) Service Aperture

ADD

The service aperture chamber shall be covered by an approved non-corrosive weatherproof door with a button head screw fitted and suitable for operation with a 6mm Allen key. The corrosion resistant Allen head screw used for locking the door is to be held captive in the door and be flush with the outside of the door. The Allen screws shall be suitably lubricated to ensure easy removal after long periods in service.

iii) Cable Entry Slot

ADD

A 250mm x 75mm cable entry slot shall be provided on all columns as shown in the ActewAGL specification drawings, with a flap designed to minimise the entry of soil. All edges shall be smooth and free of burrs.

iv) Column Identification Number Plate

ADD

All columns shall be provided with two holes 3.2mm diameter for self tapping screws for securing the column identification plate to be provided and secured by ActewAGL. These holes shall be at 143mm centres generally on the opposite side of the column to the door with the centre of the holes approximately 2.75m above ground level as shown in respective column drawing.

14.04.2 Luminaires

ADD

Pedestrian Crossing Luminaires

The flood lamps for the pedestrian crossings shall be Phillip HNF 901 (Non-Integral) narrow beam type with 400W high pressure Sodium Tubular Lamp to suit.

14.04.3 Lamps

DELETE 4000hrs in 3rd paragraph
SUBSTITUTE 5000hrs

ADD

14.04.6 Streetlight Control Panel

The streetlight control panel shall accommodate a minimum of four three-phase circuits. The following ActewAGL drawing provides the generic ActewAGL design specification for the Streetlight Control Panel and is listed here as reference only. The circuit must be designed to incorporate 10Amp circuit breakers to comply with BEPCON and AS 3000 requirements

796-2-004 Streetlighting Control Panel

Page 141

Item 1406P1.2 shall include all costs for the connection of power to the streetlighting other than fees due to ActewAGL. The item shall include costs of liaison, coordination, fees to BEPCON and assistance to ActewAGL on site as required as well as overheads and profit. The Contractor will not be entitled to any payment additional to that in Item 1406P1.2 for works relating to the connection of power to the streetlighting. A percentage of the Provisional Sum in item 1406P1.1 shall not be due to the Contractor.

Pay Item 1406P2 Supply and Lay Conduit
ADD after the second paragraph:

The cost of conduit and junction boxes in bridge or other structures shall be included in the lump sum for the structure.

ADD

Pay Item 1408P1 Street Light Control Cubicle

This pay item shall be inclusive of all work and materials required for the installation of the street light control boxes, including the control boxes, cable terminations, and electrical components.

ADD

14.08 RELOCATION OF EXISTING LIGHT COLUMNS

Where existing lighting columns are specified for relocation the relocations shall be carried out in accordance with this Specification.

Existing columns 9m or greater in height of the non-frangible type shall be replaced with frangible type columns.

SECTION 15: MAJOR CONCRETE WORKS

15.1 SCOPE

ADD the following sentence after the first paragraph:
Unless otherwise noted, all bridge works are to be constructed in accordance with the RTA Standard Specifications listed. Where the RTA specifications are silent or are not clear on an aspect of the construction, reference shall be made to Section 15 of the Standard Specification for Urban Infrastructure Works.

ADD

ACTON TUNNEL LIGHTING UPGRADES AND WALL LINING REPLACEMENT
Refer Technical Specification attached at Appendix A.

RTA SPECIFICATIONS TECHNICAL EXCEPTION CLAUSES

RTA SPECIFICATION R132

4.4 WIRE ROPE SAFETY BARRIER SYSTEMS

DELETE last sentence of 1st paragraph

SUBSTITUTE

All posts must be provided with a black powdercoat finish.

Page 144

Shared Services Procurement – Tender for Construction Projects using a Lump Sum (AS2124) Delivery System
Template Version 11.2 of 28 July 2011

STANDARD DRAWINGS

The latest amendments of the following Standard Drawings issued by the ACT Government, ACTEW Corporation, and NSW RTA shall form part of the Contract to the extent that they are relevant and not overridden by the Specification. Tenderers are to familiarise themselves with the requirements of the ACT Government, current at the time of Tendering, and allow for them in their Tender. These standards will not be bound into the Contract documents

1.1 ACTEW WATER SUPPLY, SEWERAGE AND ELECTRICAL STANDARDS

GENERAL	
WSS 001	DESIGN SYMBOLS AND NOTATION
WSS 002	ACCESS LADDER AND STAGGERED STEP IRON DETAILS
WATER SUPPLY	
WSS011	WATER MAINS 100 – 750 ND TYPICAL DETAILS CONNECTIONS TO LIVE MAINS
WSS012	WATER MAINS 100 – 750 ND TYPICAL TRENCH DETAILS
WSS013	WATER MAINS 100 – 600 ND CONCRETE THRUST BLOCKS FOR BENDS, TEES, CAPS AND PLUGS
WSS014	WATER MAINS 100 – 600 ND CONCRETE THRUST BLOCKS FOR BENDS, TEES, CAPS AND PLUGS
WSS016	WATER MAINS 100 – 750 ND TYPICAL DETAILS
WSS020	SERVICE CONNECTIONS TYPICAL DETAILS METERED CONSUMER AND IRRIGATION CONNECTIONS
WSS021	METER PIT COVER DETAILS AND SCOUR VALVE INSTALLATIONS
WSS022	GENERAL ARRANGEMENT FOR REFLUX VALVES IN MAINS
WSS024	TYPICAL DETAILS – PRECAST CONCRETE ELEMENTS
WSS025	RESTRAINED JOINT THRUST RESTRAINT FOR DN100 TO DN300 DCL MAINS
WSS027	HYDRANT MARKERS ON ROADS
WSS028	METERED WATER SERVICE CONNECTIONS. WATER METERS AND SERVICES DN32 AND LARGER (DRAFT)
SEWERAGE	
WSS051	MANHOLE PRECAST SEATING RING AND COVER
WSS052	150 ND CAST IN-SITU MANHOLE
WSS054	TYPICAL HOUSE CONNECTIONS
WSS056	STANDARD BEDDING DETAILS FOR SEWER MAINS 150-300ND

1.2 TERRITORY AND MUNICIPAL SERVICES STANDARD DRAWINGS

DS1 00 STORMWATER	
DRAWING NO.	SUBJECT
ST-0001	PIPE JUNCTIONS
ST-0011	SUMP INLETS ON KERBS AND GUTTERS
ST-0012	TYPE R AND QS SUMPS
ST-0013	PLANTATION AND GRATED SUMPS
ST-0014	1050 ND MANHOLES

Page 146

Shared Services Procurement – Tender for Construction Projects using a Lump Sum (AS2124) Delivery System
Template Version 11.2 of 28 July 2011

Page 145

Shared Services Procurement – Tender for Construction Projects using a Lump Sum (AS2124) Delivery System
Template Version 11.2 of 28 July 2011

ST-0015	SPECIAL CHAMBERED MANHOLES
ST-0017	STRUCTURES – MISCELLANEOUS DETAILS
ST-0018	PIPE CONNECTIONS TO STRUCTURES
ST-0021	PIPE CULVERTS 300-675 DIA – ENDWALLS

DS3 00 KERBING	
DRAWING NO.	SUBJECT
DS3-01	KERB AND GUTTER STANDARD DETAILS – SHEET 1
DS3-02	KERB AND GUTTER STANDARD DETAILS – SHEET 2

DS4 00 ROAD VERGES	
DRAWING NO.	SUBJECT

DS4-01	ROAD VERGE SERVICE MODULES – SHEET 1 OF 2
DS4-02	ROAD VERGE SERVICE MODULES – SHEET 2 OF 2
DS4-03	VERGE GRADIENTS AND ACCESS REQUIREMENTS
DS4-04	FOOTPATH MODULES

DS5 00 DRIVEWAYS	
DRAWING NO.	SUBJECT
DS5-01	DOMESTIC DRIVEWAYS
DS5-02	HEAVY DUTY DRIVEWAYS
DS5-03	DRIVEWAY LEVELS FOR 1 AND 2 METRE VERTICAL CURVES

DS6 00 SUBSOIL DRAINAGE	
DRAWING NO.	SUBJECT
DS6-01	SUBSOIL DRAINAGE – SHEET 1
DS6-02	SUBSOIL DRAINAGE – SHEET 2

DS7 00 STRUCTURES	
DRAWING NO.	SUBJECT
DS7-01	GRAVITY RETAINING WALLS, STONE AND CLAY BRICK
DS7-02	REINFORCED CONCRETE BLOCK WALLS UP TO 2100
DS7-03	STONE PITCHED RETAINING WALLS
DS7-04	RETAINING WALLS GENERAL NOTES
DS7-05	BRIDGE IDENTIFICATION PLATE
DS7-06	PEDESTRIAN BRIDGE BARRIER RAILINGS

DS9 00 TRAFFIC CONTROL DEVICES	
DRAWING NO.	SUBJECT
DS9-01	LINEMARKING TYPES
DS9-02	PAVEMENT MESSAGES
DS9-03	MISCELLANEOUS DETAILS
DS9-11	VERTICAL SIGN LOCATION AND LATERAL SIGN LOCATION
DS9-12	SIGN SYSTEMS ENDORSED FOR HIGH RISK AREAS
DS9-13	SPECIAL SIGNS
DS9-14	FINGER BOARD
DS9-15	STANDARD SIGN POSTING DETAILS
DS9-21	TCD's AT TRAFFIC LIGHTS
DS9-22	CABLE AND LOOP LAYOUT
DS9-23	HARDWARE LAYOUT
DS9-24	TCD's FOR ARTERIAL ROAD ROUNDABOUTS
DS9-25	TCD's FOR LOCAL STREET ROUNDABOUTS

Page 147

Shared Services Procurement – Tender for Construction Projects using a Lump Sum (AS2124) Delivery System
Template Version 11.2 of 28 July 2011

DS9-26	MISCELLANEOUS DETAILS 1
DS9-27	TYPICAL CIVIL DETAILS
DS9-28	TYPICAL LINEMARKING DETAILS
DS9-40/1	ACT PARKING SIGNS
DS9-40/2	ACT PARKING SIGNS
DS9-40/3	ACT PARKING SIGNS
DS9-40/4	ACT PARKING SIGNS
DS9-40/5	ACT PARKING SIGNS

DS11 00 BARRIERS AND FENCING

DRAWING NO. SUBJECT

DS11-01	STANDARD RANGER GATE
DS11-02	VEHICLE ACCESS GATE (HEAVY DUTY)
GW/SD/DC/12	PROTECTIVE FENCES AND BARRIERS, SHEET 1
GW/SD/DC/13	PROTECTIVE FENCES AND BARRIERS, SHEET 2
GW/SD/DC/14	STANDARD RURAL FENCING, SHEET 1
GW/SD/DC/15	STANDARD RURAL FENCING, SHEET 2

DS12 00 STREET LIGHTING

DRAWING NO. SUBJECT

Wiring Cables and Information

DC12-01-01	BLANK PANELS FOR STREET LIGHTING COLUMNS
DC12-01-02	MINOR STREETLIGHT PANEL FOR INTEGRAL LUMINAIRES ON CONCRETE POST TOP COLUMNS
DC12-01-03	SLIP BASE PANEL LAYOUT WIRING DIAGRAM
DC12-01-04	STREETLIGHTING CONTRACTOR PANEL POLE MOUNTED
DC12-01-05	SLIP BASE COLUMN BASE WIRING
DC12-01-06	LINK PANEL FOR INTEGRAL LUMINAIRES ON ENERGY ABSORBING COLUMNS
DC12-01-07	LINK PANEL FOR INTEGRAL LUMINAIRES ON 3.5M COLUMN
DC12-01-08	LINK PANEL FOR INTEGRAL LUMINAIRES ON SLIP BASE COLUMNS
DC12-01-09	LINK PANEL FOR INTEGRAL LUMINAIRES ON 4.1M POST TOP COLUMNS (SUITABLE FOR BEGA LIGHTS & KIM ARCHE LUMINAIRES)
DC12-01-10	STREETLIGHT CONTROL PANEL FOR NON-INTEGRAL METAL HALIDE LUMINAIRES
DC12-01-11	STREETLIGHT CONTROL PANEL FOR TWIN/TRAFFIC 150/250W HPS NON-INTEGRAL LUMINAIRES LAYOUT & SCHEMATIC
DC12-01-12	STREETLIGHT CONTROL PANEL FOR 400W MV SINGLE NON-INTEGRAL LUMINAIRES
DC12-01-13	STREETLIGHT CONTROL PANEL FOR 250W MV SINGLE NON-INTEGRAL LUMINAIRES
DC12-01-14	STREETLIGHT CONTROL PANEL FOR 250W METAL HALIDE LAMPS
DC12-01-15	STREETLIGHT CONTROL PANEL FOR SINGLE LINE DIAGRAM
DC12-01-16	STREETLIGHT CONTROL CUBICLE
DC12-01-17	STREETLIGHT CONTROL CUBICLE ACTEWAGL SERVICE CONNECTION ARRANGEMENT
DC12-01-18	STREETLIGHT CONTROL BOX
DC12-01-19	SPORTS LOVAL LIGHTING CONTROL BOX POLE MOUNTED
DC12-01-20	MEN EARTHING OF STREETLIGHT

Page 148

Shared Services Procurement – Tender for Construction Projects using a Lump Sum (AS2124) Delivery System
Template Version 11.2 of 28 July 2011

DC12-01-21	STREETLIGHTING 10 NEUTRAL SCREEN STRAIGHT THROUGH JOINT
DC12-01-22	STREETLIGHTING 30 NEUTRAL SCREEN STRAIGHT THROUGH JOINT
DC12-01-23	STREETLIGHT COLUMN IDENTIFICATION PLATE
DC12-01-24	PEG ACTIVATION TIME GRAPH

Footings

DC12-02-01	STREETLIGHTING COLUMN INSTALLATION
DC12-02-02	CONCRETE FOOTING DETAILS & STREETLIGHT CONTROL CUBICLE
DC12-02-03	INDICATIVE FOOTING DETAILS FOR OCTAGONAL COLUMNS

Columns

DC12-03-01	COMPLAP CONCRETE STREETLIGHT COLUMN
DC12-03-02	4.0M TAPERED STREETLIGHT COLUMN
DC12-03-03	4.5M TAPERED STREETLIGHT COLUMN
DC12-03-04	6.5M TAPERED STREETLIGHT COLUMN WITH LADDER REST
DC12-03-05	6.5M TAPERED OCTAGONAL SINGLE STREETLIGHT
DC12-03-06	9.0M IMPACT ABSORBING COLUMN BASE PLATE MOUNTED
DC12-03-07	9.0M IMPACT ABSORBING COLUMN IN GROUND MOUNTED
DC12-03-08	10.5M IMPACT ABSORBING COLUMN BASE PLATE MOUNTED
DC12-03-09	10.5M IMPACT ABSORBING COLUMN IN GROUND MOUNTED
DC12-03-10	12.0M IMPACT ABSORBING COLUMN BASE PLATE MOUNTED
DC12-03-11	12.0M IMPACT ABSORBING COLUMN IN GROUND MOUNTED
DC12-03-12	9.0M SLIP BASE
DC12-03-13	10.5M SLIP BASE
DC12-03-14	12.0M SLIP BASE
DC12-03-15	6.5M DUAL STREETLIGHT COLUMN
DC12-03-16	6.5M DECORATIVE STREETLIGHT COLUMN
DC12-03-17	4.5M FORDE TYPE 1 IN GROUND MOUNTED DECORATIVE STREETLIGHT COLUMN
DC12-03-18	4.5M FORDE TYPE 2 IN GROUND MOUNTED DECORATIVE STREETLIGHT COLUMN
DC12-03-19	6.5M FORDE TYPE 3 IN GROUND MOUNTED DECORATIVE STREETLIGHT COLUMN
DC12-03-20	6.5M FORDE TYPE 2 IN GROUND MOUNTED DECORATIVE STREETLIGHT COLUMN
DC12-03-21	9.0M FORDE TYPE 3 IN GROUND MOUNTED DECORATIVE STREETLIGHT COLUMN
DC12-03-22	9.0M FORDE TYPE 4 IN GROUND MOUNTED DECORATIVE STREETLIGHT POLE
DC12-03-23	CANBERRA MULTIPOLE STREETLIGHT
DC12-03-24	12.0M TAPERED OCTAGONAL COLUMN

Outreach Arms & Brackets

DC12-04-01	ELECTRICAL POLE BRACKET
DC12-04-02	STREETLIGHT BRACKET ARM FOR WOOD POLES
DC12-04-03	PEDESTRIAN LIGHTING BRACKET
DC12-04-04	MID ARM MOUNTING BRACKET FOR PEDESTRIAN FLOOD LIGHTS
DC12-04-05	0.5M OUTREACH POLE MOUNTED BRACKET
DC12-04-06	1.5M 4 WAY PIPE OUTREACH ARM
DC12-04-07	VPACTOR750 R-2 STREETLIGHT OUTREACH
DC12-04-08	DUAL 1.5M OUTREACH

Page 149

Shared Services Procurement – Tender for Construction Projects using a Lump Sum (AS2124) Delivery System
Template Version 11.2 of 28 July 2011

DC12-04-09	VPACTORW1.5S 1.5M SINGLE OUTREACH
DC12-04-10	VPACTORW3.0D DUAL 3M OUTREACH
DC12-04-11	VPACTORW3.0S 3M SINGLE OUTREACH
DC12-04-12	VPACTORW3.7D DUAL 3.5M OUTREACH
DC12-04-13	VPACTORW3.7D-90 DUAL 3.5M OUTREACH 90 DEGREE
DC12-04-14	VPACTORW3.7SS 3.5M SINGLE OUTREACH
DC12-04-15	VPACTORW4.5D DUAL 4.5M OUTREACH
DC12-04-16	VPACTORW4.5S SINGLE 4.5M OUTREACH
DC12-04-17	VPACTORW4.5D-90 DUAL 4.5M OUTREACH 90 DEGREES

MD.R132.F05.A	THRIE BEAM – NESTED RAIL ASSEMBLY
MD.R132.F06.A	W BEAM AND THRIE BEAM – POST INSTALLATION; HARD GROUND AND TERMINALS
MD.R132.G01.A	MELT TERMINAL- GENERAL ARRANGEMENT
MD.R132.H01.B	W BEAM CONNECTION TO TYPE F BARRIER OR BRIDGE PARAPET ON CONCRETE BRIDGES

SCHEDULE OF DRAWINGS

DRAWING NUMBER DRAWING TITLE

GENERAL

60198222-DRG-30-GE0001	COVER SHEET
60198222-DRG-30-GE0002	DRAWING INDEX AND LOCALITY PLAN
60198222-DRG-30-GE0003	DRAWING INDEX AND LOCALITY PLAN
60198222-DRG-30-GE0004	GENERAL NOTES AND LEGEND

SITE PLANS

60198222-DRG-30-RD1001	CONTROL MCE01 CH 2536.660 TO CH 2680
60198222-DRG-30-RD1002	CONTROL MCE01 CH 2680 TO CH 2840
60198222-DRG-30-RD1003	CONTROL MCE01 CH 2840 TO CH 3000
60198222-DRG-30-RD1004	CONTROL MCE01 CH 3000 TO CH 3060
60198222-DRG-30-RD1005	CONTROL MCE01 CH 3060 TO CH 3320
60198222-DRG-30-RD1006	CONTROL MCE01 CH 3320 TO CH 3480
60198222-DRG-30-RD1007	CONTROL MCE01 CH 3480 TO CH 3640
60198222-DRG-30-RD1008	CONTROL MCE01 CH 3640 TO CH 3800
60198222-DRG-30-RD1009	CONTROL MCE01 CH 3800 TO CH 3960
60198222-DRG-30-RD1010	CONTROL MCE01 CH 3960 TO CH 4120
60198222-DRG-30-RD1011	CONTROL MCE01 CH 4120 TO CH 4280
60198222-DRG-30-RD1012	CONTROL MCE01 CH 4280 TO CH 4440
60198222-DRG-30-RD1013	CONTROL MCE01 CH 4440 TO CH 4600
60198222-DRG-30-RD1014	CONTROL MCE01 CH 4600 TO CH 4760
60198222-DRG-30-RD1015	CONTROL MCE01 CH 4760 TO CH 4920
60198222-DRG-30-RD1016	CONTROL MCE01 CH 4920 TO CH 5080
60198222-DRG-30-RD1017	CONTROL MCE01 CH 5080 TO CH 5260
60198222-DRG-30-RD1018	CONTROL MCE01 CH 5260 TO CH 5400
60198222-DRG-30-RD1019	CONTROL MCE01 CH 5400 TO CH 5560
60198222-DRG-30-RD1020	CONTROL MCE01 CH 5560 TO CH 5720
60198222-DRG-30-RD1021	CONTROL MCE01 CH 5720 TO CH 5880
60198222-DRG-30-RD1022	CONTROL MCE01 CH 5880 TO CH 5932.897
60198222-DRG-30-RD1031	ON RAMP FROM PARKES WAY TO COMMONWEALTH AVENUE

ALIGNMENT CONTROL PLANS

60198222-DRG-30-RD1101	CONTROL MCE01 CH 2536.660 TO CH 2700
60198222-DRG-30-RD1102	CONTROL MCE01 CH 2700 TO CH 3040
60198222-DRG-30-RD1103	CONTROL MCE01 CH 3040 TO CH 3380

Page 151

Shared Services Procurement – Tender for Construction Projects using a Lump Sum (AS2124) Delivery System
Template Version 11.2 of 28 July 2011

DS13 00 PEDESTRIAN AND CYCLE FACILITIES

DRAWING NO. SUBJECT

DS13-01	PATH STANDARD DETAIL
DS13-02	VEHICLE RESTRICTION DETAIL
DS13-03-1	BUS STOP STANDARD DETAILS
DS13-03-2	BUS STOP STANDARD DETAILS (Connecting path near bdy)
DS13-04	CYCLE REST RAIL DETAILS
DS13-05	ON TO OFF-ROAD PATH CONNECTION DETAILS
DS13-06	MAIN COMMUNITY ROUTE DRIVEWAY CROSSING
DS13-21	COLOURED PAVEMENT TREATMENT
DS13-22	COLOURED PAVEMENT TREATMENTS AT EXIT RAMPS

1.3 NSW RTA STANDARD DRAWINGS

GUARDRAIL	
MD.R132.A01.A	W BEAM AND THRIE BEAM – POST AND BLOCKOUT COMPONENTS
MD.R132.A02.A	MODIFIED THRIE BEAM – NOTCHED BLOCKOUT
MD.R132.A04.A	W BEAM AND THRIE BEAM – POST ON BASE PLATE
MD.R132.B01.A	W BEAM RAIL AND STIFFENING PIECE CONNECTION
MD.R132.B02.A	THRIE BEAM RAIL AND STIFFENING PIECE CONNECTION
MD.R132.B03.A	W BEAM AND THRIE BEAM – TERMINAL CONNECTORS
MD.R132.B04.A	W BEAM TO THRIE BEAM – TRANSITION
MD.R132.B05.A	W BEAM – NESTING RAIL AND HALF LENGTH RAIL
MD.R132.B06.A	THRIE BEAM – NESTING RAIL AND HALF LENGTH RAIL
MD.R132.B07.A	THRIE BEAM – NESTING RAIL FOR TRANSITION TO RIGID BARRIER
MD.R132.B08.A	W BEAM – TERMINAL COMPONENT – ANCHOR PLATE
MD.R132.B09.A	MELT AND TT TERMINALS – DETAIL OF TERMINAL RAILS
MD.R132.B10.A	MELT TERMINAL – DIAPHRAGM PLATE DETAILS
MD.R132.B11.A	MELT AND TT TERMINALS – BUFFERED END SECTION DETAILS
MD.R132.C01.A	MELT AND TT TERMINALS – CABLE ASSEMBLY AND FASTENERS
MD.R132.C02.A	W BEAM AND THRIE BEAM – FASTENERS – MUSHROOM HEAD BOLTS AND NUTS
MD.R132.C03.A	W BEAM AND THRIE BEAM – FASTENERS – HEXAGONAL HEAD BOLTS AND NUTS
MD.R132.C05.A	THRIE BEAM – CONNECTION TO TYPE "F" CAST-IN ANCHOR ASSEMBLY
MD.R132.F02.A	THRIE BEAM – ASSEMBLY USING STANDARD BLOCKOUTS
MD.R132.F03.A	MODIFIED THRIE BEAM – ASSEMBLY USING NOTCHED BLOCKOUTS

Page 150

Shared Services Procurement – Tender for Construction Projects using a Lump Sum (AS2124) Delivery System
Template Version 11.2 of 28 July 2011

60198222-DRG-30-RD1104 CONTROL MCE01 CH 3380 TO CH 3740
60198222-DRG-30-RD1105 CONTROL MCE01 CH 3740 TO CH 4080
60198222-DRG-30-RD1106 CONTROL MCE01 CH 4080 TO CH 4420
60198222-DRG-30-RD1107 CONTROL MCE01 CH 4420 TO CH 4760
60198222-DRG-30-RD1108 CONTROL MCE01 CH 4760 TO CH 5100
60198222-DRG-30-RD1109 CONTROL MCE01 CH 5100 TO CH 5440
60198222-DRG-30-RD1110 CONTROL MCE01 CH 5440 TO CH 5780
60198222-DRG-30-RD1111 CONTROL MCE01 CH 5780 TO CH 5932.897
60198222-DRG-30-RD1121 DETAILED SET OUT RAMP 3
60198222-DRG-30-RD1131 CONTROL MCA01/MKC01/MTA01/MTA02/
MTA03/MTA04/MTA05
60198222-DRG-30-RD1141 SETTING OUT TABLES ON RAMP FROM PARKES
WAY TO COMMONWEALTH AVENUE
60198222-DRG-30-RD1151 SETTING OUT TABLES
60198222-DRG-30-RD1152 SETTING OUT TABLES

LONGITUDINAL SECTIONS

60198222-DRG-30-RD1201 CONTROL MCE01
60198222-DRG-30-RD1202 CONTROL MCE01
60198222-DRG-30-RD1203 CONTROL MCE01
60198222-DRG-30-RD1204 CONTROL MCE01
60198222-DRG-30-RD1205 CONTROL MCE01
60198222-DRG-30-RD1206 CONTROL MCE01

60198222-DRG-30-RD1301 CONTROL MCE02
60198222-DRG-30-RD1302 CONTROL MCE02
60198222-DRG-30-RD1303 CONTROL MCE02
60198222-DRG-30-RD1304 CONTROL MCE02
60198222-DRG-30-RD1305 CONTROL MCE02

60198222-DRG-30-RD1321 CONTROL MCE03
60198222-DRG-30-RD1322 CONTROL MCE04
60198222-DRG-30-RD1331 CONTROL MKA01
60198222-DRG-30-RD1332 CONTROL MKA02
60198222-DRG-30-RD1333 CONTROL MKA03
60198222-DRG-30-RD1334 CONTROL MKA02
60198222-DRG-30-RD1335 CONTROL MKA03
60198222-DRG-30-RD1336 CONTROL MKA04
60198222-DRG-30-RD1337 CONTROL MKA04
60198222-DRG-30-RD1338 CONTROL MKA05
60198222-DRG-30-RD1339 CONTROL MKA06

60198222-DRG-30-RD1341 CONTROL MKB01_1
60198222-DRG-30-RD1342 CONTROL MKB01_2
60198222-DRG-30-RD1343 CONTROL MKB02_1
60198222-DRG-30-RD1344 CONTROL MKB02_2
60198222-DRG-30-RD1345 CONTROL MKB03

60198222-DRG-30-DR3008 CONTROL MCE01 CH 3640 TO CH 3800
60198222-DRG-30-DR3009 CONTROL MCE01 CH 3800 TO CH 3960
60198222-DRG-30-DR3010 CONTROL MCE01 CH 3960 TO CH 4120
60198222-DRG-30-DR3011 CONTROL MCE01 CH 4120 TO CH 4280
60198222-DRG-30-DR3012 CONTROL MCE01 CH 4280 TO CH 4440
60198222-DRG-30-DR3013 CONTROL MCE01 CH 4440 TO CH 4600
60198222-DRG-30-DR3014 CONTROL MCE01 CH 4600 TO CH 4760

60198222-DRG-30-DR3051 OCI GRATED ACCESS MANHOLE (SS1)
60198222-DRG-30-DR3052 OCI GRATED ACCESS MANHOLE (SS2)
60198222-DRG-30-DR3054 TREATMENT OF REDUNDANT DRAINAGE WORKS

LIGHTING

60198222-DRG-30-SL4003 CONTROL MCE01 CH 2840 TO CH 3000
60198222-DRG-30-SL4004 CONTROL MCE01 CH 3000 TO CH 3050
60198222-DRG-30-SL4005 CONTROL MCE01 CH 3060 TO CH 3320
60198222-DRG-30-SL4006 CONTROL MCE01 CH 3320 TO CH 3480
60198222-DRG-30-SL4007 CONTROL MCE01 CH 3480 TO CH 3640
60198222-DRG-30-SL4008 CONTROL MCE01 CH 3640 TO CH 3800
60198222-DRG-30-SL4009 CONTROL MCE01 CH 3800 TO CH 3960
60198222-DRG-30-SL4010 CONTROL MCE01 CH 3960 TO CH 4120
60198222-DRG-30-SL4018 CONTROL MCE01 CH 5260 TO CH 5400
60198222-DRG-30-SL4019 CONTROL MCE01 CH 5400 TO CH 5560
60198222-DRG-30-SL4021 LIGHTING PLAN STREET LIGHT SCHEDULE
60198222-DRG-30-SL4031 LIGHTING DETAILS

TRAFFIC CONTROL DEVICES

60198222-DRG-30-TC5001 TRAFFIC CONTROL DEVICES LEGEND AND NOTES
60198222-DRG-30-TC5002 TRAFFIC CONTROL DEVICES
60198222-DRG-30-TC5003 TRAFFIC CONTROL DEVICES
60198222-DRG-30-TC5004 TRAFFIC CONTROL DEVICES
60198222-DRG-30-TC5005 TRAFFIC CONTROL DEVICES
60198222-DRG-30-TC5006 TRAFFIC CONTROL DEVICES
60198222-DRG-30-TC5007 TRAFFIC CONTROL DEVICES
60198222-DRG-30-TC5008 TRAFFIC CONTROL DEVICES
60198222-DRG-30-TC5009 TRAFFIC CONTROL DEVICES
60198222-DRG-30-TC5010 TRAFFIC CONTROL DEVICES
60198222-DRG-30-TC5011 TRAFFIC CONTROL DEVICES

TEMPORARY TRAFFIC MANAGEMENT PLANS

60198222-DRG-30-TW6001 GENERAL NOTES AND LEGEND
60198222-DRG-30-TW6011 DETOUR CYCLE PATH
60198222-DRG-30-TW6012 CONTROL MCE01 CH 2536.660 TO CH 2700
60198222-DRG-30-TW6013 CONTROL MCE01 CH 2700 TO CH 3040
60198222-DRG-30-TW6014 CONTROL MCE01 CH 3040 TO CH 3380
60198222-DRG-30-TW6015 CONTROL MCE01 CH 3380 TO CH 3740
60198222-DRG-30-TW6016 CONTROL MCE01 CH 3740 TO CH 4080
60198222-DRG-30-TW6017 CONTROL MCE01 CH 4080 TO CH 4420
60198222-DRG-30-TW6018 CONTROL MCE01 CH 4420 TO CH 4760

60198222-DRG-30-RD1346 CONTROL MKB03

60198222-DRG-30-RD1351 CONTROL MKC01 AND MTA02
60198222-DRG-30-RD1352 CONTROL MTA03 AND MTA04
60198222-DRG-30-RD1353 CONTROL MTA05

TYPICAL CROSS SECTIONS

60198222-DRG-30-RD1401 CONTROL MCE01 CH 2600 AND CH 2640
60198222-DRG-30-RD1402 CONTROL MCE01 CH 2800 AND CH 3300
60198222-DRG-30-RD1403 CONTROL MCE01 CH 3600 AND CH 4040
60198222-DRG-30-RD1404 CONTROL MCE01 CH 4600 AND CH 5340
60198222-DRG-30-RD1405 CONTROL MCE01 CH 5720

CROSS SECTIONS

60198222-DRG-30-RD1451 CONTROL MCE01
60198222-DRG-30-RD1452 CONTROL MCE01
60198222-DRG-30-RD1453 CONTROL MCE01
60198222-DRG-30-RD1454 CONTROL MCE01
60198222-DRG-30-RD1455 CONTROL MCE01
60198222-DRG-30-RD1456 CONTROL MCE01
60198222-DRG-30-RD1457 CONTROL MCE01
60198222-DRG-30-RD1458 CONTROL MCE01
60198222-DRG-30-RD1459 CONTROL MCE01
60198222-DRG-30-RD1460 CONTROL MCE01
60198222-DRG-30-RD1461 CONTROL MCE01
60198222-DRG-30-RD1462 CONTROL MCE01
60198222-DRG-30-RD1463 CONTROL MCE01
60198222-DRG-30-RD1464 CONTROL MCE01
60198222-DRG-30-RD1465 CONTROL MCE01
60198222-DRG-30-RD1466 CONTROL MCE01
60198222-DRG-30-RD1467 CONTROL MCE01
60198222-DRG-30-RD1468 CONTROL MCE01
60198222-DRG-30-RD1471 CONTROL MCA01
60198222-DRG-30-RD1472 CONTROL MCA01
60198222-DRG-30-RD1473 CONTROL MCA01

PAVEMENT DETAILS

60198222-DRG-30-PV2101 PAVEMENT PROFILES
60198222-DRG-30-PV2102 LONGITUDINAL PAVEMENT JOIN DETAILS
60198222-DRG-30-PV2103 LONGITUDINAL PAVEMENT JOIN DETAILS

DRAINAGE AND SERVICES

60198222-DRG-30-DR3001 CONTROL MCE01 CH 2536.660 TO CH 2680
60198222-DRG-30-DR3002 CONTROL MCE01 CH 2680 TO CH 2840
60198222-DRG-30-DR3003 CONTROL MCE01 CH 2840 TO CH 3000
60198222-DRG-30-DR3004 CONTROL MCE01 CH 3000 TO CH 3060
60198222-DRG-30-DR3005 CONTROL MCE01 CH 3060 TO CH 3320
60198222-DRG-30-DR3006 CONTROL MCE01 CH 3320 TO CH 3480
60198222-DRG-30-DR3007 CONTROL MCE01 CH 3480 TO CH 3640

60198222-DRG-30-TW6019 CONTROL MCE01 CH 4760 TO CH 5100
60198222-DRG-30-TW6020 CONTROL MCE01 CH 5100 TO CH 5440
60198222-DRG-30-TW6021 CONTROL MCE01 CH 5440 TO CH 5780
60198222-DRG-30-TW6022 CONTROL MCE01 CH 5780 TO CH 5954.909
60198222-DRG-30-TW6023 ON RAMP FROM PARKES WAY TO
COMMONWEALTH AVENUE

ENVIRONMENTAL MANAGEMENT PLANS

60198222-DRG-30-EN7001 GENERAL NOTES AND LEGEND
60198222-DRG-30-EN7011 CONTROL MCE01 CH 2536.660 TO CH 2700
60198222-DRG-30-EN7012 CONTROL MCE01 CH 2700 TO CH 3040
60198222-DRG-30-EN7013 CONTROL MCE01 CH 3040 TO CH 3380
60198222-DRG-30-EN7014 CONTROL MCE01 CH 3380 TO CH 3740
60198222-DRG-30-EN7015 CONTROL MCE01 CH 3740 TO CH 4080
60198222-DRG-30-EN7016 CONTROL MCE01 CH 4080 TO CH 4420
60198222-DRG-30-EN7017 CONTROL MCE01 CH 4420 TO CH 4760
60198222-DRG-30-EN7018 CONTROL MCE01 CH 4760 TO CH 5100
60198222-DRG-30-EN7019 CONTROL MCE01 CH 5100 TO CH 5440
60198222-DRG-30-EN7020 CONTROL MCE01 CH 5440 TO CH 5780
60198222-DRG-30-EN7021 CONTROL MCE01 CH 5780 TO CH 5954.909
60198222-DRG-30-EN7101 TYPICAL CROSS SECTIONS CONDITIONS 1, 2 AND 3
60198222-DRG-30-EN7102 TYPICAL CROSS SECTIONS CONDITIONS 4 AND 5

RETAINING WALL

60198222-DRG-30-RW8001 TOE OF WALL AT PAVEMENT PLAN
60198222-DRG-30-RW8002 RETAINING WALL LONGITUDINAL SECTION
60198222-DRG-30-RW8003 RETAINING WALL TYPICAL SECTION
60198222-DRG-30-RW8004 RETAINING WALL BARRIER DETAIL
60198222-DRG-30-RW8005 RETAINING WALL PANEL TYPE 'E', 'F' AND 'G'
TYPICAL SECTIONS

MISCELLANEOUS DETAILS

60198222-DRG-30-MD8101 GUARDRAIL / WIRE ROPE BARRIER
TERMINATIONS AT CLUNIES ROSS STREET

LANDSCAPE PLANS

L-0878 - DO1 LANDSCAPE PLAN WEST
L-0878 - DO2 LANDSCAPE PLAN WEST

BRIDGE OVER CLUNIES ROSS STREET - WIDENING

60198222-DRG-30-BR9100 GENERAL NOTES
60198222-DRG-30-BR9101 GENERAL ARRANGEMENT
60198222-DRG-30-BR9102 TYPICAL SECTION
60198222-DRG-30-BR9104 PILE SETOUT
60198222-DRG-30-BR9105 ABUTMENT A AND C - CONCRETE
60198222-DRG-30-BR9106 ABUTMENT A AND C - CONCRETE
60198222-DRG-30-BR9110 ABUTMENT B AND D - CONCRETE
60198222-DRG-30-BR9111 ABUTMENT B AND D - CONCRETE
60198222-DRG-30-BR9112 ABUTMENT - REINFORCEMENT

60198222-DRG-30-BR9115 PIER AND COLUMN - CONCRETE
60198222-DRG-30-BR9116 PIER AND COLUMN - REINFORCEMENT
60198222-DRG-30-BR9117 PIER AND COLUMN - REINFORCEMENT
60198222-DRG-30-BR9120 BEARING PLAN AND DETAILS
60198222-DRG-30-BR9121 GIRDER - CONCRETE
60198222-DRG-30-BR9122 GIRDER - CONCRETE
60198222-DRG-30-BR9123 GIRDER - CONCRETE
60198222-DRG-30-BR9124 GIRDER - CONCRETE
60198222-DRG-30-BR9125 GIRDER - REINFORCEMENT
60198222-DRG-30-BR9126 GIRDER - REINFORCEMENT
60198222-DRG-30-BR9141 DECK - CONCRETE
60198222-DRG-30-BR9142 DECK - CONCRETE
60198222-DRG-30-BR9143 DECK - REINFORCEMENT
60198222-DRG-30-BR9144 DECK - REINFORCEMENT
60198222-DRG-30-BR9150 STEEL TRAFFIC RAILING LAYOUT
60198222-DRG-30-BR9151 STEEL TRAFFIC RAILING DETAILS
60198222-DRG-30-BR9161 APPROACH SLAB PLAN AND DETAILS
60198222-DRG-30-BR9162 APPROACH SLAB REINFORCEMENT DETAILS
60198222-DRG-30-BR9167 STRENGTHENING ARRANGEMENT PLAN
60198222-DRG-30-BR9168 STRENGTHENING SECTIONS AND DETAILS - SHEET 1
60198222-DRG-30-BR9169 STRENGTHENING SECTIONS AND DETAILS - SHEET 2
60198222-DRG-30-BR9170 BEARING REPLACEMENT JACKING LAYOUT DETAILS

BRIDGE OVER SULLIVANS CREEK - WIDENING

60198222-DRG-30-BR9200 GENERAL NOTES
60198222-DRG-30-BR9201 GENERAL ARRANGEMENT
60198222-DRG-30-BR9202 TYPICAL SECTION
60198222-DRG-30-BR9204 PILE SETOUT
60198222-DRG-30-BR9205 ABUTMENT A - CONCRETE
60198222-DRG-30-BR9206 ABUTMENT A - CONCRETE
60198222-DRG-30-BR9207 ABUTMENT A - REINFORCEMENT
60198222-DRG-30-BR9208 ABUTMENT A - REINFORCEMENT
60198222-DRG-30-BR9210 ABUTMENT A - CONCRETE
60198222-DRG-30-BR9211 ABUTMENT A - CONCRETE
60198222-DRG-30-BR9212 PIER AND COLUMN - REINFORCEMENT
60198222-DRG-30-BR9213 PIER AND COLUMN - REINFORCEMENT
60198222-DRG-30-BR9215 PIER AND PILECAP - CONCRETE
60198222-DRG-30-BR9216 PILECAP - REINFORCEMENT
60198222-DRG-30-BR9217 BEARING PAD DETAILS AND GIRDER LAYOUT
60198222-DRG-30-BR9220 PSC GIRDER TYPE 1
60198222-DRG-30-BR9221 PSC GIRDER TYPE 1
60198222-DRG-30-BR9222 PSC GIRDER TYPE 1
60198222-DRG-30-BR9223 PSC GIRDER TYPE 1
60198222-DRG-30-BR9224 PSC GIRDER TYPE 2
60198222-DRG-30-BR9225 PSC GIRDER TYPE 2
60198222-DRG-30-BR9226 PSC GIRDER TYPE 2
60198222-DRG-30-BR9227 PSC GIRDER TYPE 2
60198222-DRG-30-BR9228 DECK - CONCRETE

Page 156

Shared Services Procurement - Tender for Construction Projects using a Lump Sum (AS2124) Delivery System
Template Version 11.2 of 28 July 2011

60198222-DRG-30-BR9231 DECK - CONCRETE AND DETAILS
60198222-DRG-30-BR9232 DECK - REINFORCEMENT PLAN
60198222-DRG-30-BR9233 DECK - REINFORCEMENT SECTIONS
60198222-DRG-30-BR9234 DECK - CONTINUOUS GIRDER
JOINT REINFORCEMENT
60198222-DRG-30-BR9235 DECK - DRAINAGE DETAILS
60198222-DRG-30-BR9236 DECK - CONCRETE
60198222-DRG-30-BR9245 STEEL TRAFFIC RAILING LAYOUT
60198222-DRG-30-BR9246 STEEL TRAFFIC RAILING LAYOUT
60198222-DRG-30-BR9251 APPROACH SLAB - PLAN AND DETAILS
60198222-DRG-30-BR9252 APPROACH SLAB - REINFORCEMENT DETAILS
60198222-DRG-30-BR9260 STRENGTHENING PLAN
60198222-DRG-30-BR9261 STRENGTHENING DETAILS
60198222-DRG-30-BR9262 STRENGTHENING DETAILS, TYPE 1, 2 AND 3
60198222-DRG-30-BR9263 STRENGTHENING DETAILS, TYPE 4 AND 5
60198222-DRG-30-BR9264 STRENGTHENING PLATE GEOMETRY
60198222-DRG-30-BR9270 BEARING REPLACEMENT JACKING LAYOUT DETAILS

Page 157

Shared Services Procurement - Tender for Construction Projects using a Lump Sum (AS2124) Delivery System
Template Version 11.2 of 28 July 2011

FORM OF TENDER (Lump Sum)

(Page 1 of 2)

The Tender Box
Shared Services Procurement
Ground Floor North, Dame Pattie Menzies House
16 Challis Street,
Dickson ACT 2602
(PO Box 818, DICKSON ACT 2602)

I/ve _____ ACN/ABN
(legal entity in block letters)

accept the tender and contract conditions in this RFT and tender to perform the Works for the

Parkes Way Widening, Glenloch Interchange to Edinburgh Avenue

(Project No) _____

for the GST inclusive sum of \$ _____ ("Tender Price")

I/ve understand that by signing this Form of Tender, a deed of agreement will be created if this Tender is accepted in writing by the Principal.

I/ve, therefore, warrant that all information provided by me/us in this Tender is complete and accurate.

Contact and Notice Details

Address of Registered Office of Tenderer _____

Address for Service of Notices _____

Contact Person and Position within the Tendering Organisation _____

Telephone Number _____ Facsimile Number _____

E-mail address _____

Election of Security/Retention Money

CONTRACTS OF OR LESS THAN \$500,000 - (refer to Special Conditions of Contract 8.02).

If an election is not made 5% security will be required.

☐ 1% Security plus 4% Retention ☐ 5% Security

Page 158

ACT Procurement Solutions - Tender for Construction Projects

Version 4, 23 March 2006

FORM OF TENDER (Lump Sum)

(Page 2 of 2)

Acknowledgment of Addenda

(Only to be completed when addenda have been issued during the tender period.)

I/ve acknowledge that the following addenda have been received and allowance for these addenda has been made in the Tender Price _____

SIGNED BY THE TENDERER on _____ 200..

SIGNED by and on behalf of _____)

(Name of Tenderer) _____)

ACN/ABN _____)

in the presence of: _____)

Signature of Witness _____

Print Name of Witness _____

Signature of Authorized Signatory _____

Print Name and Office Held _____

Signature of Authorized Signatory _____

Print Name and Office Held _____

Note:

Company: This form must be signed by 2 directors or a director and a secretary.

If the company is a proprietary company who has a sole director who is also the sole company secretary then this form must be signed by that director and witnessed.

Partnership: This form must be signed by at least one partner on behalf of all other partners and witnessed.

Individual: This form must be signed by the individual tendering for the Works and witnessed.

Page 159

Shared Services Procurement - Tender for Construction Projects using a Lump Sum (AS2124) Delivery System
Template Version 11.2 of 28 July 2011

SCHEDULES

TENDER SCHEDULE

(Tenders submitted without this Tender Schedule will be deemed non-conforming and not considered further.)

ITEM 1

I/We provide the following financial breakdown applicable to the Tender Price submitted on the attached Form of Tender for the Works:

..... (Project No)

(a)	Cost of work exclusive of GST or Provisional Sums	
(b)	GST applicable to the above	
(c)	Allowance for Provisional Sums (this includes applicable GST)	
(d)	Tender Price on Form of Tender [(a) + (b) + (c)]	
TOTAL (to Form of Tender)		

ITEM 2

I/We identify and state the value of any GST Free or Input Taxed Supplies as follows.

.....
.....

.....
Authorized Signatory

.....
Authorized Signatory

.....
Print Name

.....
Print Name

.....
Date

.....
Date

(Priced) Bill of Quantities

Schedule of Prices

SCHEDULE 1 Undertaking of Compliance

.....[Name of Tenderer],
.....[ACN (if any)]
has complied with the National Code of Practice for the Construction Industry
("Code") in preparing its tender response to request for Request for Tender No.
The Tenderer undertakes to comply with the Code in performing the Contract, should it be the successful tenderer.
The Tenderer acknowledges that it is aware the Principal may impose a sanction on a tenderer or contractor who or which does not comply with the Code. The sanction imposed may include but may not be limited to:

- (a) the reporting of the breach to an appropriate statutory body or law enforcement agency;
- (b) a formal warning that continued non-compliance will lead to more severe sanctions;
- (c) reduction in the number of tendering opportunities that are given, for example by excluding the non-complying party from tendering for ACT Government work above a certain value;
- (d) preclusion from tendering for any ACT Government work for a specified period;
- (e) publication of details of the breach and the identification of the party committing the breach; and
- (f) referral of the breach to the appropriate industry association for action consistent with industry codes of practice.

..... Authorized Signatory	 Authorized Signatory
..... Print Name	 Print Name
..... Date	 Date

SCHEDULE 2

STATUTORY DECLARATION

Statutory Declarations Act 1959 (Cwlth)

I, ... (name) of
..... (address and occupation) make the following
declaration under the *Statutory Declarations Act 1959* (Cwlth).

The information and details specified in the following 5 pages, titled 'Ethical Suppliers Declaration', are, I believe, correct as of the date of this declaration.

I understand that a person who intentionally makes a false statement in a statutory declaration is guilty of an offence under section 11 of the *Statutory Declarations Act 1959*, and I believe that the statements in this declaration are true in every particular.

.....
Signature of person making the declaration

Declared at (place)

on (day) of (month) (year)

Before me,

.....
Signature of person before whom the declaration is made

.....
Full name, qualification and address of person before whom the declaration is made (in printed letters)

ETHICAL SUPPLIERS DECLARATION

Definitions

In this Declaration.

Full Details means details of:

- (a) the nature of the breach or offence or alleged breach or offence;
- (b) any conviction recorded or adverse finding made in respect of the breach or offence;
- (c) any penalty or orders imposed by a court, tribunal, commission or board in respect of the breach or offence and the maximum penalty that could have been imposed under the Prescribed Legislation;
- (d) the name of the court, tribunal, commission or board, the State or Territory in which the proceeding or prosecution is brought, the date on which the proceeding or prosecution was commenced and the number or description assigned to the proceeding or prosecution by the court, tribunal, commission or board;
- (e) the name of the person or other legal entity against which the finding or conviction was made or the proceeding or prosecution was initiated.

Tendering Entity means the legal entity (individual or company) that proposes to enter into a contract with the Territory at the end of the tendering process, for the supply of prescribed works or services.

Contract means a written contract for the procurement of prescribed works or services having a total consideration, or estimated total consideration, worth \$20,000 or more.

Employee means a natural person who is employed under a contract of service (excluding professional or information technology services) to provide a supplier of prescribed works or services or a Subcontractor with his or her labour.

Employee and industrial relations obligations means compliance with:

- (a) Prescribed Legislation; and
- (b) determinations made by the tribunals of competent jurisdiction in respect of the interpretation, breach or any other matter concerning any Prescribed Legislation.

Note: Examples of employee and industrial relations obligations may typically include payment of remuneration; training; annual holidays; long service leave entitlements; occupational health and safety; workers' compensation; injury management, (including rehabilitation); legal age of employment; discrimination; and superannuation. This list is non exhaustive.

Prescribed Works or Services means works or services that require the exertion of labour by Employees in the performance of a Contract.

Page 168

Name of the Tendering Entity in relation to which I make this Declaration:

ACN / ABN of the Tendering Entity:

If a company, include ACN, and if a partnership or sole proprietor, include the full names of individual members and ABN.

1. The following industrial instrument (award or agreement) made pursuant to any Prescribed Legislation specifically applies to the Employees and Subcontractors of the Tendering Entity and is binding on it.

2. The Tendering Entity has in the preceding 24 months of the date of this Declaration complied with all Prescribed Legislation.

YES ☐	NO ☐
------------------------------	-----------------------------

3. The Tendering Entity has in the preceding 24 months of the date of this Declaration recognised the rights of Employees and Subcontractors to union membership and representation.

YES ☐	NO ☐
------------------------------	-----------------------------

4. The Tendering Entity has in the preceding 24 months of the date of this Declaration complied with any amendments to wages and conditions of employment for their Employees and Sub-contractors as decided by any authorised industrial or wage-setting agency.

YES ☐	NO ☐
------------------------------	-----------------------------

5. In the preceding 24 months of the date of this Declaration there have been either:

- (a) no findings against the Tendering Entity, or a proposed Subcontractor, by a court, tribunal, commission or board of a breach of any Prescribed Legislation, including a finding of a breach in a non-confidential consent order;

Page 170

Prescribed Legislation means:

- (a) awards or industrial agreements made pursuant to any legislation applicable to a supplier or Subcontractor;
- (b) Long Service Leave Act 1976 (ACT);
- (c) Work Safety Act 2008 (ACT);
- (d) Long Service Leave (Building and Construction Industry) Act 1981 (ACT);
- (e) Long Service Leave (Contract Cleaning Industry) Act 1999 (ACT);
- (f) Workers' Compensation Act 1951 (ACT);
- (g) Workplace Relations Act (1996) (Cwlth);
- (h) Fair Work Act 2009 (Cwlth); and
- (i) Superannuation Guarantee (Administration) Act 1992 (Cwlth).

Subcontractor means a legal entity that is contracted (or proposed to be contracted) by the Tendering Entity to provide prescribed works or services in connection with a Contract between the Territory and the Tendering Entity.

Page 169

OR

- (b) the following findings against the Tendering Entity, or a proposed Subcontractor, by a court, tribunal, commission or board of a breach of any Prescribed Legislation, including a finding of a breach in a non-confidential consent order [provide Full Details].

6. In the preceding 24 months of the date of this Declaration there have been either:

- (a) no convictions under the Prescribed Legislation against the Tendering Entity or a proposed Subcontractor;

OR

- (b) the following convictions under the Prescribed Legislation against the Tendering Entity or a proposed Subcontractor [provide Full Details].

7. There are currently no proceedings or prosecutions against the Tendering Entity or a proposed Subcontractor in respect of a breach of any Prescribed Legislation OR the following proceedings and prosecutions are currently brought against the Tendering Entity or a proposed Subcontractor [provide Full Details].

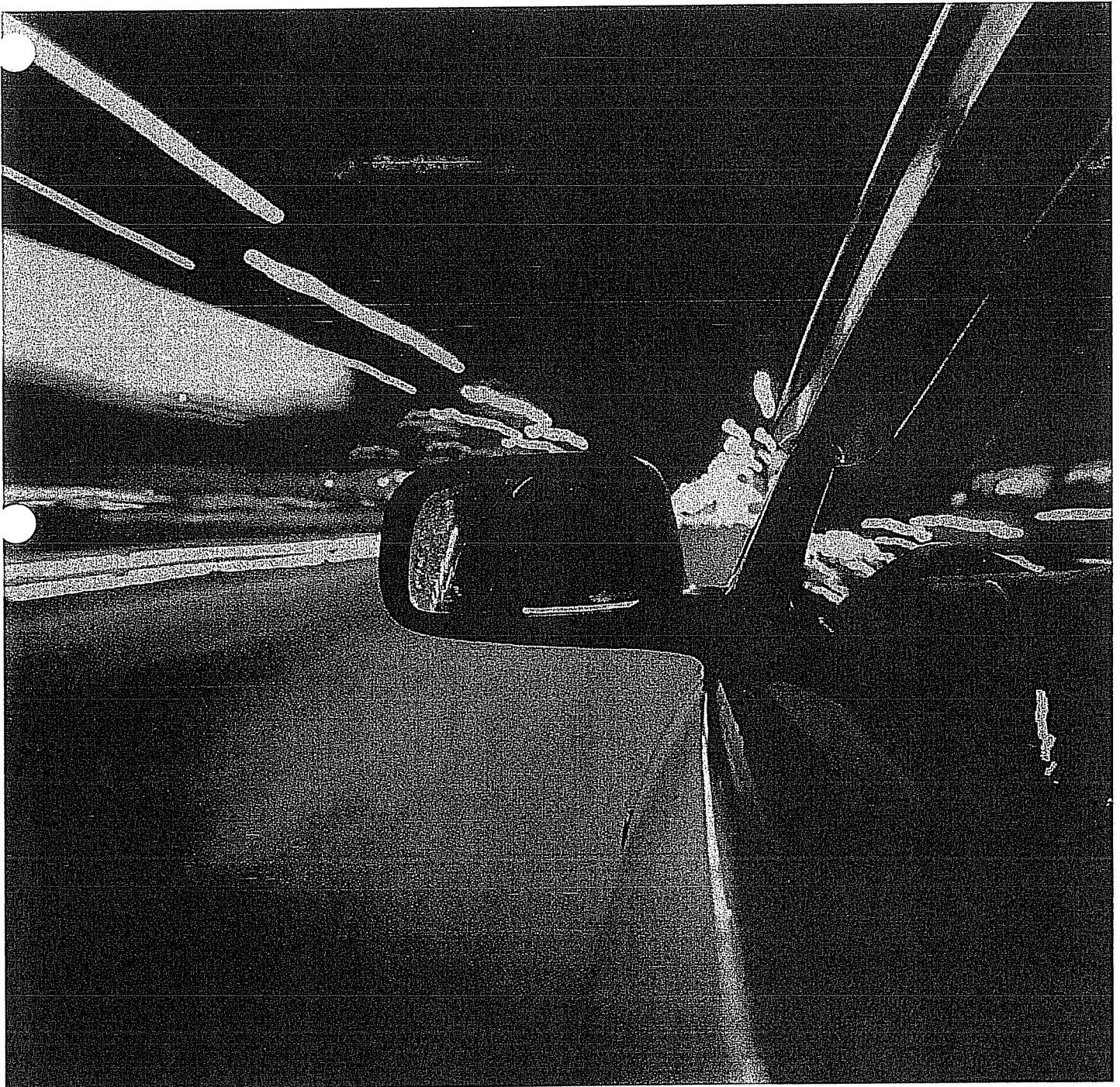
Page 171

8. The Tendering Entity has not been required to implement any remedial measures to ensure future compliance with the Prescribed Legislation OR the Tendering Entity has implemented the following remedial measures to ensure future compliance with Prescribed Legislation.

APPENDIX A: ACTON TUNNEL LIGHTING
TECHNICAL SPECIFICATION

Acton Tunnel Lighting Upgrade

DR Report



AECOM

Acton Tunnel Lighting Upgrade
Acton Tunnel Lighting Upgrade

Acton Tunnel Lighting Upgrade

DR Report

Project No: 12541

Prepared for
Shared Services Procurement

Prepared by

AECOM Australia Pty Ltd
Level 2, 60 Marcus Clarke Street, Canberra ACT 2600, Australia
T +61 2 6201 3000 F +61 2 6201 3099 www.aecom.com
ABN 20 093 846 923

28 September 2011

60198222

AECOM in Australia and New Zealand is certified to the latest version of ISO9001 and ISO14001.

© AECOM Australia Pty Ltd (AECOM). All rights reserved.

AECOM has prepared this document for the sole use of the Client and for a specific purpose, each as expressly stated in the document. No other party should rely on this document without the prior written consent of AECOM. AECOM undertakes no duty, nor accepts any responsibility, to any third party who may rely upon or use this document. This document has been prepared based on the Client's description of its requirements and AECOM's experience, having regard to assumptions that AECOM can reasonably be expected to make in accordance with sound professional principles. AECOM may also have relied upon information provided by the Client and other third parties to prepare this document, some of which may not have been verified. Subject to the above conditions, this document may be transmitted, reproduced or disseminated only in its entirety.

28 September 2011

Quality Information

Document Acton Tunnel Lighting Upgrade

Ref 60198222

Date 28 September 2011

Prepared by Anthony Linard/Rod Weeks

Reviewed by Andrew Todd

Revision History

Revision	Revision Date	Details	Authorised	
			Name/Position	Signature
A	23-May-2010	PSP Report	Mark Stefanac Group Leader - Buildings	
B	28 Sept 2011	DR Report	Rod Weeks Technical Director WIS	

Table of Contents

Executive Summary	i
1.0 Introduction and background	1
1.1 Project background	1
2.0 Design methodology	2
2.1 Preliminary calculations	2
2.1.1 Assessment of tunnel against AS/NZS 1158.5	2
2.1.2 Computer modelling of tunnel	2
2.1.3 Preliminary calculations	2
2.1.4 Development of design options	2
2.1.5 Development of budget estimates	2
2.2 Detailed design	2
3.0 Review of existing tunnel lighting infrastructure	3
3.1 General Overview	3
3.2 Existing luminaires	3
3.2.1 Condition and maintainability	3
3.2.2 Recycling potential of existing luminaires	3
3.3 Existing control equipment	3
3.4 Electrical infrastructure	3
3.5 Tunnel wall surface cladding	4
3.6 Ceiling Cladding	4
4.0 Acton Tunnel lighting classification – AS/NZS 1158.5	5
4.1 Introduction	5
4.2 Road element classification	5
4.2.1 Stopping sight distance	5
4.2.2 Determination of see-through from SSD	5
4.3 Determination of lighting subcategory	6
4.4 Determination of access zone luminance	6
4.5 Threshold zone luminance	7
4.6 Luminance reduction in the threshold and transition zones	7
4.7 Interior zone	7
4.8 Exit zone	7
4.9 Night-time lighting	7
4.10 Mains failure lighting	7
4.10.1 Duplicate power supplies requirements	8
4.10.2 Mains power failure lighting requirements	8
4.11 Light technical parameters	8
5.0 Lighting technology study	10
5.1 Best available technology	10
5.1.1 High pressure sodium	10
5.1.2 Fluorescent	10
5.2 Energy saving techniques	10
5.2.1 Best available lamp and luminaire technology	10
5.2.2 Optimised design of tunnel interior surfaces and luminaire layout	10
5.2.3 Switching of light levels in response to ambient light levels	10
5.3 Active reactor technology	11
6.0 Related issues	12
6.1 Maintenance	12
6.1.1 Lamp maintenance factor	12
6.1.2 Luminaire maintenance factor	12
6.1.3 Room Surface Maintenance factor	12
6.2 Work-as Executed Data	12
6.3 Interior wall surface finishes	12
6.4 Building impacts of lighting works	12
7.0 Selection of Design Option	13
8.0 Estimated Energy usage	14

Executive Summary

Final design has been carried out for a lighting upgrade to Acton Tunnel following completion of the investigation into the possible reuse of the existing lighting which indicated that this was not a feasible option. A range of new lighting options were also investigated, and a preferred solution in terms of luminaire types and placement has been documented. A major factor in the upgrade that became apparent was the surface cladding of the tunnel walls. The existing cladding has poor reflectance properties and works against an optimal design. A re-cladding of the tunnel walls with a higher-reflectivity aluminium panel has therefore been documented. Approximate costing of the wall cladding is included.

Estimates suggest that the extra cost associated with the new wall cladding would be offset completely by lower energy consumption costs over a 20 year design life.

It is recommended that a bulk re-lamping frequency of four years be implemented for the tunnel, as well as a regular cleaning regime for the walls and luminaires

The probable cost for the works as documented is \$3.94M.

1.0 Introduction and background

1.1 Project background

The Department of Territory and Municipal Services (TaMS) has an ongoing program to progressively upgrade street lighting in the ACT, and as a part of this has begun the process of investigating the upgrade of lighting in the Acton Tunnel. Acton Tunnel is Canberra's longest tunnel, at approximately 190 metres long. The Tunnel is on the major arterial road Parkes Way, and caters for large volumes of traffic on a daily basis.

The majority of the tunnel's existing lighting infrastructure is original equipment from the building of the tunnel approximately 30 years ago. The tunnel has separate carriageways for East- and Westbound traffic, each with three lanes and a bicycle/emergency stopping lane. The tunnel floor is concrete, the walls clad in AC sheeting and the ceilings clad in Stramit strawboard faced with AC sheeting. The extent of other services in the tunnel is limited to fire sprinklers. Ventilation systems are provided in the carparks located above the tunnel.

The speed limit through the tunnel is 90 km/h, and the surrounding parts of Parkes Way are illuminated to Category V3, with metal halide light sources on the Eastern side and high pressure sodium to the West.

AECOM were commissioned to investigate an upgrade to the tunnel's lighting. This will include an investigation into the possible upgrade or reuse of the existing luminaires as well as the design of a new lighting system that is independent of the existing arrangement.

2.0 Design methodology

2.1 Preliminary calculations

2.1.1 Assessment of tunnel against AS/NZS 1158.5

The tunnel lighting design process began with an analysis of the tunnel in accordance with the procedures outlined in AS/NZS 1158.5:2009. This determined the required light technical parameters to be met by the lighting design.

2.1.2 Computer modelling of tunnel

The next stage of the process was the creation of a three-dimensional model of the tunnel in the lighting calculation program AGI32. The model was based on the physical dimensions of Acton Tunnel and included surface reflectance properties selected based on those observed on site. Calculation points were included on road surfaces and walls as dictated by the Standard. The bicycle/emergency stopping lane has been included as part of the carriageway as per the requirements of the Standard.

2.1.3 Preliminary calculations

A number of preliminary calculations were run to determine the optimum layout and type of luminaires needed to meet the specified light technical parameters. In terms of luminaire placement, several options were trialled, including a single central row of luminaires, two side rows of luminaires (similar to the existing installation) and three rows of luminaires. Luminaires with various light output distributions were trialled, including symmetrical distribution, angled symmetrical and wall-washing to determine the best-performing arrangement to suit the tunnel's geometry. Other options were trialled as appropriate, such as tilting of luminaires to improve light distribution.

2.1.4 Development of design options

As the preliminary designs were refined, two rough design options were developed. These were based on two scenarios: the first that no internal surface treatments were to be changed in the tunnel, primarily meaning that the existing wall surfaces remain, and the second assuming that new higher reflectivity wall treatments will be added to the tunnel walls. Each scenario was developed to approximately 80% completion to prove the concept and await confirmation of design parameters for final design. TAMS will be required to choose which design option is to be taken to 100% design.

2.1.5 Development of budget estimates

For each of the two proposed design options, budget estimates have been developed to predict the upfront installation costs of each scheme as well as projected long-term running costs. These are presented in terms of monetary cost, energy usage and carbon dioxide emissions. Similar estimates are made for the existing scheme to allow a point of comparison. It should be noted that the existing scheme would not necessarily be usable for the time period of the calculations due to physical deterioration and difficulties sourcing lamps, however the comparison should be able to be used for comparison purposes.

2.2 Detailed design

The design parameters approved by TAMS have been used for detailed design for the new lighting scheme. The design has been developed to comply with the requirements of the Standard, and further details such as daytime switching levels, lighting controls, circuiting etc progressed to DR stage.

3.0 Review of existing tunnel lighting infrastructure

3.1 General Overview

The existing tunnel lighting infrastructure is approximately 30 years old. It appears that in that time the electrical infrastructure and controls equipment have been maintained and upgraded and that the luminaires have degraded significantly. It is unknown to what Standard the tunnel lighting design was designed to, however given that Standards Australia did not have a tunnel lighting standard until 2009, it is unlikely that the design would comply even if all components were in good working order.

3.2 Existing luminaires

3.2.1 Condition and maintainability

The luminaires in the tunnel are approximately 30 years old. The luminaires are a combination of low pressure sodium (SOX) lamps and linear fluorescent. The condition of the luminaires is poor, with a general accumulation of dirt and apparent damage to some diffusers. Given the age of the installation, this poor condition is to be expected, as this is well past the expected lifetime of any luminaire constantly exposed to the elements and constantly in use. Given also that the lamp types in use (SOX) are not readily available, there is a strong case for refurbishment or replacement.

We understand that the luminaires in use were manufactured by a company named GEC. This company is no longer trading under that name, and we understand that it was taken over by Rexel in 1998. The luminaires in use are no longer produced, and photometric information is not available. Given this, refurbishment of the existing luminaires is not feasible, as calculations are not able to be performed to assess the photometric performance of the luminaires.

Given the above, to achieve an as-new, Standards compliant tunnel lighting design for Acton Tunnel, the only available option is to install new luminaires. To achieve a best-practice low energy installation, the use of new luminaires with high quality optics and best available lamp technology is required.

3.2.2 Recycling potential of existing luminaires

It was observed during a site inspection of the switch room, where spare luminaires are stored, that the existing luminaires appear to be constructed of very solid gauge of aluminium. Considering the large number of luminaires installed, and that they have reached the end of their useful life, there is potential to recover some costs by recycling the luminaire bodies.

3.3 Existing control equipment

The tunnel lighting is currently controlled by a programmable logic controller (PLC) which appears to have been installed or serviced in 1997. This equipment appears to be in good working order, however an apparent lack of documentation may cause difficulties for upgrade or maintenance. The detailed design phase of this project will look into the feasibility of keeping this equipment or replacing it with new.

3.4 Electrical infrastructure

The existing electrical infrastructure appears to be of good quality and in good condition. A previous electrical condition report (S.Sih, Oct 2008) recommended a number of rectification measures be undertaken on the

equipment, but found the infrastructure to generally be in good condition. It was also noted that there appears to be a general lack of documentation on changes that have been made to the infrastructure, including issues such as missing distribution board schedules.

In general, it appears that the electrical infrastructure is able to be retained and reused with the tunnel lighting upgrade. When the upgrade is undertaken, it will provide the opportunity to correctly balance loads across the distribution boards and accurately document sub circuit layouts.

3.5 Tunnel wall surface cladding

According to the Work-as Executed drawings the internal wall surfaces of the tunnel are clad in 9 mm thick AC sheeting. The panels are screwed onto the surface. The majority of the panels are an off-white colour, although a number of panels throughout both sides of the tunnel are a dark grey colour. All panels are dirty and have poor reflective properties. Given that compliance with the Standard required achieving certain levels of diffuse luminance (i.e. brightness) on walls, the reflectivity of the tunnel wall claddings will have a significant impact on the design of lighting in the tunnel. The wall cladding in the tunnel will be relevant for two reasons. The first reason concerns the reflectivity as mentioned, whereby the higher the reflectivity of the wall, the less illumination (and therefore less lighting energy) will be required to achieve the required levels of luminance. Secondly, the ability to resist grime and the ability to be cleaned will affect the room surface maintenance factor (RSMF) that is chosen during the design process. A surface that is more resistant to dirt build-up and is easier to clean will allow the use of a higher RSMF, thereby decreasing the amount of luminaires needed to achieve the required lighting parameters.

A similar but lower cost option for re-cladding the walls is to clad to a height of 2.4 m (standard panel height) above the concrete crash barrier with the aluminium panelling, and paint the remaining upper portion of the wall with an appropriate high-reflectance, dirt-resistant paint. This will give much of the same benefits without such a high initial cost.

3.6 Ceiling Cladding

According to the Work-as-Executed drawings the ceilings are clad in 40 mm thick Stramit strawboard faced with 6 mm thick AC sheeting.

4.0 Acton Tunnel lighting classification – AS/NZS 1158.5

4.1 Introduction

The Australian Standard AS/NZS 1158.5:2009 Lighting for roads and public spaces Part 5: Tunnels and Underpasses (hereafter referred to as the Standard) specifies performance and design requirements for lighting schemes in tunnels and underpasses. The Standard begins with procedures for determining the applicable classification of a tunnel or underpass, based on the physical properties of the tunnel and the speed limit of the road. Subsequent calculations based on various roadway and tunnel characteristics give rise the required luminance at the entrance to the tunnel, and subsequent reductions in luminance along the length of the tunnel.

The procedures from the Standard have been followed for Acton Tunnel, and are summarised below.

4.2 Road element classification

Classification of the tunnel to determine its Lighting Subcategory is achieved by determining the Stopping Sight Distance (SSD), examining the tunnel from this distance to determine the extent of see-through, and applying the results to Figure 2.2 of the Standard.

4.2.1 Stopping sight distance

From Table 2.2 of the Standard, for a road with a speed limit of 90km/h and no corrections for grade, the Stopping Sight Distance is 140 metres.

4.2.2 Determination of see-through from SSD

A site investigation was undertaken, whereby photos were taken from the stopping sight distance at each approach to the tunnel. [Figure 1](#) and [Figure 2](#) show the approach view in the Eastbound and Westbound directions respectively. It can be seen that neither view has see-through.

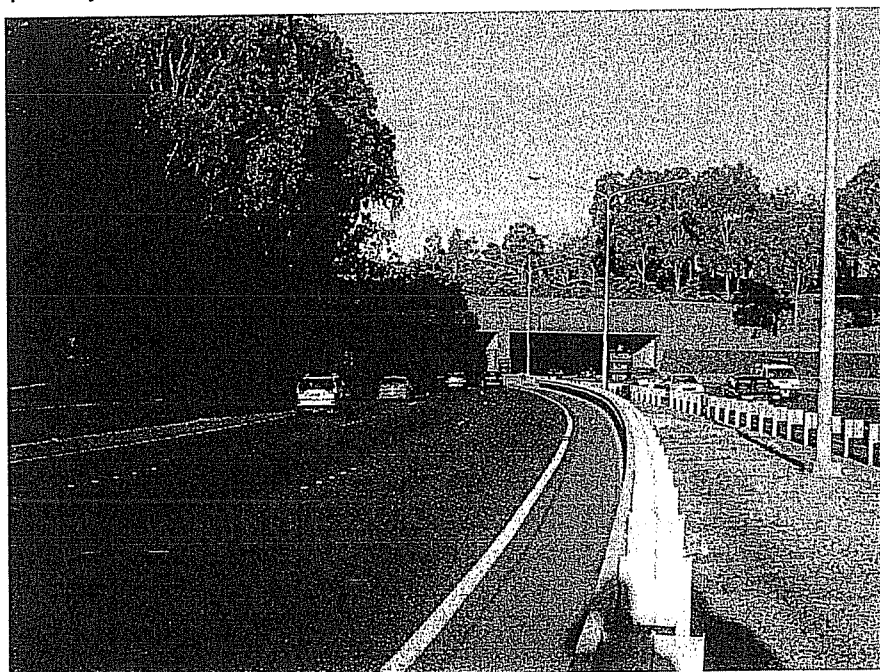


Figure 1: Eastbound view from SSD



Figure 2: Westbound view from SSD

4.3 Determination of lighting subcategory

Applying Figure 2.2 of the Standard indicates that with no see-through the road element classifies as a 'Tunnel'. The tunnel length (approximately 190 metres) is less than the transition zone (transition zone equals 450m, from Figure 3.2 of the Standard), therefore the applicable lighting category for the tunnel is **Category TU2**.

The Standard describes TU2 as follows:

"Tunnel of shorter length which requires an abbreviated tunnel lighting treatment after the threshold zone. Part of urban, high traffic volume road network for motor vehicle traffic only." (From Table 2.1 of the Standard).

4.4 Determination of access zone luminance

The access zone luminance describes the brightness of a view of the tunnel entrance, and is estimated using the technique outlined in Appendix H of the Standard. This includes the estimation of the brightness of each element in a 20° field of view of the tunnel entrance as observed from the SSD. An image of the tunnel entrance is divided into discrete areas based on the objects in that view, and luminances are assigned to each element as per the recommendations in Tables H1 and H2 of the Standard.

Access zone luminances calculated in each direction of travel are as follows:

Direction of travel	Access zone luminance L_{20}
Eastbound	4852
Westbound	5115

4.5 Threshold zone luminance

The road surface luminance of the threshold zone is determined by multiplying the L_{20} values by a scaling factor k . The value of k is interpolated from Table 3.1 of the Standard for a SSD of 140m to be 0.08677; therefore the threshold zone luminances to be used in the tunnel lighting design are as follows:

Direction of travel	Threshold zone luminance L_{th}
Eastbound	420.64
Westbound	443.44

These are the values that will be used as the primary design criteria on which the tunnel lighting is based.

4.6 Luminance reduction in the threshold and transition zones

Figure 3.2 from the Standard outlines the decrease in luminance throughout the transition zone. The rate of decrease is dependent on the design speed of the road, which in this case is 90 km/hr. Luminance levels are stepped down in increments corresponding to 100%, 75%, 50%, 25% and 12.5%, with the length of these zones being 70 m, 35 m, 20 m, 35 m, and 45 m respectively.

4.7 Interior zone

The average road surface luminance in this zone shall not be less than the value derived from Table 3.2 of the Standard. For a SSD of 140m, the interior zone luminance shall be above 9.2 cd/m². Although the Acton Tunnel is not long enough to require interior zone lighting, this value is used to determine the night-time lighting level.

4.8 Exit zone

For a lighting scheme designed to Category TU2, where the exit is reached in the threshold or transition zone, exit zone lighting is not required.

4.9 Night-time lighting

The night-time lighting is required to be not less than 50% of the lighting applicable to the road and walls in the interior zone. In this case, with the interior zone luminance calculated to be 9.2 cd/m², the night-time lighting level shall not be less than 4.6 cd/m².

4.10 Mains failure lighting

The Standard includes the following requirements for a Subcategory TU2 lighting scheme:

"5.1.2 Subcategory TU2 - Short Tunnels

Duplicate main power supplies plus UPS"

4.10.1 Duplicate power supplies requirements

The Standard requires that the normal entrance and interior zone lighting be provided with duplicate power supplies. This may be achieved either by having two permanent supplies from alternative sources, each supplying

part of the normal lighting, or by having normal lighting fed from one supply with an automatic and practically instantaneous changeover from one supply to the other upon failure of the first.

The existing supply arrangement includes duplicate feeds from two substations and an automatic transfer switch, so complies with this requirement.

4.10.2 Mains power failure lighting requirements

Lighting subcategories TU1, TU2 and TU3 require a mains failure lighting scheme to be installed. This will form a part of the normal night-time lighting scheme throughout the length of the tunnel and shall consist of a number of evenly spaced luminaires energised from a UPS.

The average illuminance level from the mains failure lighting scheme will be at least 10 lux horizontal average at the carriageway surface, with a minimum of 2 lux at any location within the tunnel. The lighting will remain active for a minimum of 30 minutes under mains failure conditions

Exit signage should be installed to the requirements of AS/NZS 2293.

4.11 Light technical parameters

A summary of the light technical parameters and tunnel properties used in the calculations is as follows:

The design parameters shall be as follows:

- Road surface CIE R1 (Concrete)
- Wall reflectance 0.25 (existing surface), 0.6 proposed new surface
- Concrete barrier reflectance 0.35
- Ceiling reflectance 0.2
- Maintenance factor (existing walls) 0.68
- Maintenance factor (new walls) 0.74
- Luminaire optical mounting height 5.35 metres
- Tunnel width: 14.8 metres
- Number of lanes: 3 lanes plus cycle/emergency stopping lane
- Design maximum speed: 90 km/h
- Stopping sight distance: 140 meters
- Traffic flow: Single directional
- Zone lengths and luminance as per AS1158.5 (2007)
- L20 value Southbound: 10000cd/m²
- Threshold zone luminance: 500 to 550 cd/msq
- L20 value Northbound: 10800 cd/msq
- Threshold value: 540 to 600 cd/msq
- Type of tunnel lighting installation symmetrical

The tunnel lighting system switching sequence will occur in accordance with the varying luminance levels detected in the access zone by the photometers at each tunnel portal.

5.0 Lighting technology study

5.1 Best available technology

Industry best practice and previous AECOM studies have established a current best practice combination of technologies for tunnel lighting. These include the use of high pressure sodium and fluorescent lamps. The benefits of each are outlined below.

5.1.1 High pressure sodium

High pressure sodium lamps (HPS) are among the highest efficacy lamps in general use. The latest generation of HPS lamp (Osram's Vialox NAV-T Super 4Y and similar) combines very high efficacy with long lifespan and very good lumen maintenance. HPS lamps are stable at high temperature, which is important in tunnel lighting schemes. From a practical viewpoint, HPS lamps are available in a useful range of wattages, which make them well suited for tunnel lighting designs, where graduated lighting levels are required.

5.1.2 Fluorescent

Fluorescent luminaires are very well suited to tunnel lighting at lower luminance levels, therefore are the preferred choice for night-time tunnel lighting. The ease of switching and dimming of luminaires make them flexible to use. In addition they are well suited for use as emergency lighting, due to their instant starting ability and low input power requirements. Extremely long-life T8 lamps are available, such as the Aura Ultimate long-life lamp, which is rated to a service life of 48,000 hours life when operated with magnetic ballasts or 70,000 when operated with electronic ballasts.

5.2 Energy saving techniques

Energy saving techniques available for tunnel lighting can be summarised into three broad categories, as follows:

5.2.1 Best available lamp and luminaire technology

As described above, there is an established industry best practice regarding the type of light sources that are best used in tunnel lighting. These include the very high efficacy high pressure sodium lamp and the high efficacy fluorescent lamp. Luminaire technology contributes to overall efficiency through the selection of luminaires with high quality optics and high protection from dirt ingress.

5.2.2 Optimised design of tunnel interior surfaces and luminaire layout

The tunnel lighting Standard includes requirements for the brightness levels of walls. This means that lighting must be arranged such that light is directed on the tunnel walls, creating brightness to satisfy the required levels. In addition, reflection of light off the walls can contribute to increasing light levels on the tunnel floor. The implication of both of these items is that increasing the reflectivity of the tunnel walls can decrease the amount of lighting energy that is required to be installed. Given that the existing tunnel wall coatings are not very reflective and are not resistant to dirt build-up, there is an opportunity to reduce potential energy usage by re-cladding the tunnel walls with higher-reflectivity, dirt-resistant materials.

5.2.3 Switching of light levels in response to ambient light levels

The intent of the design is to employ a total of five daytime switching levels. Switch groups would be configured such that light levels can be varied in response to ambient light levels during the day. Lower luminance levels at the tunnel opening will allow for the tunnel transition lighting to be set to a lower level. Luminance meters at each tunnel entrance will constantly monitor ambient light levels, allowing the graduated switching to take place. Switching levels of 100%, 75%, 50%, 25% and 12.5% will be used. Two extra light levels will be included, for night-time usage and for emergency lighting.

5.3 Active reactor technology

TaMS has requested that 'Active Reactor' technology be considered for use in the tunnel lighting. Active Reactor is a proprietary technology which makes use of the fact that discharge lamps require lower power at the beginning of life than they do at the end of life, therefore allowing energy savings by tailoring the delivered power to the actual requirement of the lamp. The device consists of an iron core ballast to supply a constant base of approximately 70% power, and an electronic device to supply a variable amount of power depending on the age of the lamp. The electronic component of the device has an expected life in the order of seven years (manufacturer's claim), which is temperature dependent. Higher running temperatures will shorten the life of the electronic component. Since the device combines an iron core component and an electronic component, with the former having a much longer expected lifetime, the fallback position of the Active Reactor upon failure of the electronic component will be a maximum of 70% power.

From the research we have conducted, it appears that the Active Reactor technology is well suited to outdoor and road lighting, where ambient temperatures during operation are not expected to be high. This is similar to the recommended applications of electronic ballasts. The use of Active Reactor technology in a tunnel situation may be problematic due to the expected high temperatures that may be experienced, primarily in the higher wattage luminaires (up to 400 W) which will operate during the daytime. Luminaire manufacturer Schröder has indicated that they could incorporate the technology in their luminaires, but expressed reservations about using them in a tunnel situation due to temperature effects, particularly for higher wattage luminaires.

It may be possible to use the Active Reactor technology in housings separate from the luminaire to remove them from the source of heat of the lamps. In this case, the Active Reactor and ballast would be in a separate, IP-rated housing mounted next to the luminaire. This method will be explored for the detailed design.

Although electronic ballast technology is becoming more widely used in external lighting, tunnel lighting generally uses magnetic ballasts as standard due to their longevity and resistance to high temperatures. In this instance we would recommend against the use of Active Reactor in the tunnel and the documentation has proceeded in line with this recommendation.

6.0 Related issues

6.1 Maintenance

The planned cleaning and maintenance regime of the tunnel will have an impact on the design of the tunnel lighting. The lighting design process takes into account maintenance and cleaning through the use of Maintenance Factors, which are used to predict the light output depreciation of the tunnel lighting system in the worst case (i.e. at the point where maintenance is undertaken). The overall maintenance factor is a combination of several factors, as described below:

6.1.1 Lamp maintenance factor

This value is taken from manufacturer's data, and predicts the drop in lumen output of the lamp after a certain time period (the re-lamping period). A re-lamping period of four years has been assumed in preliminary calculations.

6.1.2 Luminaire maintenance factor

This value predicts the amount of dirt build-up on the luminaire, and is taken from tables in AS/NZS 1158.1 Appendix E. This value is dependent on the cleanliness of the environment and the frequency of cleaning. A cleaning frequency of four years has been assumed in preliminary calculations.

6.1.3 Room Surface Maintenance factor

This value predicts the amount of dirt build-up on reflective room surfaces, and is dependent on the cleanliness of the environment and the ability of the surface to resist dirt build-up. This value is estimated from tables in the Australian Lighting Standards, and has been estimated to be worse for the existing walls than it would be for new wall claddings, as new wall cladding would be smooth, therefore resistant to dirt build-up and easy to clean. The existing wall surfaces are slightly textured, therefore would be less resistant to dirt build-up and harder to clean.

6.2 Work-as Executed Data

Work-as Executed drawings are available for the tunnel construction and the associated lighting and sprinkler infrastructure. This data has been used in the design of the tunnel lighting upgrade works.

6.3 Interior wall surface finishes

As discussed in several places in this report (refer to sections 3.5, 4.11 and 5.2.2), to achieve the best possible lighting design for the tunnel in terms of Standards compliance, energy use minimisation, long-term maintenance and driver seeing conditions, the existing wall cladding will be replaced with new cladding which will give higher reflectivity and greater resistance to dirt build-up. The cladding material adopted is Alpolc aluminium panels as recommended in the PSP report.

6.4 Building impacts of lighting works

The removal of the existing lighting will create a continuous gap the length of each tunnel on each side of the ceiling. As this gap opens into the ceiling void the filling of these gaps has been specified using powder coated off-white metal panelling fitted to ceiling supports.

7.0 Selection of Design Option

As discussed previously, two general lighting options were explored. The two situations investigated are where the existing tunnel wall cladding is retained, and where the wall cladding is replaced with a new higher reflectivity surface. For each option, lighting designs were refined to a level of completeness where comparisons in terms of installation and running costs and energy use could be made using lighting schemes with similar luminaires and lamp types.

The outcome was the selection of the option with the new wall cladding

The selected option adopted involves re-cladding the tunnel walls with new higher reflectivity aluminium materials. This significantly increases the reflectivity of the walls, and allows the use of a higher wall surface maintenance factor due to the improved ease of cleaning. The higher reflectivity also allows for the use of fewer luminaires, whilst understanding that there will be extra costs associated with the installation of the new wall cladding.

8.0 Estimated Energy usage

Refer to PSP report for a discussion and comparison of the energy usage.

9.0 Probable Estimate of Cost

The probable estimate of cost for the work as detailed in the DR documentation is \$3.94M inclusive of GST, made up as follows.

Remove existing linings and ceiling

Removal of asbestos to walls	\$152,000.00
Removal of asbestos to ceiling	\$60,800.00

Provision for Traffic

Establish	\$10,000.00
Remove	\$5,000.00
Maintenance	\$60,000.00

Lighting

Removal and replacement of existing tunnel luminaires	\$2,385,800
Work as Executed drawings	\$5,000
Operation and Maintenance manuals	\$10,000

Wall and Ceiling Treatments

Lining walls as detailed	\$755,964.00
Painting of walls as detailed	\$57,000.00
Replacement of asbestos ceiling panels including cutting and reinforcing of ceiling grid	\$76,000.00
Cutting and reinforcing of ceiling grid	

Sub total	\$3,577,600
GST	\$357 800
TOTAL	\$3,935,400

AECOM Australia Pty Ltd has no control over the cost of labour, materials, equipment or services furnished by others, neither has it control over contractors methods for determining prices, competitive bidding or market conditions. The assessment of probable construction cost produced by AECOM will be made on the basis of our best judgement as an experienced and qualified engineering consultant, familiar with the construction industry. As AECOM is not a qualified Quantity Surveyor, nor does it employ quantity surveyors, AECOM cannot and will not guarantee that any tenders or actual construction costs will not vary from this assessment of probable construction cost.

